DATA BOOK / 11th EDITION

Power Semiconductor Division GI General Instrument

ISO 9000 APPROVED

DATA BOOK

GI General Instrument
Power Semiconductor Division

INTRODUCTION

General Instrument Corporation is a major multinational company manufacturing a wide range of products from data systems, broadband communications and semiconductor products. The corporation, which has been in existence over 50 years, has manufacturing and sales locations throughout the world serving all major electronic markets.

The Power Semiconductor Division, a leading producer of discrete semiconductor devices has manufacturing facilities in the United States, Ireland and the Far East. These devices include low and medium power rectifiers from standard thru ultrafast recovery, bridge assemblies and transient voltage suppressors. We offer the widest selection of rectifier package types and junction structures including plastic encapsulated, glass passivated, superectifier, and surface mounts. Advanced junction technologies include double diffusion, double diffused fast and ultra-fast recovery, narrow base epitaxial, PAR and Schottky.

Particular emphasis has been focused on the superectifier product family including our new super surface mounted devices. The superectifier, when introduced over fifteen years ago increased rectifier reliability by several orders of magnitude. Today it still remains unmatched as the cost performance leader in axial leaded rectifiers. Now the superectifier features of metallurgically bonded junction, glass passivation, and flame retardant encapsulation are available in our line of super surface mounted rectifiers. For the ultimate in surface mounted rectifier reliability it's super surface mount.

The information contained in this data book is intended to provide the necessary technical and support data to assist the design engineer. It is our policy to maintain high standards of product manufacturing. The General Instrument logo (GI), printed on every component, ensures that it reaches the highest level of quality and reliability. In the complex and competitive semiconductor industry, high standards of quality using the latest methods of statistical quality controls are of the utmost importance since they constitute for our customers, the assurance of reliable product performance.

Not every application problem can be solved using a standard device, in this case we often develop special products to meet the customer requirements. If in doubt, call your local Sales Office or our Application Engineering Laboratory for further information.

SYMBOLS

C_J	Junction Capacitance	T_C	Case Temperature
I_F	DC Forward Current	t_d	Time Duration
$I_{(AV)}$	Average Forward Rectifier Current	t_f	Fall Time
I_D	Stand-by Reverse Leakage Current	T_J	Junction Temperature
I_{FSM}	Peak Forward Surge Current	T_L	Lead Temperature
I_o	Mean Forward Current	t_r	Rise Time
I_R	Reverse Leakage Current	t_{rr}	Reverse Recovery Time
I_{rr}	Reverse Recovery Current	T_{STG}	Storage Temperature
I_{PPM}	Maximum Peak Impulse Current	$V_{(BR)}$	Reverse Breakdown Voltage
$I_{RM(REC)}$	Maximum Peak Recovery Current	V_{FM}	Instantaneous Forward Voltage
I_{RSM}	Maximum Non-Repetitive Reverse Peak Current	V_{FR}	Forward Recovery Voltage
I_T	On-State Test Current	V_R	Dc Reverse Voltage
I^2t	Rating for Fusing	V_{RM}	Maximum Recurrent Peak Reverse Voltage
$P_{M(AV)}$	Steady State Power Dissipation	V_{RMS}	RMS Input Voltage
P_{PM}	Peak Pulse Power Dissipation	V_{RRM}	Repetitive Peak Reverse Voltage
Q_{RR}	Recovered Charge	V_{RSM}	Maximum Non-Repetitive Peak Reverse Voltage
$R\Theta JA$	Thermal Resistance (Junction to Ambient)	V_C	Clamping Voltage
$R\Theta JC$	Thermal Resistance(Junction to Case)	V_{WM}	Working Stand-off Voltage
$R\Theta JL$	Thermal Resistance (Junction to Lead)	V_Z	Zener Voltage
T_A	Ambient Temperature	Z_Z	Dynamic Impedance

DRAWINGS

All dimensions are in inches and (millimeters.)
Figures not to scale.

TEMPERATURES

Ratings at 25°C ambient temperature unless otherwise specified.

The General Instrument data book is not a document for official acceptance tests. Relevant is only the detailed data sheet, which is available on request. The Manufacturer reserves the right to change the contained data at any time in order to improve performance and supply the best product possible.

Notice of Revision on JEDEC Registered Case Outlines

The following case outlines have undergone a revision of outline names as shown below:

OLD OUTLINE	NEW OUTLINE
CASE 1	DO-201AD
CASE 25	DO-204AC
DO-15	DO-204AC
DO-41	DO-204AL
SO-8	MS-012AA
TO-3P	TO-247AD
8 PIN DIP	MS-001BA
16 PIN DIP	MS-001BB

CONTENTS

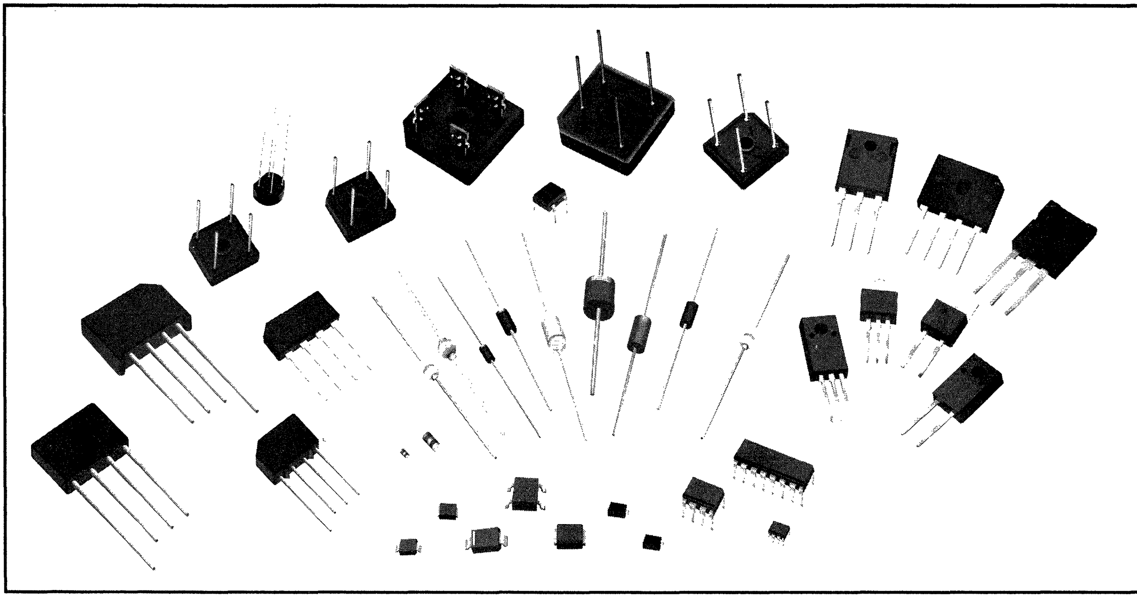
POWER SEMICONDUCTOR DIVISION

DATA BOOK
11th Edition

Published January, 1994

General Instrument

GENERAL INSTRUMENT'S PRODUCT LINE



GENERAL INSTRUMENT ISO 9000 APPROVED

nsai NATIONAL STANDARDS AUTHORITY OF IRELAND
Glasnevin, Dublin 9, Ireland

Certificate of Registration of Quality Systems

to

I.S./ISO 9002 / EN 29002:1989

The National Standards Authority of Ireland certifies that

General Semiconductor Ireland

Macroom, Co Cork

manufacturers of a range of transient voltage suppressors (diodes)

has been assessed for compliance with the provisions of the above Irish Standard and is hereby registered in the National Register of Certified Products and Companies.

Registered Firm
Irish Standard
I.S./ISO 9000/EN 29000
Quality System

Signed: ________ *Authorised Officer*

Date of Issue: 18th June 1991

Registration No.: M345

The technical requirements of the standard referred to above are identical to the following national standards harmonized with EN29002: NBN x 50-004; NF X 50-132; NEN 2647; NS 5802; SN 029 100B; BS 5750: Part 2 (ISO 9002-18=987); DIN ISO 9002; and US Standard ANSI/ASQC Q92-1987

DNV

DET NORSKE VERITAS

QUALITY SYSTEM CERTIFICATE

Certificate No. 2864

This is to certify that

THE QUALITY SYSTEM
of

GENERAL INSTRUMENT OF TAIWAN LTD.
POWER SEMICONDUCTOR DIVISION

233 PAO CHIAO ROAD, HSIN TIEN,
TAIPEI, TAIWAN, 23115 R.O.C.

Has been found to conform to the Quality System Standard

ISO 9001-1987 EN 29001-1987 CNS 12681 Z4034:1990
JIS Z9901:1991 ASQC Q91-1987
BS 5750:PART 1:1987

This Certificate is valid for the following product or service ranges

DESIGN AND MANUFACTURE OF POWER RECTIFIERS AND PROTECTION DEVICES.

Place and date
Sidcup 20th September 1993
for the Accredited Unit
Det Norske Veritas QA Ltd.
Management Representative

NATIONAL ACCREDITATION OF CERTIFICATION BODIES
Registration Number
013

This certificate is valid until
19th August 1996
Lead Auditor

Lack of fulfilment of condition as set out in the Appendix may render this certificate invalid

QUALITY ASSURANCE

General Instrument

QUALITY ASSURANCE

CUSTOMER INFORMATION

INTRODUCTION

Quality and Reliability of the Power Semiconductor Division extends its services to the areas of materials and product analysis, statistical quality control, reliability evaluation, quality inspection and development of new test methods.
Headquartered in New York, it assumes the responsibility for the development, implementation and administration of the Quality Assurance and statistical quality control programs for all operations of the Division, both domestic and foreign.
At our manufacturing plants, rigid and extensive in-process statistical quality controls are utilized such that the quality and reliability of our products are consistent and repeatable. The laboratories of our facilities are equipped with the latest high-level instrumentation and staffed with skilled technicians and engineers.
Professional expertise and the most modern scientific equipment maintains our position of excellence and leadership as the foremost producer of semiconductor devices, and assures that the quality levels of our products, from inspection and test of raw materials to final approval of completed devices, meet the highest standards of the industry.

We offer...
- Top-flight specialists and modern facilities.
- Experienced Test and Reliability Engineers.
- Statistical Quality Control.
- Fully equipped laboratories able to perform all types of scientific investigation.

SERVICES OF THE MATERIALS AND DEVICE ANALYSIS SECTION

- Testing, inspection and evaluation of materials utilizing the facilities of the electrical, mechanical, high-reliability and chemical analysis departments of our laboratories.
- Research and development of testing methods.
- Inspection of materials to ensure compliance by suppliers and contractors to specifications.
- Failure analysis to determine the cause of breakdown in materials or components.
- Qualification testing of military devices in accordance with applicable military specifications. The laboratories are qualified to perform testing to MIL-S-19500, MIL-STD-750, MIL-STD-202, and also are qualified to MIL-STD-883 tests under MIL-M-38510. Qualification approvals (QPL listing) were awarded by the United States, Canadian and West German Departments of Defense.

TEST CONDITIONS

OPERATING LIFE
Conditions: Rated voltage, rated current, for 1000 hours at rated maximum junction temperature

DC BLOCKING
Conditions: Rated voltage for 1000 hours at rated maximum junction temperature in inert environment.

STORAGE LIFE
Conditions: Rated maximum ambient temperature for 1000 hours in inert environment

LEAD PULL
Conditions: Axial pull to destruction.

LEAD FATIGUE
Conditions: number of 90-degree bends with 0.5 kg weight attached to lead.

MOISTURE RESISTANCE
Conditions: 85 °C, 85% Relative Humidity for 1000 hours.

FLAMMABILITY
Conditions: Encapsulating compound, General Instrument's proprietary formulas, GI-4B or GI-5A is self-extinguishing, recognized and registered by Underwriters' Laboratories, U.S. under 94V-O rating.

SOLDERABILITY
Conditions: 95% coverage within 1.2 mm of device body.

TEMPERATURE CYCLING
Conditions: - 65 °C to +175 °C.

SHOCK
Conditions: 5 blows of 1500g's.

VIBRATION (CONSTANT)
Conditions 20 g's at 60 Hz ± 20 Hz.

ACCELERATION
Conditions: 20,000 g's.

SALT ATMOSPHERE
Conditions: 5% solution for 24 hours at 40 °C.

HIGH RELIABILITY-TEST CAPABILITIES

♦ ***Barometric Pressure:***
This equipment simulates low atmospheric pressure encountered in non-pressurized environments up to 200,000 feet.

♦ ***Humidity:***
This equipment evaluates units in an accelerated manner, and monitors the effects of their resistance to high humidity and heat conditions. Typical RH of 90 to 98% is achieved.

♦ ***Salt (Spray) and Salt Atmosphere:***
The equipment provides an accelerated laboratory corrosion test simulating the effects of seacoast atmospheres. Salt concentration and velocity per day can be maintained between 10,000 and 50,000 mgm/m2/day. Salt Atmosphere - Salt spray 5%- 20% salt solution.

♦ ***Thermal Shock Temp.-Cycling:***
This test determines the resistance of devices to exposure at extremely high and low temperatures. Chamber limits - 74°C to 250° C.

♦ ***Mass Spectrometer Leak Detector (Fine Leak):***
To determine the effectiveness (or the hermeticity) of the seal on devices with internal cavities which are evacuated or contain air or gas. Machine limits $1 - 10^{-9}$ *to* $10 - 10^{-6}$*atm.*

♦ ***Gross Leak:***
Determine seal leak greater than $10 - 10^{-6}$*ATM cc/Sec.*

♦ ***Constant Acceleration:***
Determines the effects of a centrifugal force on devices up to 700,000g under space environment (refrigerated vacuum).

♦ ***Shock:***
Subjects the devices to conditions resulting from sudden applied forces or abrupt changes in motion produced by rough handing, transportation or field operation from 10 to 4,500g.

♦ ***Vibration Fatigue:***
Tests the effects of vibration within the frequency range of 60 Hz at 0-70g.

♦ ***Vibration Noise:***
Measures the amount of electrical noise produced by the devices under vibration from 9-5kHz and 0-70g.

♦ ***Non-Operating Life:***
To determine the effects on devices at elevated temperatures.Temperature ranges up to 300 °C.

♦ ***Operating Life Test:***
To operate the devices under intended condition to screen and eliminate marginal devices and eliminate mortality.

- ♦ *Steady State Operating Life*
- ♦ *Reverse Bias Operating Life*
- ♦ *Intermittent Operating Life*

♦ ***Solderability - Lead Integrity (Lead Tension):***
Determine the solderability on all devices from 0 to 400 °C.
Lead Tension - Designed to check the capabilities of the devices to withstand straight pulls.

♦ ***Lead Integrity (bending stress):***
Check the quality of leads, welds and seals of the devices to withstand bends under specific weights.

♦ ***Lead Integrity (lead torque):***
Check the devices, leads and seals for resistance to twisting motion. Equipment limits from .5 cmkg to 100 mkg.

♦ ***Hi-Power Microscopic Inspection:***
Examine internal and external construction of our devices up to 600 times.

♦ ***Bond Strength:***
This determines strength of lead bonding between the active area of the device and connecting packaging lead.

SCHOTTKY RECTIFIERS

0.6 TO 40 AMPERES

General Instrument

LOW CURRENT AXIAL SCHOTTKY RECTIFIERS

TYPE	SB020 thru SB040	SB120 thru SB160	1N5817 thru 1N5819	SB320 thru SB360	1N5820 thru 1N5822	SB520 thru SB560
PACKAGE	MPG06	DO-204AL		DO-201AD	DO-201AD	DO-201AD
IO(A)	0.6	1.0	1.0	3.0	3.0	5.0
VR=20(V)	SB020	SB120	1N5817	SB320	1N5820	SB520
VR=30(V)	SB030	SB130	1N5818	SB330	1N5821	SB530
VR-40(V)	SB040	SB140	1N5819	SB340	1N5822	SB540
VR=50(V)		SB150		SB350		SB550
VR=60(V)		SB160		SB360		SB560

MEDIUM CURRENT SCHOTTKY RECTIFIERS

SINGLE RECTIFIERS

TYPE	MBRF735 thru MBRF760	MBR735 thru MBR760	SBLF1030 thru SBLF1040	SBL1030 thru SBL1040	MBRF1035 thru MBRF10100	MBR1035 thru MBR10100	MBRF1635 thru MBRF1660	MBR1635 thru MBR1660
PACKAGE	ITO-220AC	TO-220AC	ITO-220AC	TO-220AC	ITO-220AC	TO-220AC	ITO-220AC	TO-220AC
BARRIER HEIGHT	HIGH	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH
IO(A)	7.5	7.5	10.0	10.0	10.0	10.0	16.0	16.0
VR=30(V)			SBLF1030	SBL1030				
VR=35(V)	MBRF735	MBR735			MBRF1035	MBR1035	MBRF1635	MBR1635
VR=40(V)			SBLF1040	SBL1040				
VR=45(V)	MBRF745	MBR745			MBRF1045	MBR1045	MBRF1645	MBR1645
VR=50(V)	MBRF750	MBR750			MBRF1050	MBR1050	MBRF1650	MBR1650
VR=60(V)	MBRF760	MBR760			MBRF1060	MBR1060	MBRF1660	MBR1660

MEDIUM CURRENT SCHOTTKY RECTIFIERS

DUAL RECTIFIERS

TYPE	SBLF1030CT thru SBLF1040CT	SBL1030CT thru SBL1040CT	MBRF1535CT thru MBRF1560CT	MBR1535CT thru MBR1560CT	SBLF1630CT thru SBLF1640CT	SBLF1630CT thru SBL1640CT	MBRF2035CT thru MBRF20100CT	MBR2535CT thru MBR20100CT	MBRF2535CT thru MBRF2560CT	MBR2535CT thru MBR2560CT
PACKAGE	ITO-220AB	TO-220AB	ITO-220AB	TO-220AB	ITO-220AB	TO-220AB	ITO-220AB	TO-220AB	ITO-220AB	TO-220AB
BARRIER HEIGHT	LOW	LOW	HIGH	HIGH	LOW	LOW	HIGH	HIGH	HIGH	HIGH
IO(A)	10.0	10.0	15.0	15.0	16.0	16.0	20.0	20.0	30.0	30.0
VR=30(V)	SBLF1030CT	SBL1030CT			SBLF1630CT	SBL1630CT				
VR=35(V0			MBRF1535CT	MBR1535CT			MBRF2035CT	MBR2035CT	MBRF2535CT	MBR2535CT
VR=40(V)	SBLF1040CT	SBL1040CT			SBLF1640CT	SBL1640CT				
VR=45(V)			MBRF1545CT	MBR1545CT			MBRF2045CT	MBR2045CT	MBRF2545CT	MBR2545CT
VR=50(V)			MBRF1550CT	MBR1550CT			MBRF2050CT	MBR2050CT	MBRF2550CT	MBR2550CT
VR=60(V)			MBRF1560CT	MBR1560CT			MBRF2060CT	MBR2060CT	MBRF2560CT	MBR2560CT

MEDIUM CURRENT SCHOTTKY RECTIFIERS

DUAL RECTIFIERS CONT.

TYPE	SBLF2030PT thru SBLF2040PT	SBL2030PT thru SBL2040PT	SBLF3030PT thru SBLF3040PT	SBL3030PT thru SBL3040PT	MBRF3035PT thru MBRF3060PT	MBR3035PT thru MBR3060PT	SD241P	MBRF4035PT thru MBRF4060PT	MBR4035PT thru MBR4060PT
PACKAGE	ITO-3P	TO-247AD	ITO-3P	TO-247AD	ITO-3P	TO-247AD	TO-247AD	ITO-3P	TO-247AD
BARRIER HEIGHT	LOW	LOW	LOW	LOW	HIGH	HIGH	HIGH	HIGH	HIGH
IO(A)	20.0	20.0	30.0	30.0	30.0	30.0	30.0	40.0	40.0
VR=30(V)	SBLF2030PT	SBL2030PT	SBLF3030PT	SBL3030PT					
VR=35(V)					MBRF3035PT	MBR3035PT		MBRF4035PT	MBR4035PT
VR=40(V)	SBLF2040PT	SBL2040PT	SBLF3040PT	SBL3040PT					
VR=45(V)					MBRF3045PT	MBR3045PT	SD241P	MBRF4045PT	MBR4045PT
VR=50(V)					MBRF3050PT	MBR3050PT		MBRF4050PT	MBR4050PT
VR=60(V)					MBRF3060PT	MBR3060PT		MBRF4060PT	MBR4060PT

AXIAL PLASTIC SCHOTTKY RECTIFIERS

0.6 TO 5.0 AMPERES

General Instrument

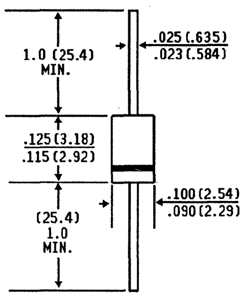
SB020 THRU SB040

MINIATURE LOW CURRENT SCHOTTKY BARRIER RECTIFIER

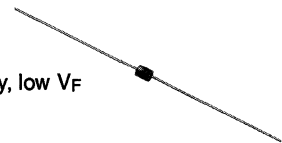
***VOLTAGE** - 20 to 40 Volts* ***CURRENT** - 0.6 Amperes*

FEATURES

MPG06



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.375" (9.5 mm) lead lengths at 5 lbs. (2.3 kg) tension

MECHANICAL DATA

Case: Molded Plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.0064 ounces, 0.181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	SB020	SB030	SB040	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	Volts
Maximum Average Forward Rectified Current at .375", (9.5mm) Lead Length T_L=60°C	$I_{(AV)}$		0.6		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L=70°C	I_{FSM}		20.0		Amps
Maximum Instantaneous Forward Voltage at 0.6A	V_F		0.55		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking (NOTE 2) T_A=25°C	I_R		0.5		mA
T_A=100°C	I_R		10.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\Theta JA}$		46.0		°C/W
Operating Junction Temperature Range	T_J		-55 to +125		°C
Storage Temperature Range	T_{STG}		-55 to +150		°C

NOTES:
1. Thermal Resistance from Junction to Ambient Vertical P.C. Board Mounting, 0.5", 1.27mm Lead Length with 1.5" sq. (38.1mm^2) copper pads.
2. Pulse Test: Pulse width=300μs, Duty Cycle=2%.

RATINGS AND CHARACTERISTIC CURVES SB020 THRU SB040

FIG. 1 — FORWARD CURRENT DERATING CURVE

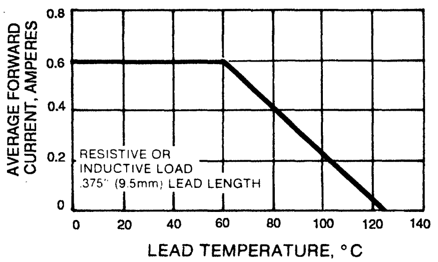


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

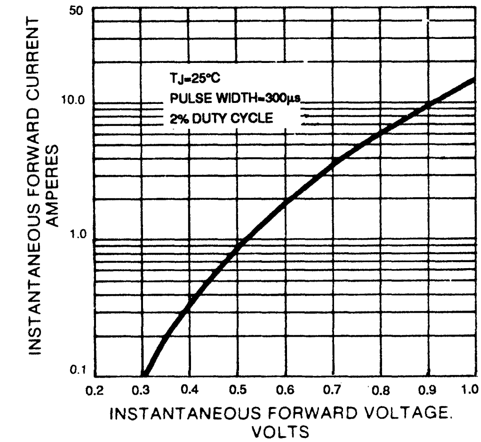


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS

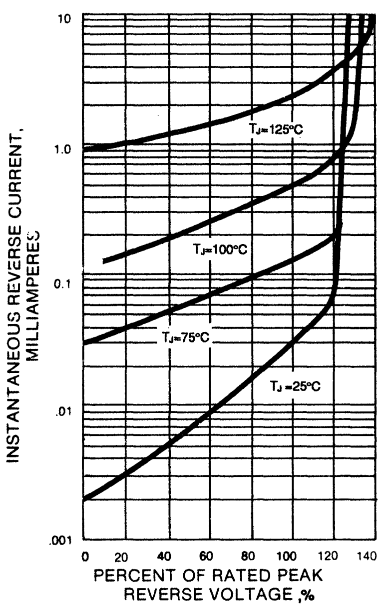


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

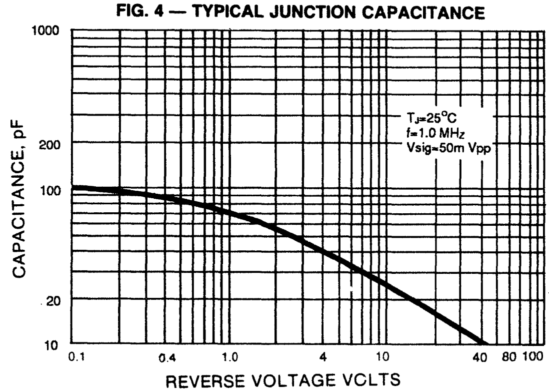
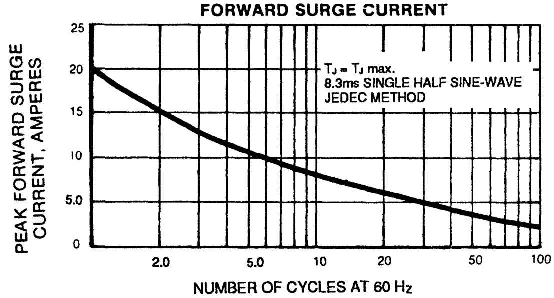


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



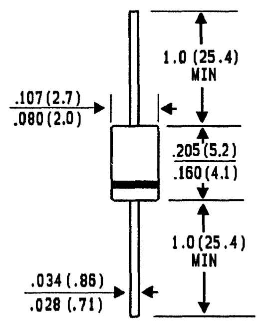
1N5817 THRU 1N5819

MINIATURE SCHOTTKY BARRIER RECTIFIERS

***VOLTAGE** - 20 to 40 Volts* ***CURRENT** - 1.0 Ampere*

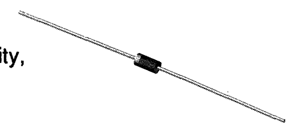
FEATURES

DO-204AL



Dimensions in inches
and
(millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Guardring for stress protection
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.375" (9.5 mm) lead lengths at 5 lbs., (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-41 Molded Plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounces, .34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	1N5817	1N5818	1N5819	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	Volts
* Maximum DC Blocking Voltage	V_{DC}	20	30	40	Volts
* Maximum Non-Repetitve Peak Reverse Voltage	V_{RSM}	24	36	48	Volts
* Maximum Average Forward Rectified Current .375", 9.5mm Lead Length at T_L=90°C	$I_{(AV)}$		1.0		Amps
* Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_L = 70°C	I_{FSM}		25.0		Amps
* Maximum Forward Voltage at 1.0A	V_F	.450	.550	.600	Volts
* Maximum Forward Voltage at 3.1A	V_F	.750	.875	.900	Volts
* Maximum Instantaneous Reverse Current at Rated DC Reverse Voltage (NOTE 3) T_A=25°C / T_A=100°C	I_R		1.0 / 10.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\Theta JL}$		15.0		°C/W
Typical Junction Capacitance (NOTE 2)	C_J		110.0		pF
* Storage and Operating JunctionTemperature Range	T_J,T_{STG}		-65 to +125		°C

NOTES: 1. Thermal Resistance from Junction to Lead, PC Board Mounting with .375(9.5mm) Lead Lengths and 1.5 in^2 (38.1 mm^2) copper pads.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
3. Pulse Test: 300μs Pulse Width, 2.% Duty Cycle.
*JEDEC registered values

FIG 1 - FORWARD CURRENT DERATING CURVE

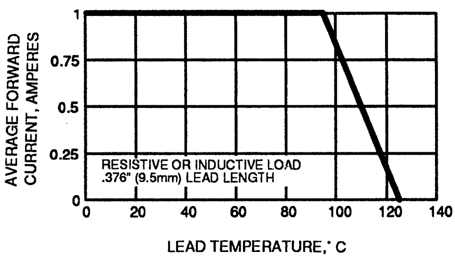


FIG 2 - TYPICAL REVERSE CHARACTERISTICS

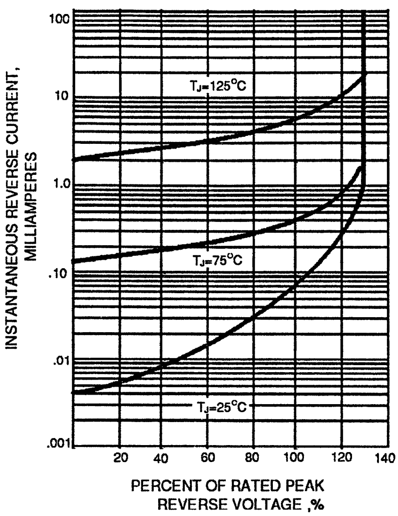


FIG 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

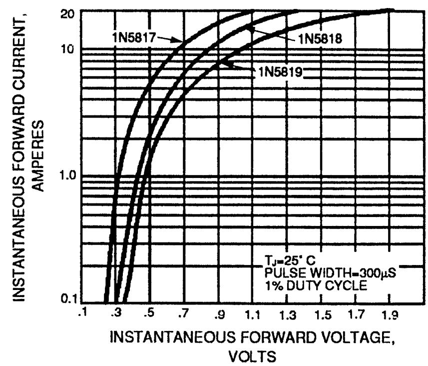


FIG 4 - MAXIMUM NON-REPETITIVE PEAK SURGE CURRENT

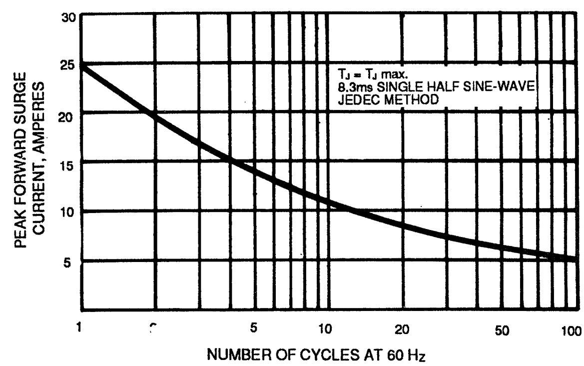
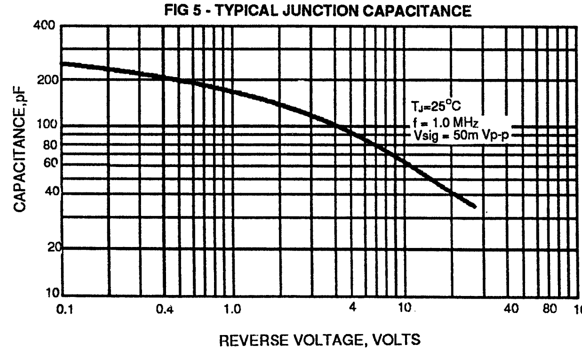


FIG 5 - TYPICAL JUNCTION CAPACITANCE



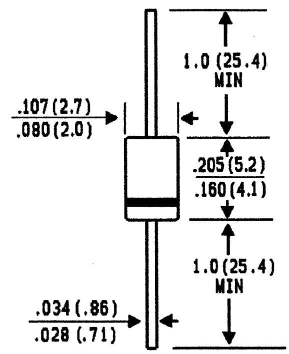
SB120 THRU SB160

MINIATURE SCHOTTKY BARRIER RECTIFIER

***VOLTAGE RANGE** - 20 to 60 Volts* ***CURRENT** - 1.0 Ampere*

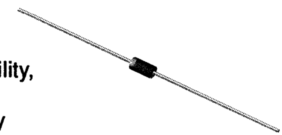
FEATURES

DO-204AL



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.375" (9.5mm) lead lengths/5lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-41 Molded Plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounces, .34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SB120*	*SB130*	*SB140*	*SB150*	*SB160*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Length See Fig.1	$I_{(AV)}$	1.0					Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0					Amps
Maximum Instantaneous Forward Voltage at 1.0A (NOTE 2)	V_F	0.50			0.70		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage (NOTE 2) T_A=25°C	I_R	0.5					mA
T_A=100°C	I_R	10.0			5.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\theta JL}$	15.0					°C/W
Operating Junction Temperature Range	T_J	-65 to +125			-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +150					°C

NOTES:
1.Thermal Resistance Junction to Lead P.C. Board Mounting .375" (9.5 mm) Lead Lengths.
2.Pulse Test: Pulse Width=300μs, Duty Cycle=2.0%.

FIG. 1 — FORWARD CURRENT DERATING CURVE

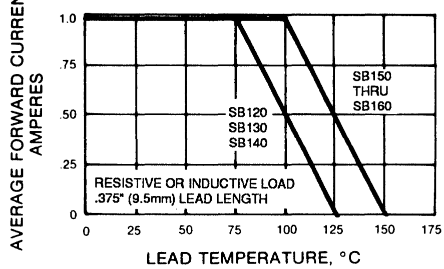


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

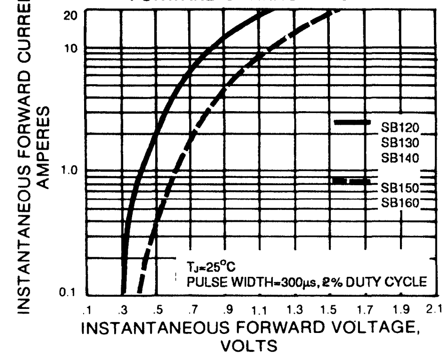


FIG. 3A — TYPICAL REVERSE CHARACTERISTICS

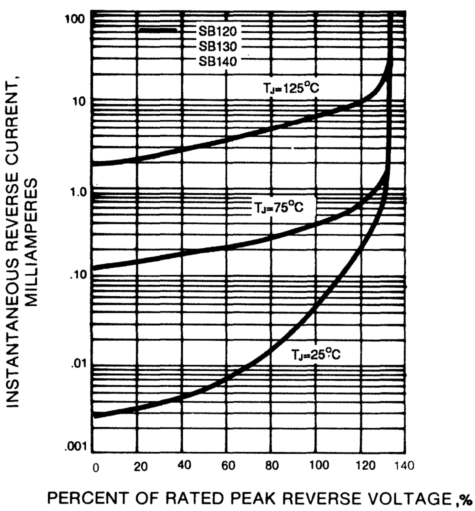


FIG. 3B — TYPICAL REVERSE CHARACTERISTICS

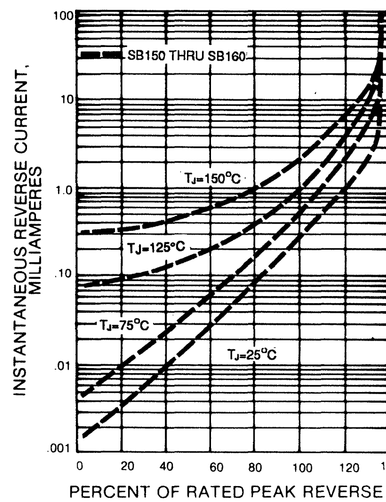


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

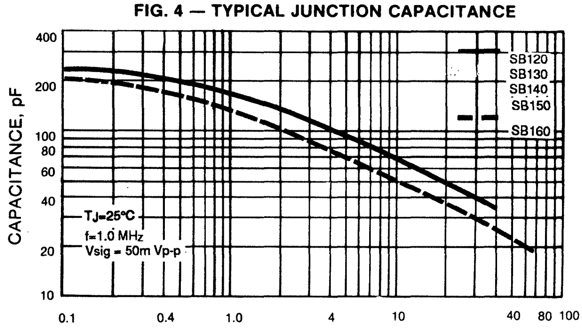
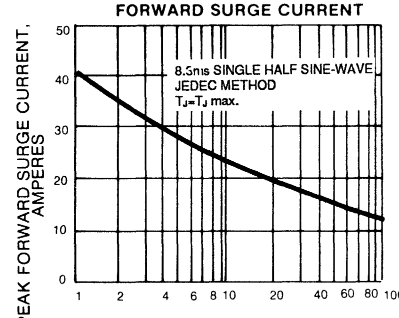


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



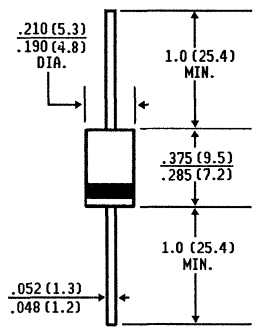
1N5820 THRU 1N5822

MEDIUM CURRENT SCHOTTKY BARRIER RECTIFIER

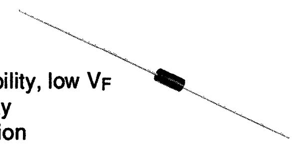
***VOLTAGE** -20 to 40 Volts* ***CURRENT** - 3.0 Amperes*

FEATURES

DO-201AD



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.375" (9.5 mm) lead lengths at 5 lbs. (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded Plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounces, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	1N5820	1N5821	1N5822	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	Volts
* Maximum DC Blocking Voltage	V_{DC}	20	30	40	Volts
* Non-Repetitve Peak Reverse Voltage	V_{RSM}	24	36	48	Volts
* Maximum Average Forward Rectified Current .375", 9.5mm Lead Length at T_L=95°C	$I_{(AV)}$		3.0		Amps
* Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) atT_L=75°C	I_{FSM}		80.0		Amps
* Maximum Instantaneous Forward Voltage at 3.0 (NOTE 1)	V_F	.475	.500	.525	Volts
* Maximum Instantaneous Forward Voltage at 9.4 (NOTE 1)	V_F	.850	.900	.950	Volts
* Maximum Average Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R		2.0		mA
(NOTE 1) T_A=100°C	I_R		20.0		mA
Typical Thermal Resistance (NOTE 2)	$R_{\Theta JL}$		20.0		°C/W
* Storage and Operating Junction Temperature Range	T_J, T_{STG}		-65 to +125		°C

NOTES:
1. Pulse Test: Pulse Width=300μs, Duty Cycle=2%.
2. Thermal Resistance from Junction to Lead Vertical PC Board Mounting, .500" (12.7 mm) Lead Length with 2.5" sq. (63.5mm^2) copper pads.

*JEDEC registered values

FIG. 1 — FORWARD CURRENT DERATING CURVE

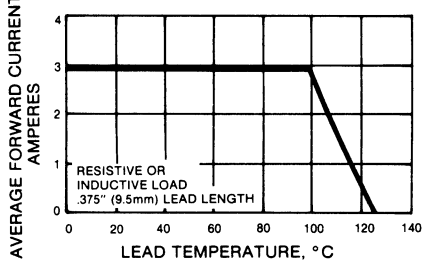


FIG 3 - MAXIMUM NON-REPETITVE PEAK FORWARD SURGE CURRENT

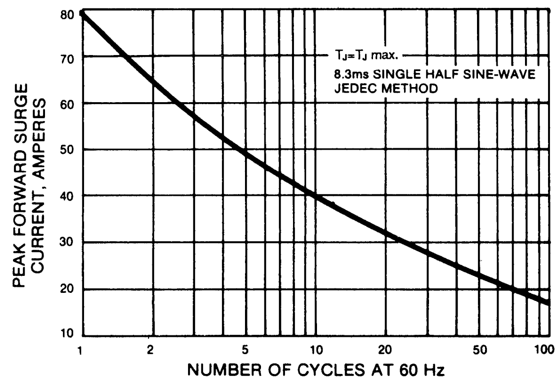


FIG. 2 — TYPICAL REVERSE CHARACTERISTICS

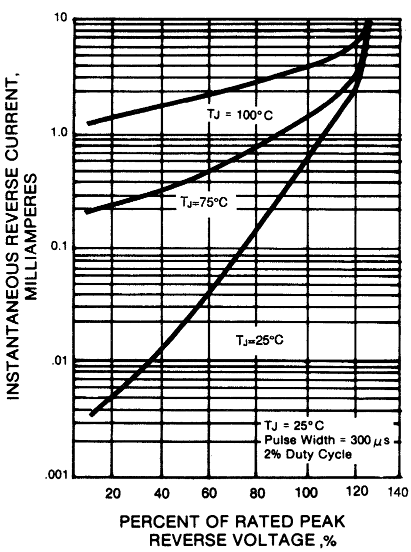


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

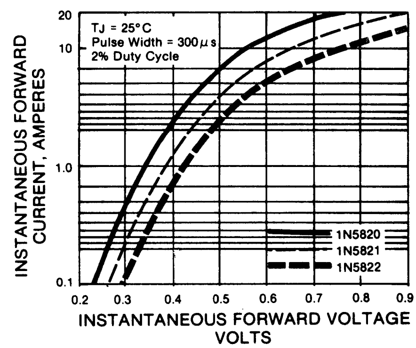
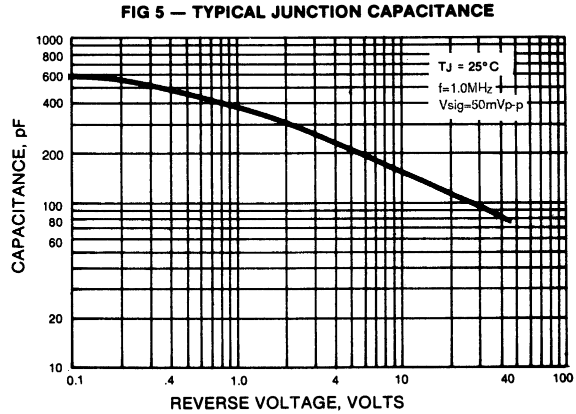


FIG 5 — TYPICAL JUNCTION CAPACITANCE



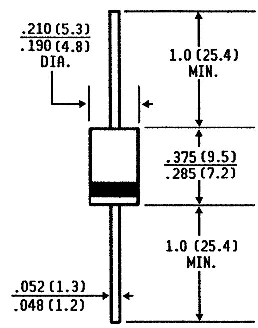
SB320 THRU SB360

MEDIUM CURRENT SCHOTTKY BARRIER RECTIFIER

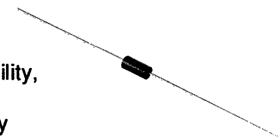
***VOLTAGE** - 20 to 60 Volts* ***CURRENT** - 3.0 Amperes*

FEATURES

DO-201AD



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory
- Flammability Classificaiton 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.375" (9.5 mm) lead lengths at 5 lbs. (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded Plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounces, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	SB320	SB330	SB340	SB350	SB360	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current at .375", 9.5mm Lead Length (see Fig. 1)	$I_{(AV)}$	3.0					Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	80.0					Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	.50			.74		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage (NOTE 2) T_A=25°C	I_R	0.5					mA
T_A=100°C	I_R	20.0					mA
Typical Thermal Resistance (NOTE 1)	$R_{\theta JL}$	20.0			10.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +125			-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +150					°C

NOTES:
1. Thermal Resistance from Junction to Lead Vertical P.C. Board Mounting, .500" (12.7 mm) Lead Length with 2.5"sq. (63.5mm^2) copper pads.
2. Pulse Test: Pulse Width=300μs, Duty Cycle=2%.

FIG. 1 — FORWARD CURRENT DERATING CURVE

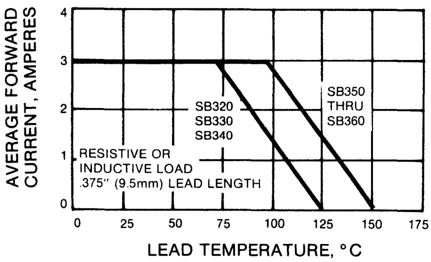


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

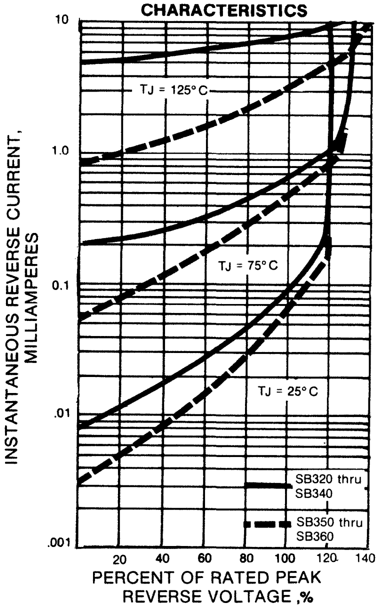


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

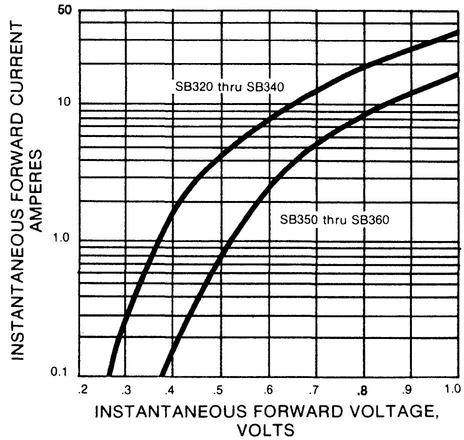


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

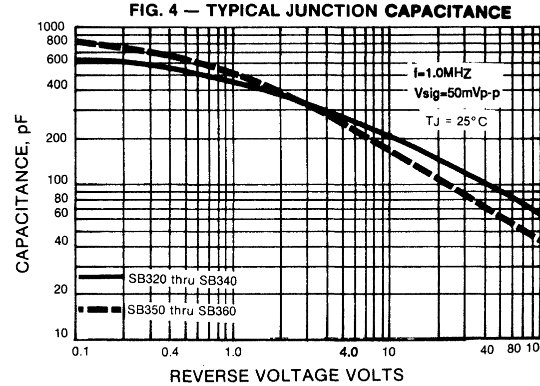
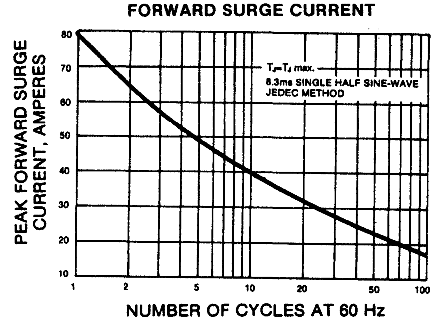


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



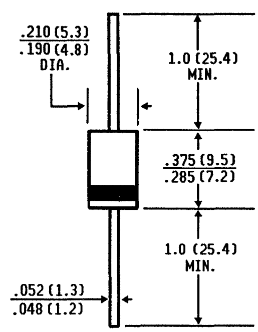
SB520 THRU SB560

HIGH CURRENT SCHOTTKY BARRIER RECTIFIERS

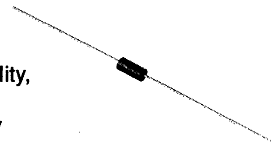
***VOLTAGE** - 20 to 60 Volts* ***CURRENT** - 5.0 Amperes*

FEATURES

DO-201AD



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.375" (9.5 mm) lead lengths at 5 lbs., (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded Plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounces, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SB520*	*SB530*	*SB540*	*SB550*	*SB560*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current .375", 9.5mm Lead Length See Fig.1	$I_{(AV)}$	5.0					Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at rated T_L	I_{FSM}	150.0					Amps
Maximum Instantaneous Forward Voltage at 5.0A	V_F	0.55			0.67		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R	0.5					mA
(NOTE 2) T_A=100°C	I_R	50.0			25.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\theta JL}$	15.0			10.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +125			-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +150					°C

NOTES:
1. Thermal Resistance Junction to Lead Vertical P.C. Board Mounting, .375" (9.5mm) Lead Length.
2. Pulse Test: Pulse Width=300μs, Duty Cycle=2%.

FIG. 1 — FORWARD CURRENT DERATING CURVE

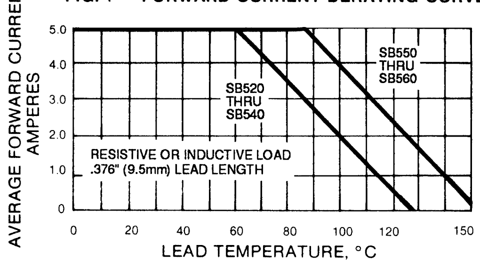


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

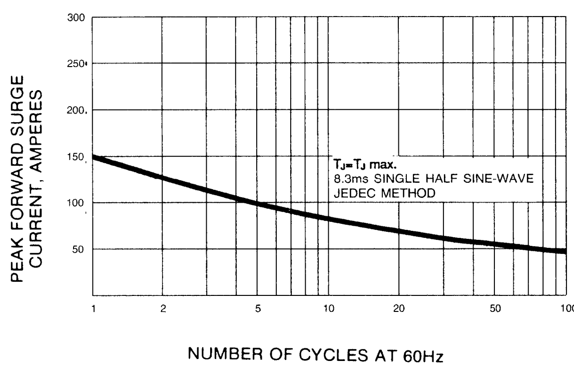


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

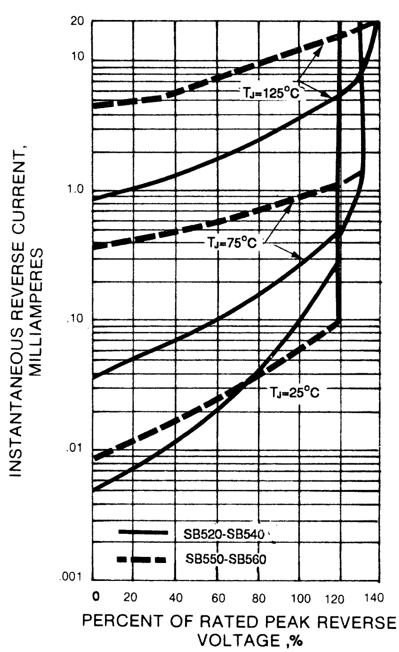


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

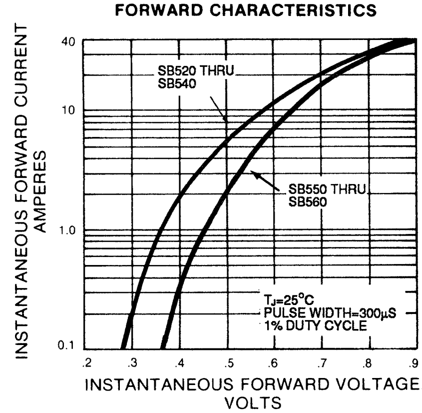
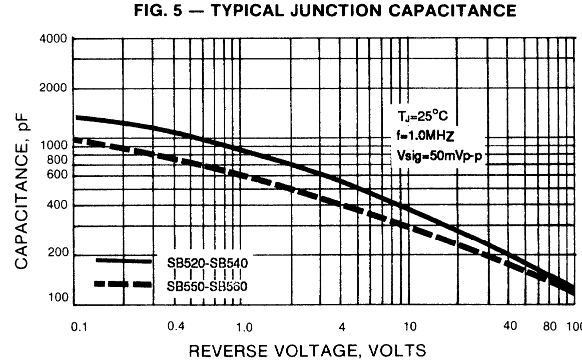


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



MEDIUM CURRENT SCHOTTKY RECTIFIERS

7.5 TO 40.0 AMPERES

SEE
NEW
ISOLATED
PACKAGES

General Instrument

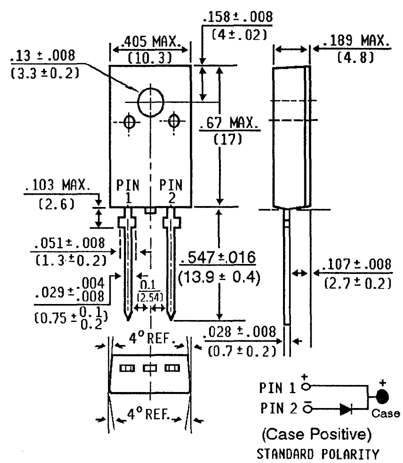
MBRF735 AND MBRF745

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 7.5 Amperes*

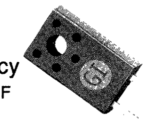
FEATURES

ITO-220



Dimensions in inches and (millimeters)

- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-220 Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in.- lb. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBRF735*	*MBRF745*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWS}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	7.5		Amps
Peak Repetitive Forward Current (Square Wave, 20 KHz) at T_C=105°C	I_{FRM}	15.0		Amps
Peak Forward Surge Current,8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage at I_F=7.5A, T_C=125°C I_F=15A, T_C=125°C I_F=15A, T_C=25°C	V_F	0.57 0.72 0.84		Volts
Maximum Instantaneous Reverse Current T_C=125°C at Rated DC Blocking Voltage (NOTE 2) T_C=25°C	I_R	15.0 0.1		mA mA
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance (NOTE 1)	RΘJC	3.5		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1.Thermal Resistance Junction to Case.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

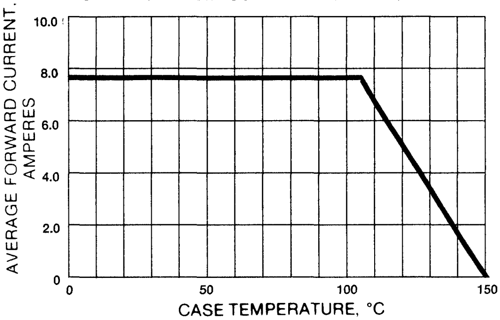


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

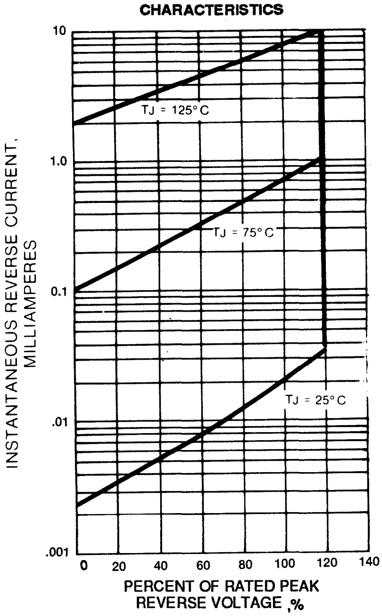


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

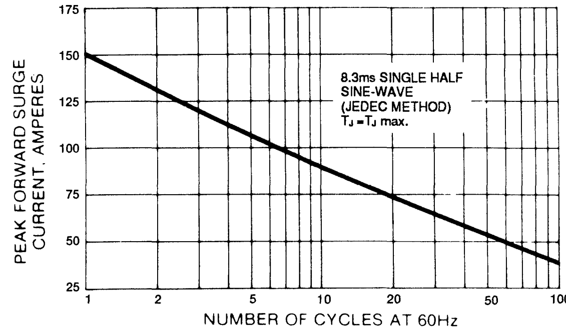


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

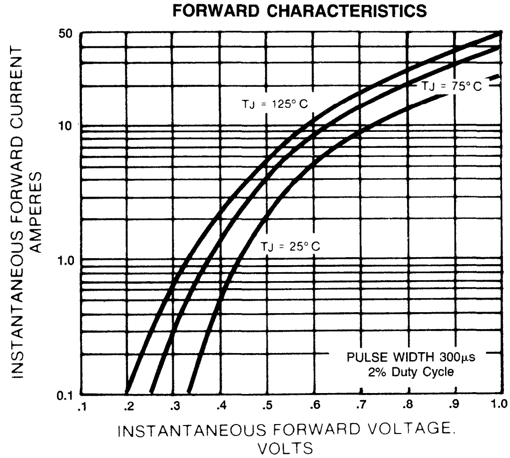
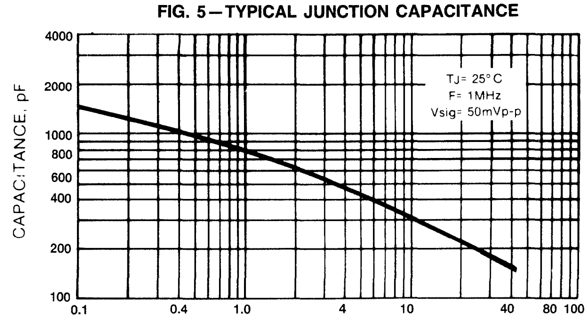


FIG. 5—TYPICAL JUNCTION CAPACITANCE



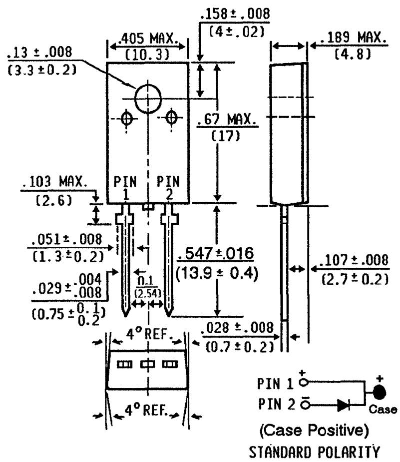
MBRF750 AND MBRF760

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 7.5 Amperes*

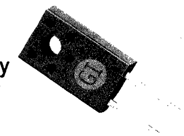
FEATURES

ITO-220



Dimensions in inches and (millimeters)

- Isolated plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-220 Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lb. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBRF750*	*MBRF760*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	7.5		Amps
Peak Repetitive Forward Current (Square Wave, 20 KHz) at T_C=125°C	I_{FRM}	15.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage at (NOTE 2) I_F=7.5A, T_C=125°C I_F=7.5A, T_C=25°C	V_F	0.65 0.75		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage (NOTE 2) T_C=125°C T_C=25°C	I_R	50.0 0.5		mA mA
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance (NOTE 1)	$R_{\Theta JC}$	3.5		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance Junction to Case.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

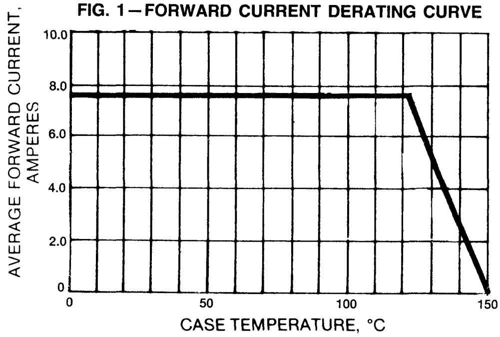


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

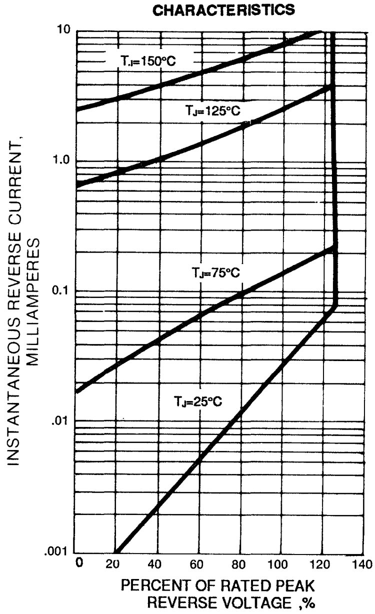


FIG. 3 -MAXIMUM NON-REPETIVE PEAK FORWARD SURGE CURRENT

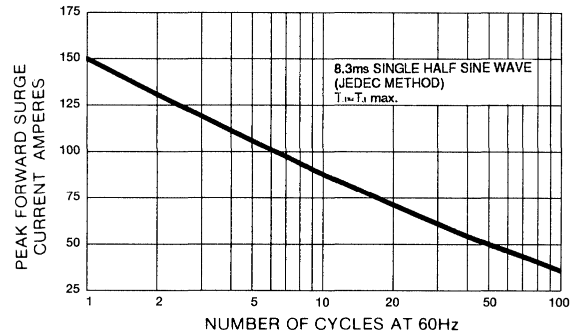


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

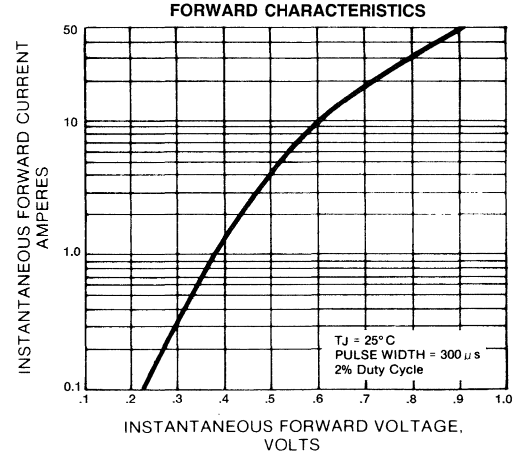
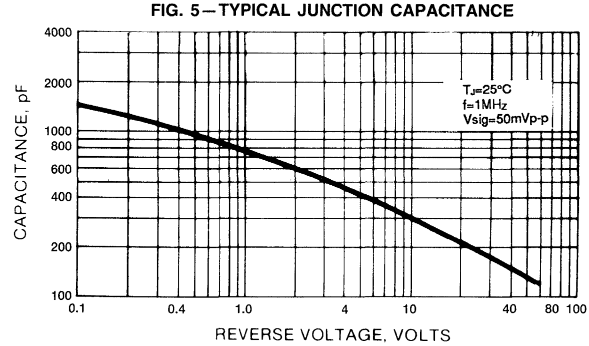


FIG. 5—TYPICAL JUNCTION CAPACITANCE



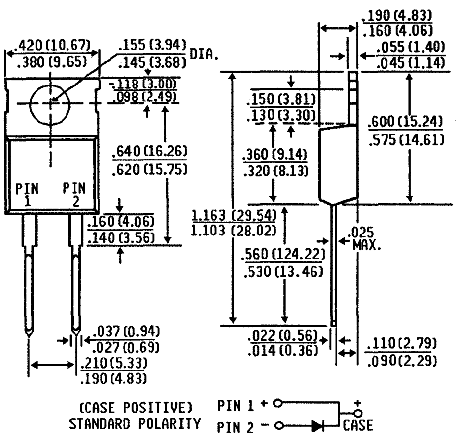
General Instrument

MBR735 AND MBR745

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 7.5 Amperes*

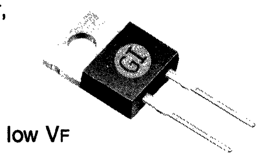
TO-220AC



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	MBR735	MBR745	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	7.5		Amps
Peak Repetitive Forward Current(Square Wave, 20 KHz) at T_C=105°C	I_{FSM}	15.0		Amps
Peak Foward Surge Current,8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage at I_F=7.5A, T_C=125°C I_F=15A, T_C=125°C I_F=15A, T_C=25°C	V_F	0.57 0.72 0.84		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage (NOTE 2) T_C=125°C T_C = 25°C	I_R	15.0 0.1		mA mA
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Maximum Thermal Resistance, (NOTE 1)	$R\theta JC$	3.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance Junction to Case.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs, 1.0 KHz.

FIG. 3 -MAXIMUM NON-REPETIVE PEAK FORWARD SURGE CURRENT

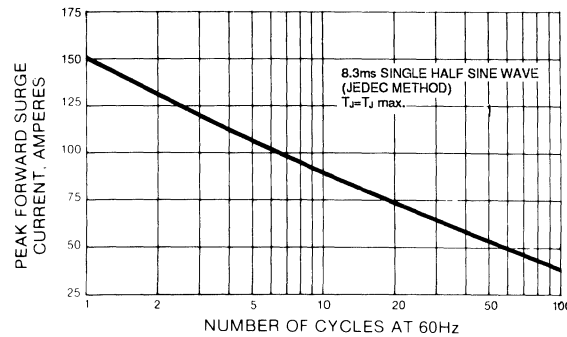


FIG. 1 — FORWARD CURRENT DERATING CURVE

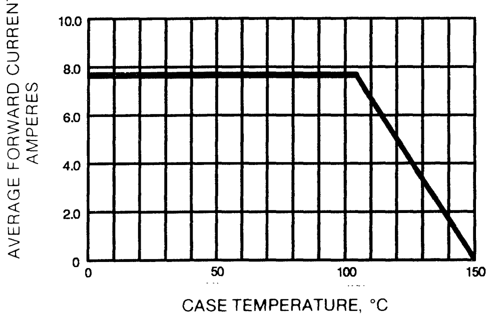


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

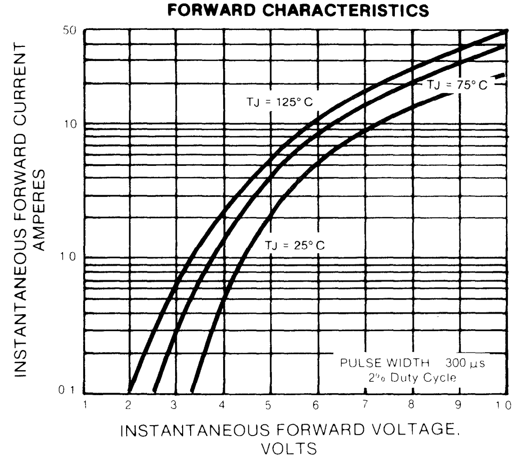


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

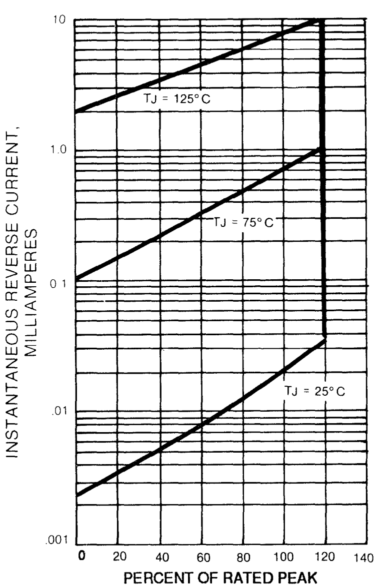
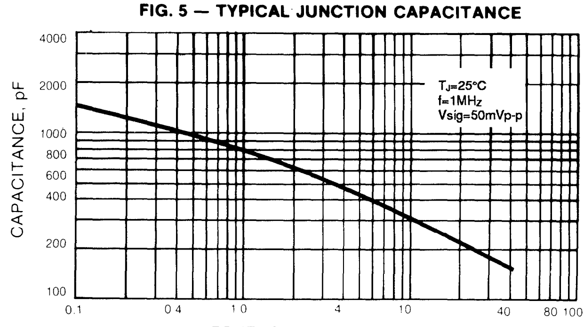


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



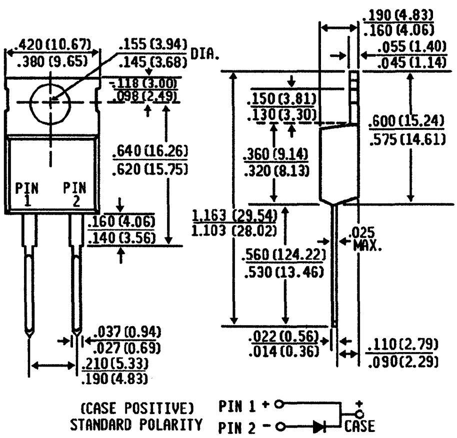
MBR750 AND MBR760

SCHOTTKY RECTIFIER

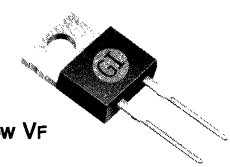
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 7.5 Amperes*

FEATURES

TO-220AC



Dimensions in inches and (millimeters)



- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- ◆ Metal to silicon rectifier, majority carrier conduction
- ◆ Low power loss, high efficiency
- ◆ High current capability, low V_F
- ◆ High surge capacity
- ◆ Epitaxial construction
- ◆ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ◆ High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- ◆ Guardring for transient protection

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBR750*	*MBR760*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWS}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	7.5		Amps
Peak Repetitive Forward Current (Square Wave, 20 KHz) at T_C=125°C	I_{FRM}	15.0		Amps
Peak Forward Surge Current, 8.3ms single half sine--wave superimposed on rated load (JEDEC Method)	I_{FSM}	150		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage at (NOTE 2) I_F=7.5A, T_C=125°C I_F=7.5, T_C=25°C	V_F	0.65 0.75		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage (NOTE 2) T_C=25°C T_C=125°C	I_R	0.5 50.0		mA mA
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance (NOTE 1)	$R_{\theta JC}$	3.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2µs Pulse Width, f=1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

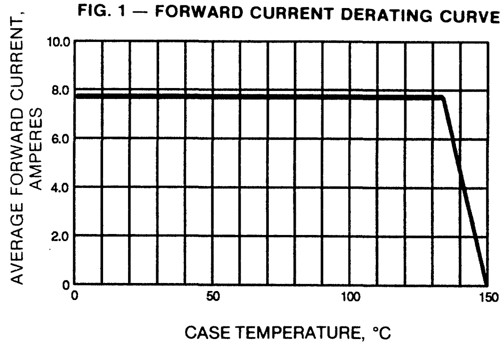


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

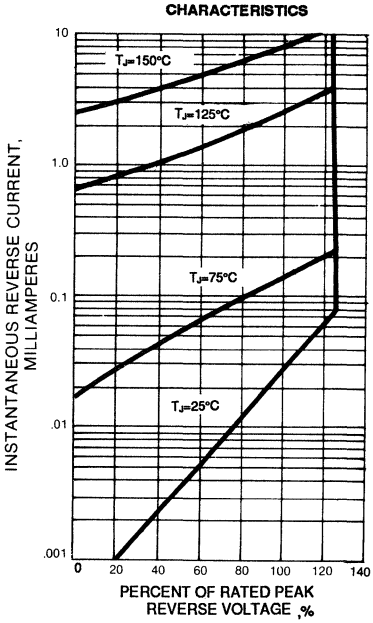


FIG. 3 -MAXIMUM NON-REPETIVE PEAK FORWARD SURGE CURRENT

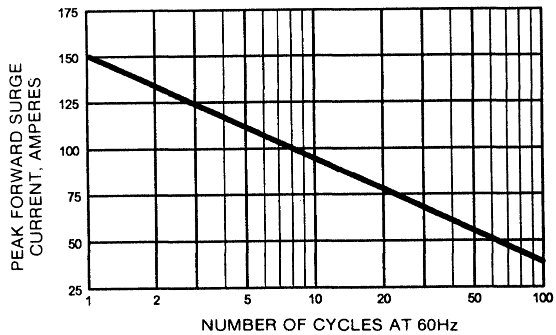


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

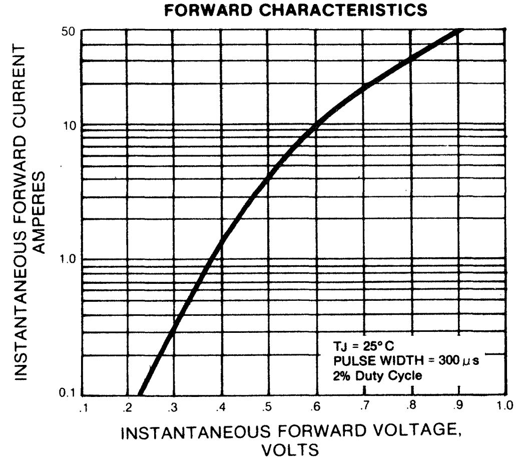
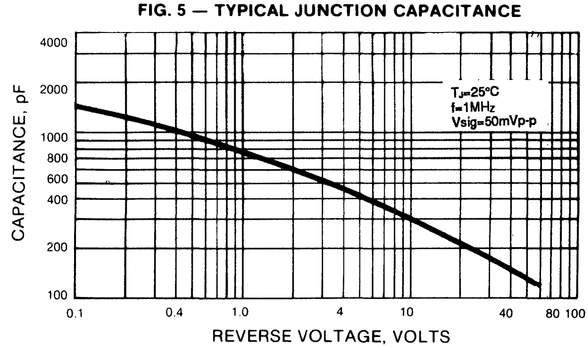


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

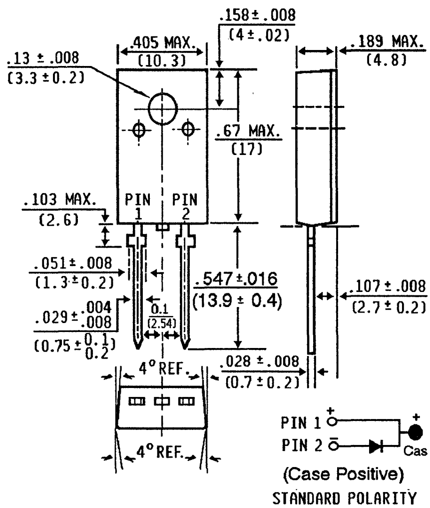


MBRF1035 AND MBRF1045

SCHOTTKY RECTIFIER

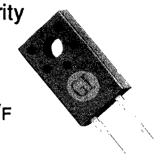
***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 10.0 Amperes*

ITO-220



Dimensions and (millimeters)

FEATURES



- Isolated plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Guardring for transient protection
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Internal Insulation: 1.5K V_{RMS}
- High temperature soldering guaranteed:250°C/10 seconds/.25"(6.35mm) from case

MECHANICAL DATA

Case: ITO-220 Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in.- lb.max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	MBRF1035	MBRF1045	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWS}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=135°C	$I_{(AV)}$	10.0		Amps
Peak Repetitive Forward Current, (Square Wave 20 KHz) at T_C=135°C	I_{FSM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 2))	I_{RSM}	1.0		Amps
Voltage Rate of Change at (rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage at (NOTE 1) I_F=10A, T_C=125°C I_F=20A, T_C=125°C I_F=20A, T_C=25°C	V_F	0.57 0.72 0.84		Volts
Maximum Instantaneous Reverse Current at DC Blocking Voltage (NOTE 1) T_C=125°C T_C=25°C	I_R	15.0 0.1		mA mA
Typical Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.2		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Pulse Test: Pulse Width 300µs, Duty Cycle 2%.
2. 2.0µs Pulse Width, f=1.0KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

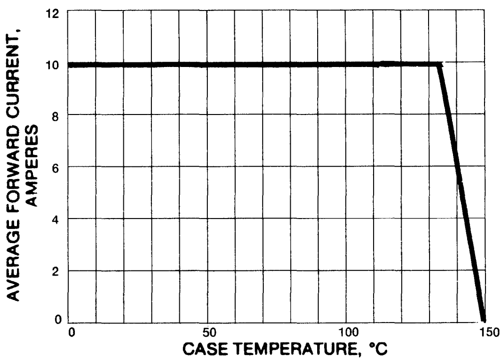


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

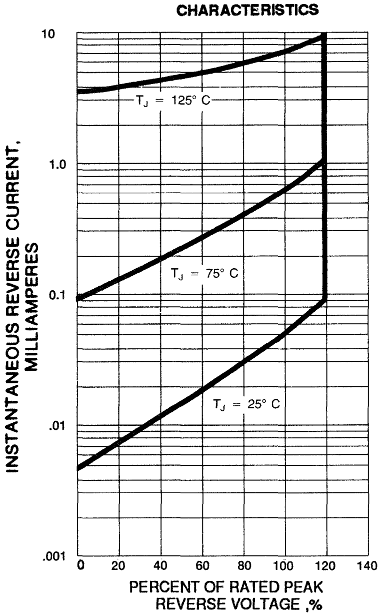


FIG. 3 -MAXIMUM NON-REPETIVE PEAK FORWARD SURGE CURRENT

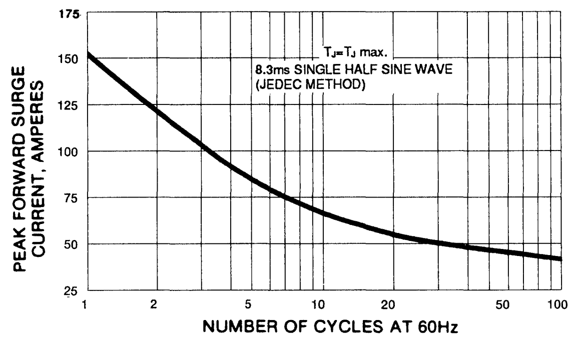


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

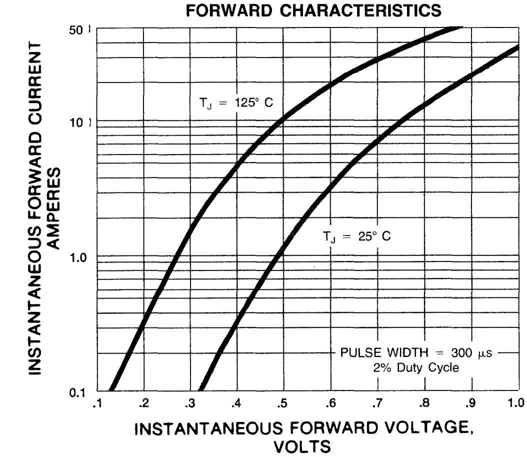
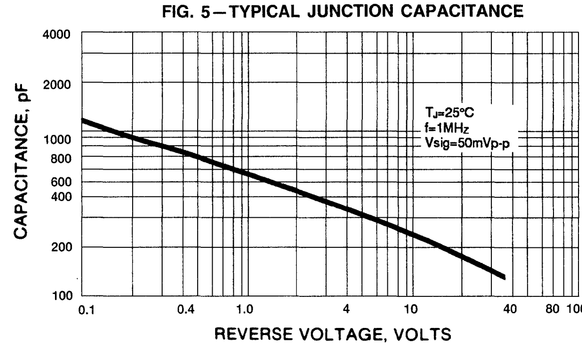


FIG. 5—TYPICAL JUNCTION CAPACITANCE

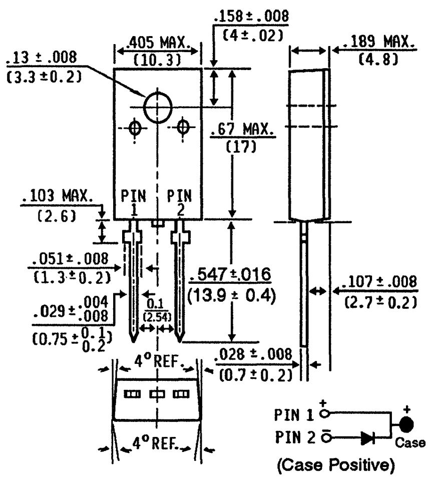


MBRF1050 AND MBRF1060

SCHOTTKY RECTIFIER

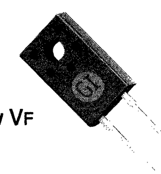
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** -10.0 Amperes*

ITO-220



Dimension in inches and (millimeters)

FEATURES



- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Internal Insulation: 1.5K V_{RMS}
- High temperature soldering guaranteed: 250°C/10 seconds/.25"(6.35mm) from case

MECHANICAL DATA

Case: ITO-220 Fully Over Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in-lb. max.
Weight: .08 ounces, 2.24 gram

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBRF1050*	*MBRF1060*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=133°C	$I_{(AV)}$	10.0		Amps
Peak Repetitive Forward Current, (Square Wave 20 KHz) at T_C=133°C	I_{FRM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RRM}	0.5		Amps
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage at (NOTE 1) I_F=1.0A, T_C=25°C I_F=10A, T_C=125°C I_F=20A, T_C=125°C I_F=20A, T_C= 25°C	V_F	0.80 0.70 0.85 0.95		Volts
Maximum Instantaneous Reverse Current at Rated DC Block Voltage (NOTE 1) T_C=125°C T_C=25°C	I_R	50.0 0.15		mA mA
Typical Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.2		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Pulse Test Pulse Width 300µs, Duty Cycle 2%.
2. 2.0µs Pulse Width, f=1.0 KHz.

FIG 2. - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

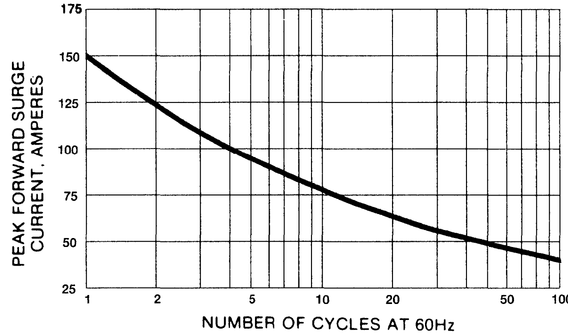


FIG. 1—FORWARD CURRENT DERATING CURVE

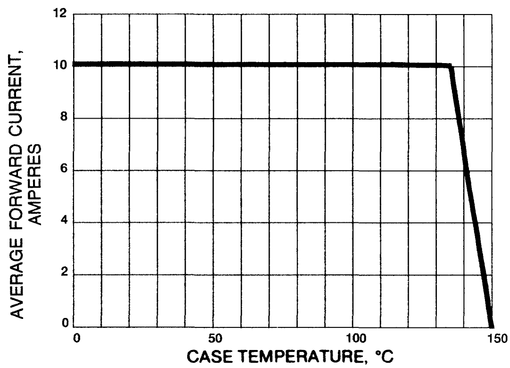


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

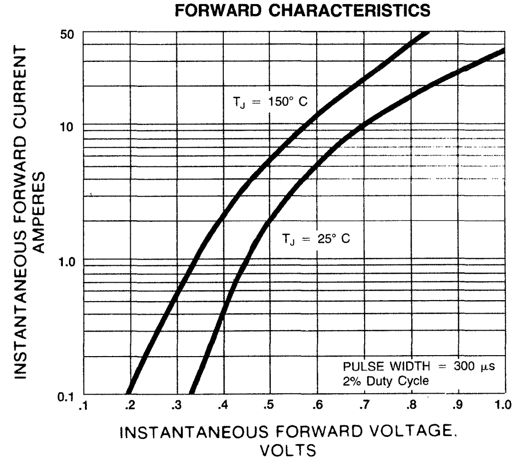


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

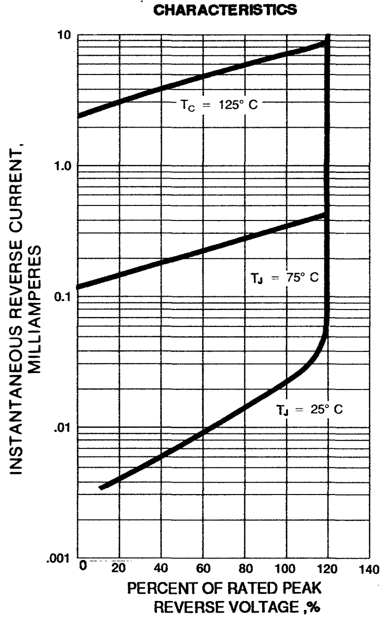
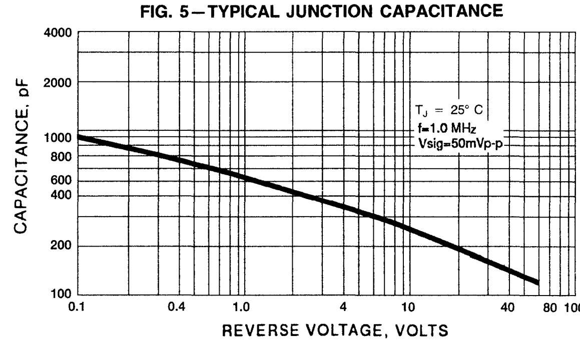


FIG. 5—TYPICAL JUNCTION CAPACITANCE

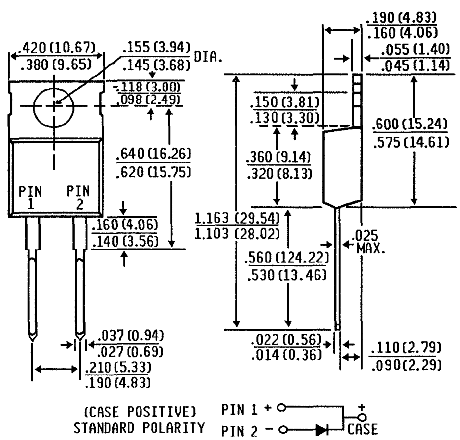


MBR1035 AND MBR1045

SCHOTTKY RECTIFIER

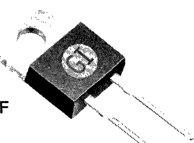
VOLTAGE RANGE - 35 and 45 Volts *CURRENT - 10.0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- High temperature soldering guaranteed: 250°C/10 seconds/.25"(6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	MBR1035	MBR1045	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	10.0		Amps
Peak Repetitive Forward Current, (Square Wave 20 KHz) at T_C=135°C	I_{FSM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RRM}	1.0		Amps
Voltage Rate of Change at (rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage (NOTE 1) I_F=10A, T_C=125°C I_F=20A, T_C=125°C I_F=20A, T_C=25°C	V_F	0.57 0.72 0.84		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage (NOTE 1) T_C=125°C T_C= 25°C	I_R	15.0 0.1		mA mA
Maximum Thermal Resistance, Junction to Case	$R_{\Theta JC}$	2.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Pulse Test: Pulse Width 300µs, Duty Cycle 2%.
2. 2.0µs Pulse Width, f=1.0 KHz.

FIG 1 - FORWARD CURRENT DERATING CURVE

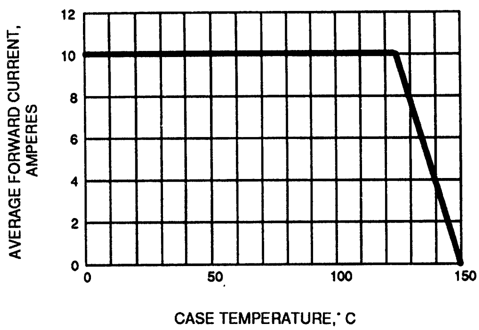


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

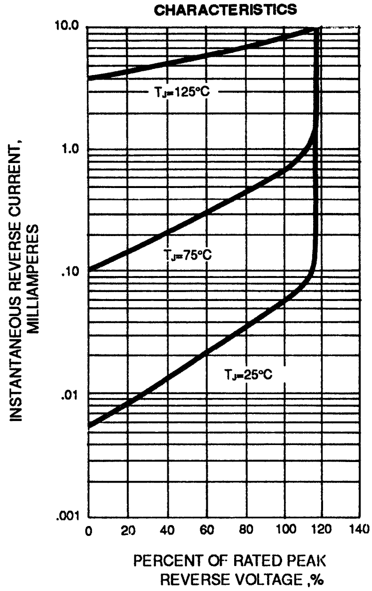


FIG 3 - MAXIMUM NON-REPETITIVE SURGE CURRENT

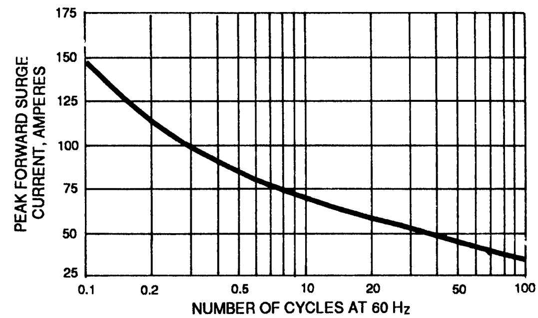


FIG 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

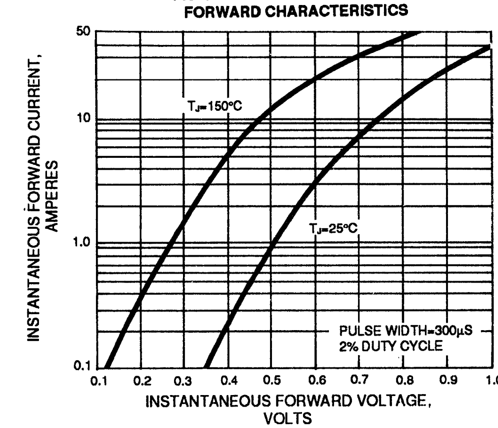
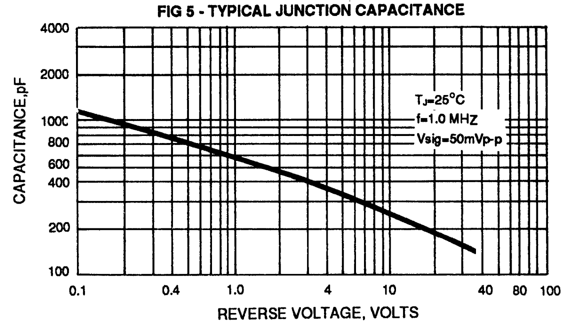


FIG 5 - TYPICAL JUNCTION CAPACITANCE



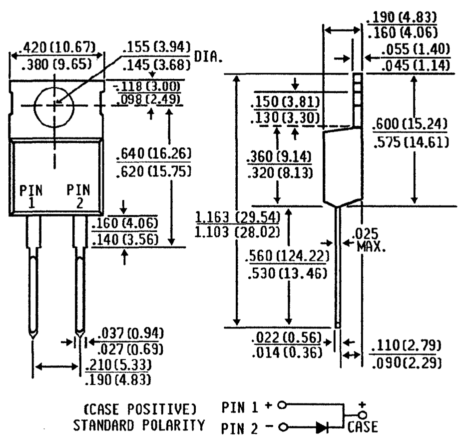
MBR1050 AND MBR1060

SCHOTTKY RECTIFIER

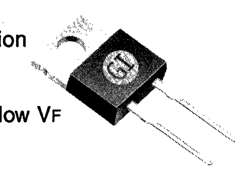
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 10.0 Amperes*

FEATURES

TO-220AC



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- High temperature soldering guaranteed: 250°C/10 seconds/.25" (6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBR1050*	*MBR1060*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current T_C=133°C	$I_{(AV)}$	10.0		Amps
Peak Repetitive Forward Current, (Square Wave 20 KHz) at T_C=133°C	I_{FSM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RRM}	0.5		Amps
Voltage Rate of Change at (rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage (NOTE 1) I_F=10A, T_C=25°C	V_F	0.80		Volts
I_F=10A, T_C=125°C		0.70		
I_F=20A, T_C=125°C		0.85		
I_F=20A, T_C=25°C		0.95		
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage (NOTE 1) T_C=125°C	I_R	50.0		mA
T_C=25°C		0.15		mA
Maximum Thermal Resistance, Junction to Case	$R_{\Theta JC}$	2.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Pulse Test: Pulse Width 300µs, Duty Cycle 2%.
2. 2.0µs Pulse Width, f=1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

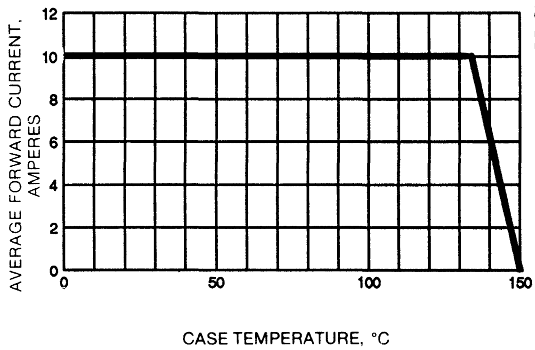


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

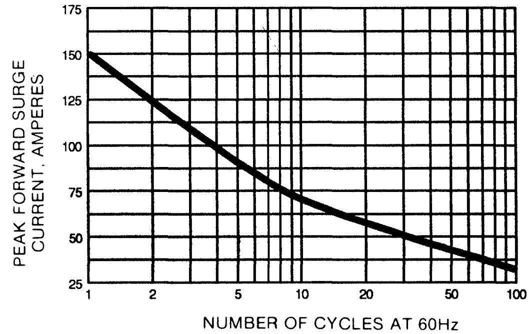


FIG. 2- TYPICAL REVERSE CHARACTERISTICS

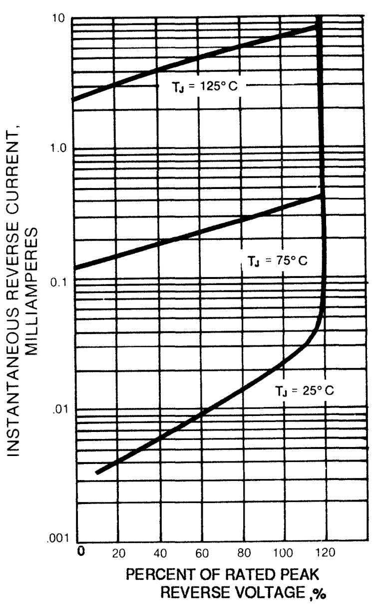


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

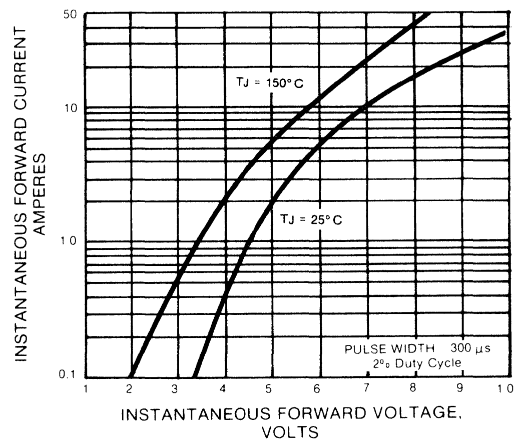
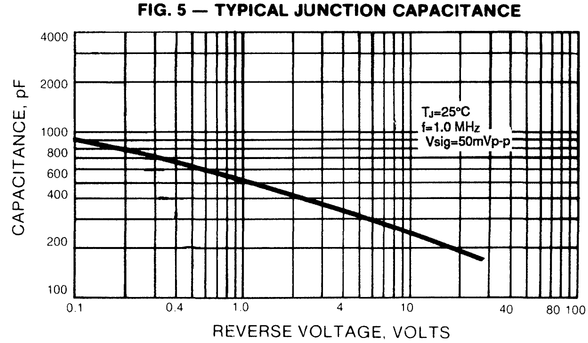


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



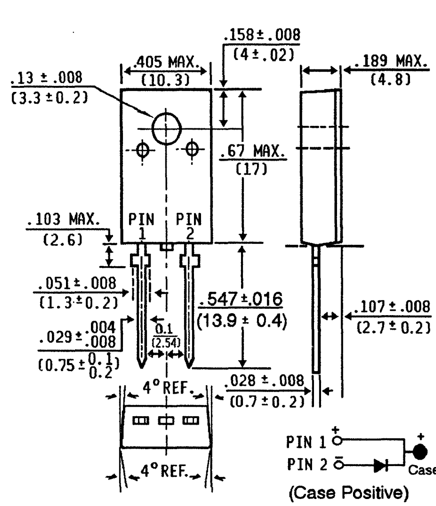
SBLF1030 AND SBLF1040

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 10.0 Amperes*

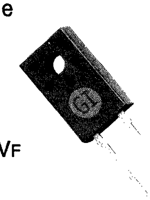
FEATURES

ITO-220



Dimensions in inches and (millimeters)

- Isolated plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Isolated overmolded package
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-220 Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in - lbs max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SBLF1030*	*SBLF1040*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current	$I_{(AV)}$	10.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum Instantaneous Forward Voltage I_F=10A, (NOTE 2)	V_F	0.60		Volts
Maximum Average Reverse Current at rated DC Blocking Voltage per leg (NOTE 2) Tc=25°C / Tc=100°C	I_R	1.0 / 50.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\theta JC}$	3.5		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.

FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

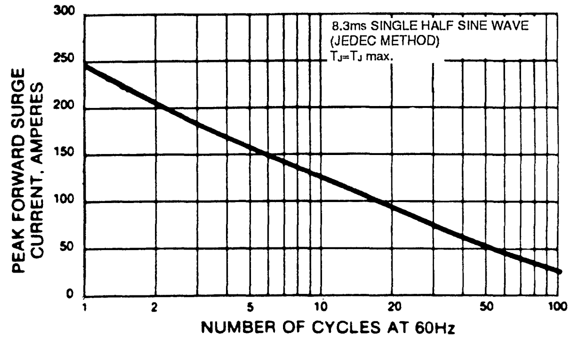


FIG. 1 - FORWARD CURRENT DERATING CURVE

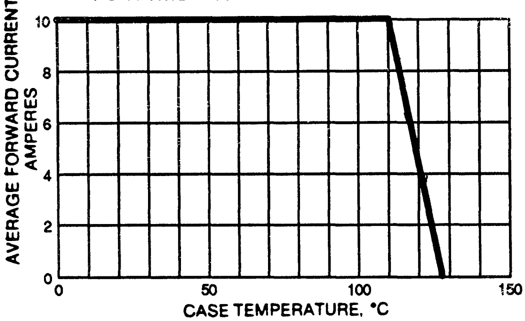


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

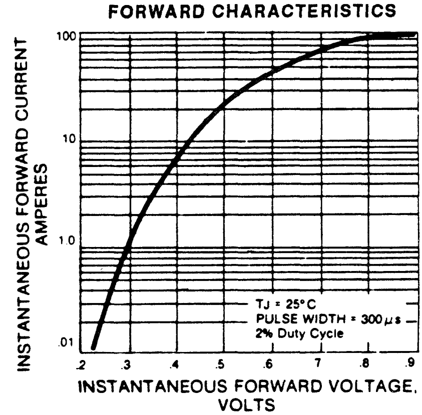


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS

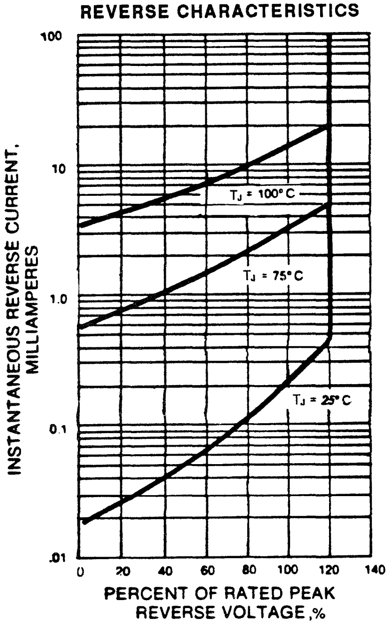
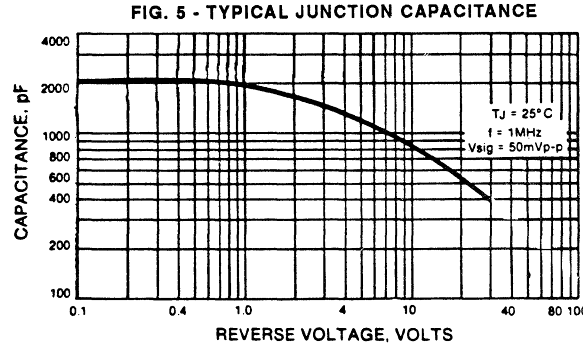


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



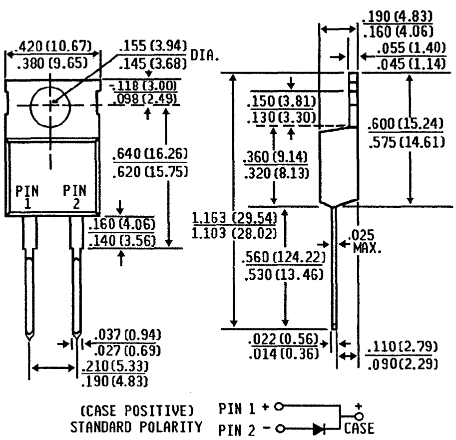
SBL1030 AND SBL1040

SCHOTTKY RECTIFIER

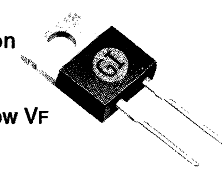
***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 10.0 Amperes*

FEATURES

TO-220AC



Dimensions in inches
and
(millimeters)



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

CROSS REFERENCE GUIDE

GI	FUJI	SHINDENGEN
SBL1040	ERC62-004	S5S4M
SBL1030	---	S5S3M

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*SBL1030*	*SBL1040*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=110°C	$I_{(AV)}$	10.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum Instantaneous Forward Voltage at I_F=10A, T_C=25°C (NOTE 2)	V_F	0.60		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage (NOTE 2) T_C=100°C	I_R	1.0 50.0		mA
Typical Thermal Resistance (NOTE 1)	$R\Theta JC$	3.0		°C/W
Operating and Storage Temperature Range	T_J, T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case.
2. Pulse Test: 300µs Pulse Width, 2% Duty Cycle.

FIG. 1 — FORWARD CURRENT DERATING CURVE

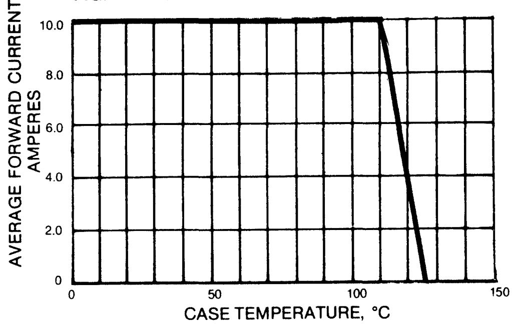


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

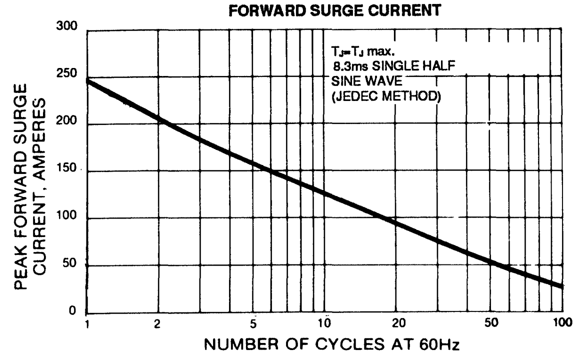


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

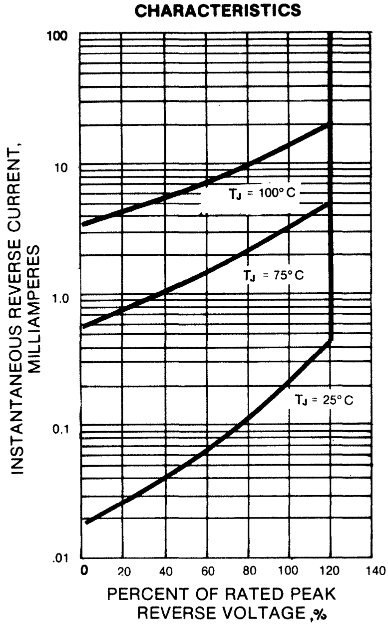


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

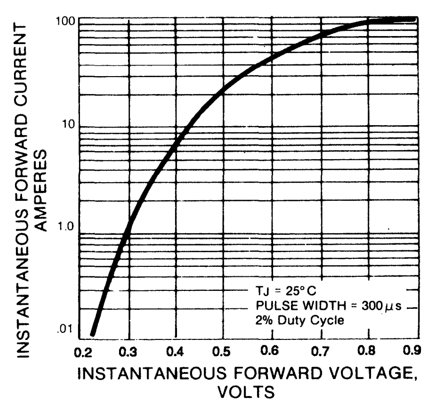
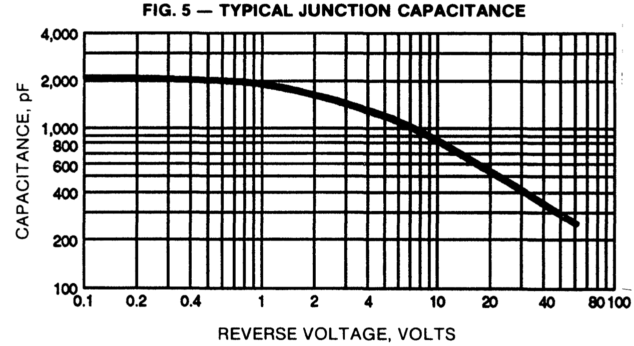


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



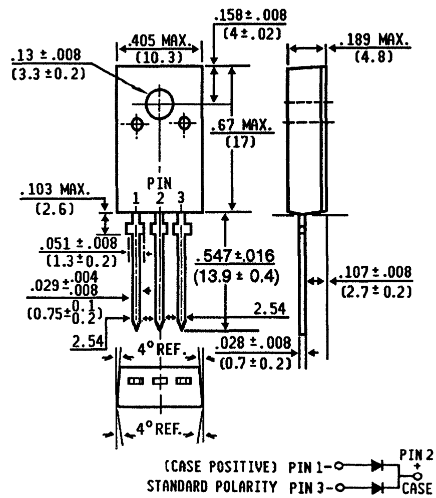
SBLF1030CT AND SBLF1040CT

SCHOTTKY RECTIFIER

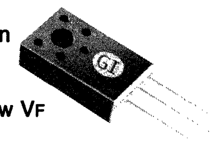
***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 10.0 Amperes*

FEATURES

ITO-220CT



Dimensions in inches and (millimeters)



- Isolated Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Dual rectifier construction, positive center-tap
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}
- High temperature soldering guaranteed:250°C/10 seconds/.25"(6.35mm) from case

MECHANICAL DATA

Case: ITO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lb. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	SBLF1030CT	SBLF1040CT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=95°C	$I_{(AV)}$	10.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0		Amps
Maximum Instantaneous Forward Voltage Per Leg at I_F=5.0A,T_C=25°C (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Reverse Current at T_C =25°C rated DC Blocking Voltage per leg (NOTE 2) 00°C	I_R	0.5 50.0		mA
Typical Thermal Resistance per element (NOTE 1)	$R_{\theta JC}$	3.5		°C/W
Operating and Storage Temperature Range	T_J,T_{STG}	-40 to +125		°C

Notes:
1. Thermal Resistance from Junction to Case per element.
2. Pulse Test: 300μs Pulse Width, 2% Duty Cycle.

FIG. 1 — FORWARD CURRENT DERATING CURVE

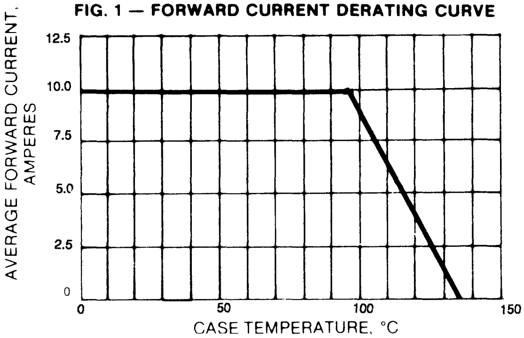


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

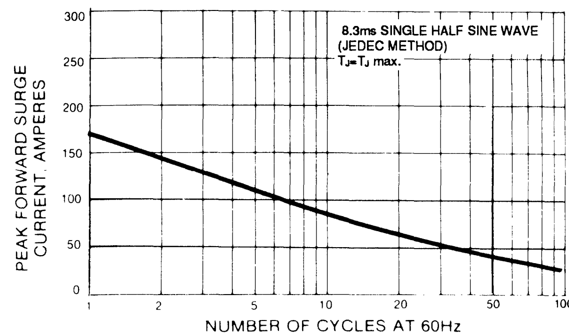


FIG. 3— TYPICAL REVERSE CHARACTERISTICS (PER LEG)

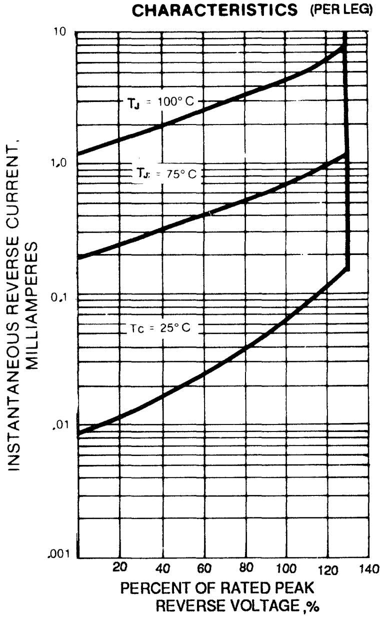


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

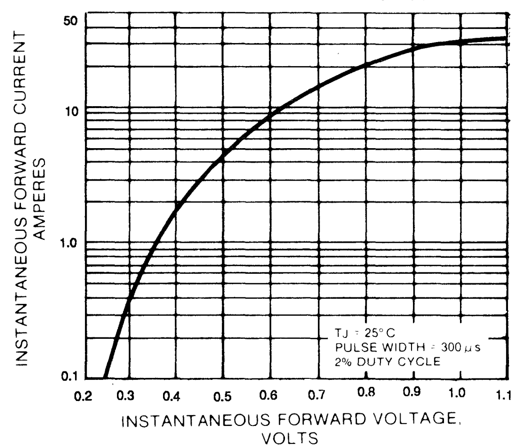
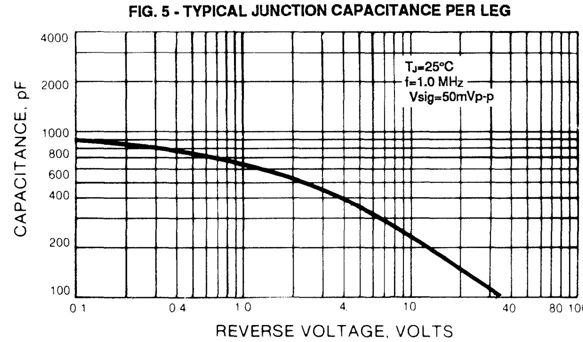


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

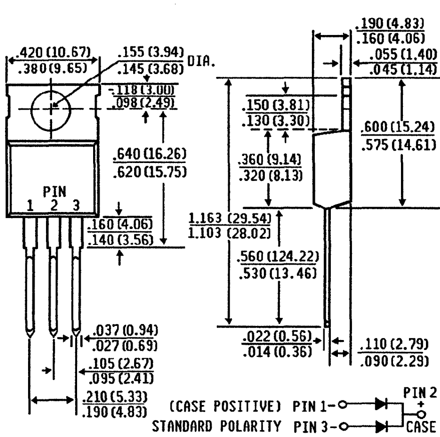


SBL1030CT AND SBL1040CT

SCHOTTKY RECTIFIER

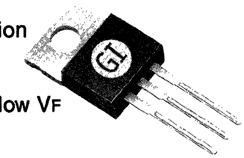
***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 10.0 Amperes*

TO-220AB



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Dual rectifier construction, positive center-tap
- Guardring for transient protection
- High temperature soldering guaranteed:250°C/10 seconds/.25"(6.35mm) from case

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

CROSS REFERENCE GUIDE

GI	FUJI	SHINDENGEN
SBL1040CT	ESAC82-004	- - -

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	SBL1030CT	SBL1040CT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=95°C	$I_{(AV)}$	10.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0		Amps
Maximum Instantaneous Forward Voltage Per Leg at I_F=5.0A,T_C=25°C (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage per leg (NOTE 2) T_C=25°C / T_C=100°C	I_R	0.5 / 50.0		mA
Typical Thermal Resistance per leg (NOTE 1)	$R_{\theta JC}$	3.0		°C/W
Operating Junction and Storage Temperature Range	$T_{J,TSTG}$	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Cycle.

FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

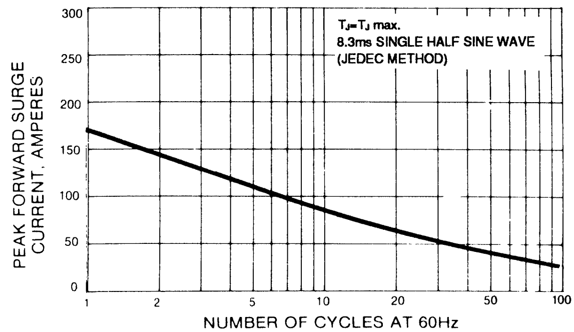


FIG. 1 — FORWARD CURRENT DERATING CURVE

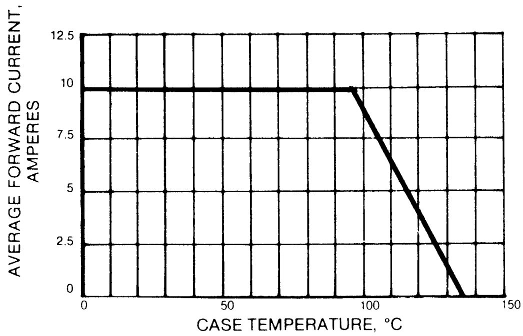


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

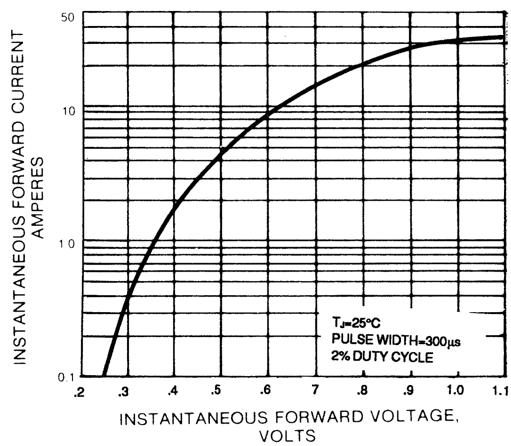


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS (PER LEG)

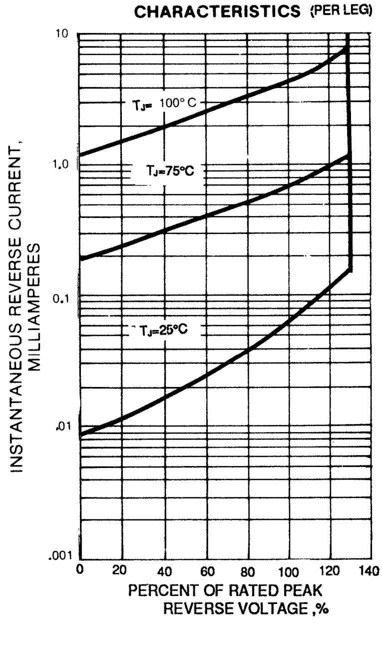
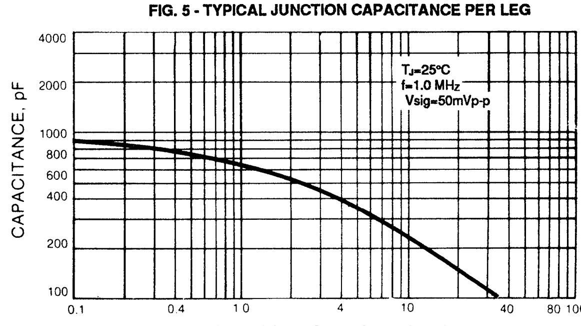


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



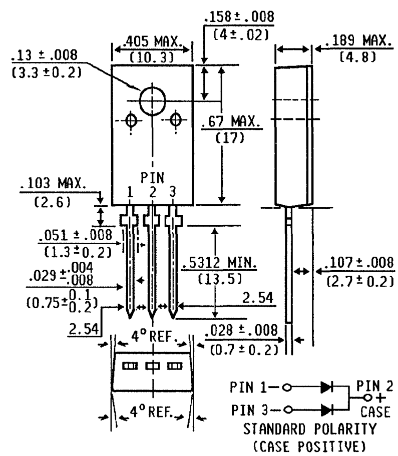
MBRF1535CT AND MBRF1545CT

SCHOTTKY RECTIFIER

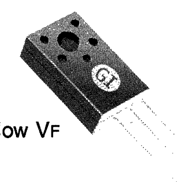
***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 15.0 Amperes*

FEATURES

ITO-220CT



Dimensions in inches and (millimeters)



- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: ITO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	***MBRF1535CT***	***MBRF1545CT***	***UNITS***
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	15.0		Amps
Peak Repetitive Forward Current (Square Wave, 20 KHz) per leg at T_C=105°C	I_{FRM}	15.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage Per Leg at (NOTE 2) I_F= 7.5A, T_C=125°C I_F= 15A, T_C=125°C I_F=15A, T_C= 25°C	V_F	0.57 0.72 0.84		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg (NOTE 2) T_C= 125°C T_C= 25°C	I_R	15.0 0.1		mA
Voltage Rate of Change at (Rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance per leg (NOTE 1)	$R_{\Theta JC}$	3.5		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Cycle.
3. 2.0µs Pulse Width, 1.0KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

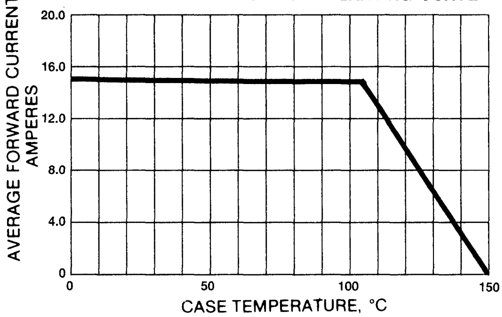


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

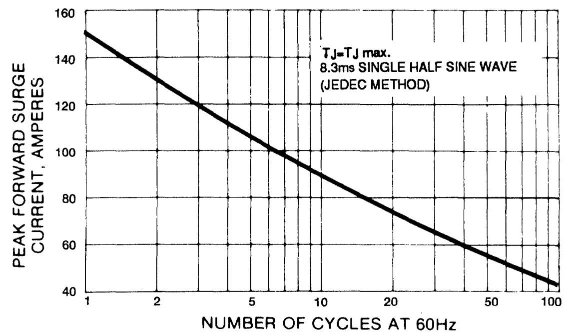


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

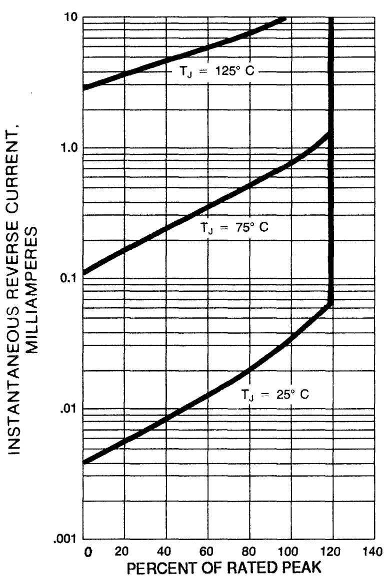


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

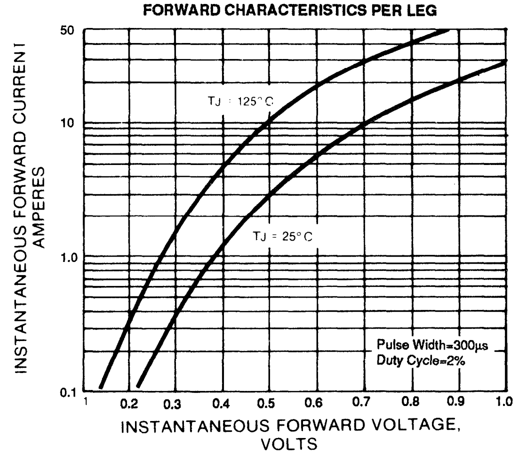
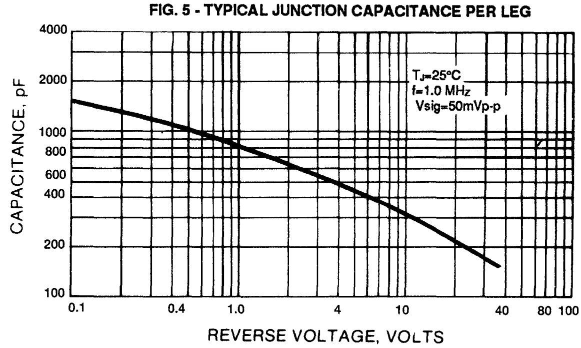


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



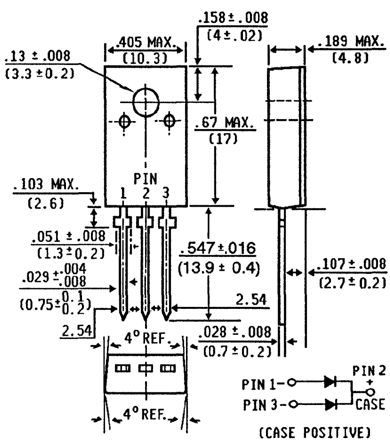
General Instrument

MBRF1550CT AND MBRF1560CT

SCHOTTKY RECTIFIER

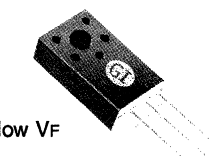
VOLTAGE RANGE - 50 and 60 Volts CURRENT - 15.0 Amperes

ITO-220CT



Dimensions in inches and (millimeters)

FEATURES



- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: ITO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBRF1550CT*	*MBRF1560CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	15.0		Amps
Peak Repetitive Forward Current (Square Wave, 20 KHz) at T_C=105°C per leg	I_{FRM}	15.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage Per Leg at (NOTE 2) I_F=7.5A, T_C=125°C I_F=7.5A, T_C=25°C	V_F	0.65 0.75		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg (NOTE 3) T_C=125°C T_C=25°C	I_R	50.0 0.5		mA
Voltage Rate of Change, (Rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance per leg (NOTE 1)	RΘJC	3.5		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Cycle.
3. 2.0µs Pulse Width, 1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

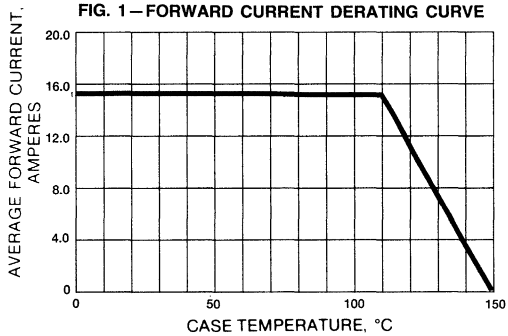


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

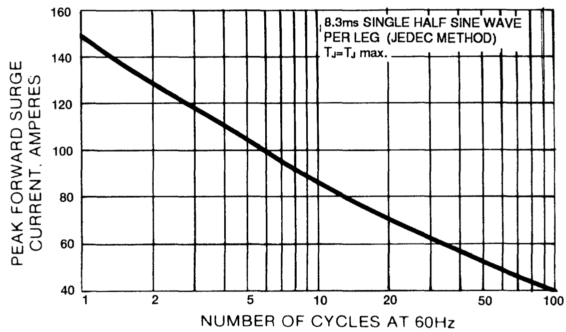


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

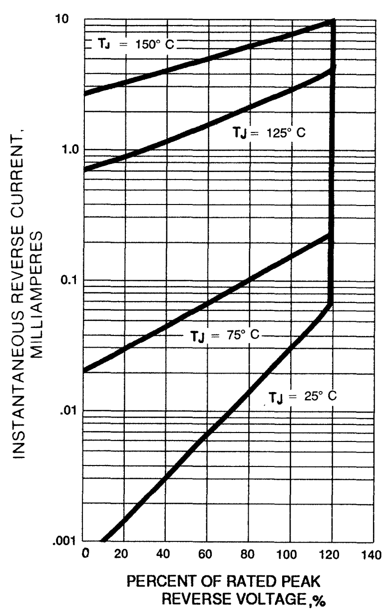


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

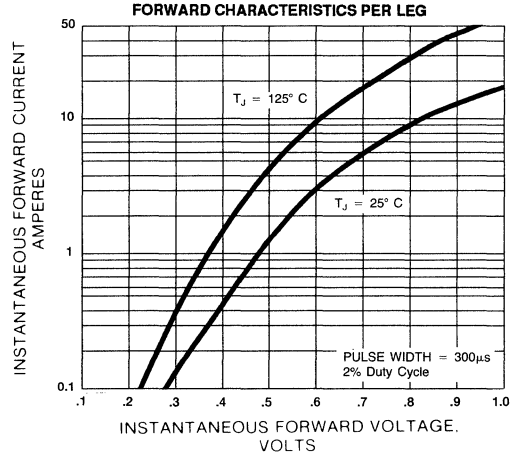
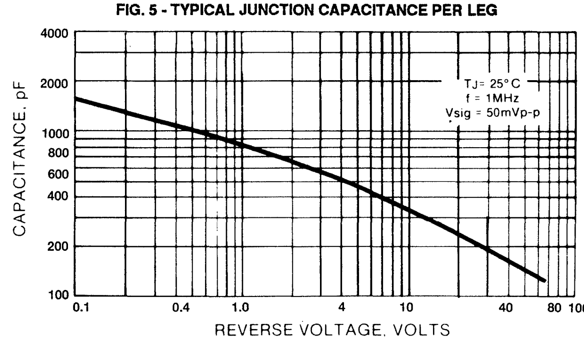


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



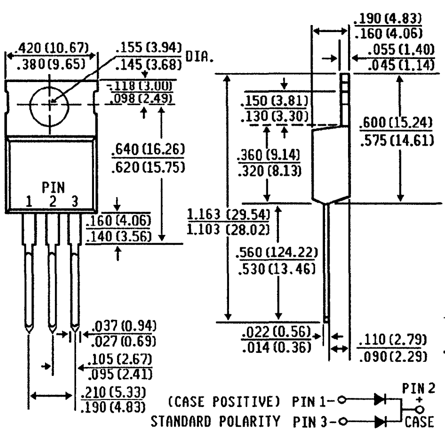
MBR1535CT AND MBR1545CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 15.0 Amperes*

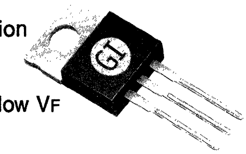
FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	MBR1535CT	MBR1545CT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	15.0		Amps
Peak Repetitive Forward Current per diode at T_C=105°C (Rated V_R, Square wave, 20KHz)	I_{FRM}	15.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage Per Leg at (NOTE 2) I_F=7.5A,T_C=125°C / I_F=15A,T_C=125°C / I_F=15A,T_C=25°C	V_F	0.57 / 0.72 / 0.84		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg T_C=125°C / T_C = 25°C	I_R	15.0 / 0.1		mA
Voltage Rate of Change at (Rated V_R)	dv/dt	1000		V/µs
Maximum Thermal Resistance per leg (NOTE 1)	$R_{\Theta JC}$	3.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance Junction to Case.
2. Pulse Test: 300µs, Pulse Width, 2% Duty Factor.
3. 2.0µs, Pulse Width 1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

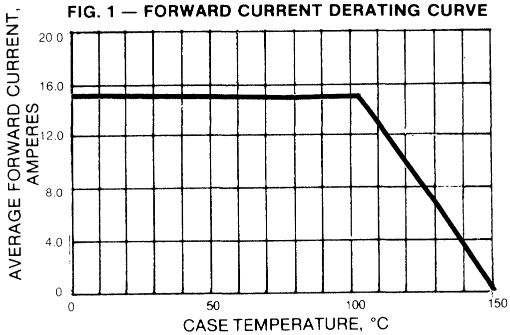


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

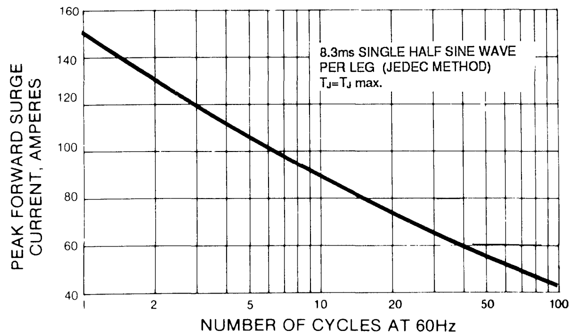


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

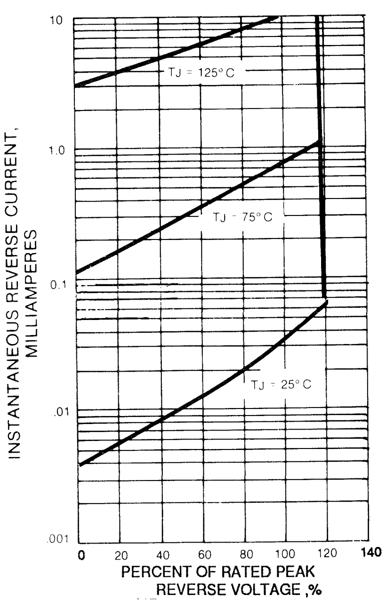


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

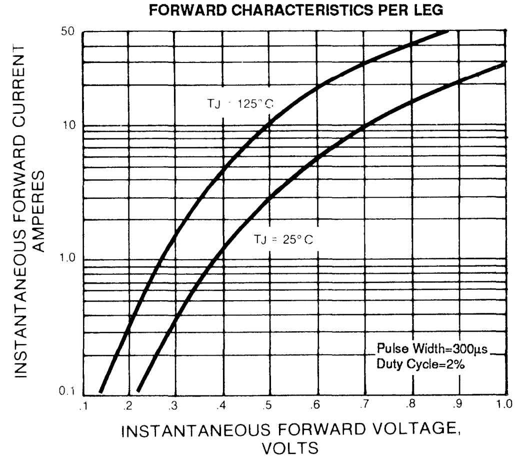
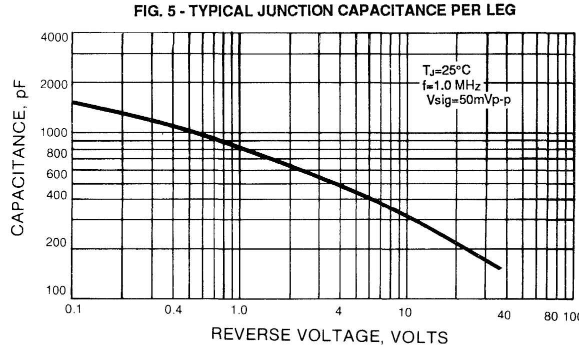


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



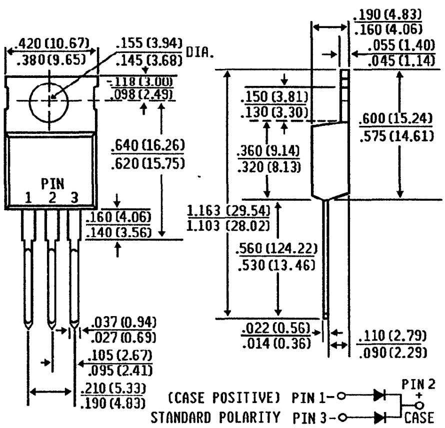
MBR1550CT AND MBR1560CT

SCHOTTKY RECTIFIER

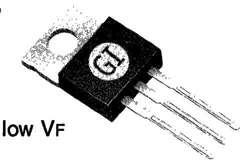
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 15.0 Amperes*

FEATURES

TO-220AB



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBR1550CT*	*MBR1560CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	15.0		Amps
Peak Repetitive Forward Current (Rated V_R, Sq. Wave, 20KHz) at T_C=105°C	I_{FRM}	15.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=7.5A, T_C=25°C (NOTE 2) I_F=7.5A, T_C=125°C	V_F	0.75 0.65		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg at T_C=25°C T_C=125°C	I_R	1.0 50.0		mA
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance per leg (NOTE 1)	$R_{\theta JC}$	3.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1.0KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

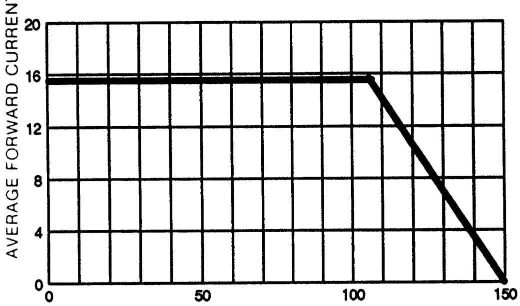


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

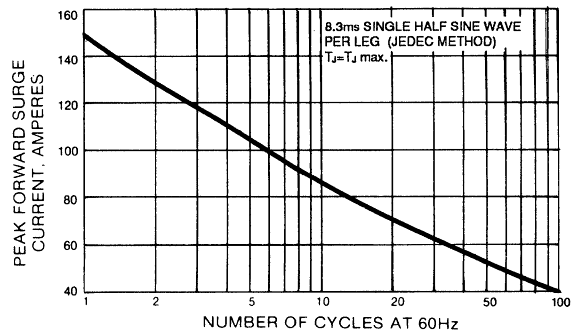


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

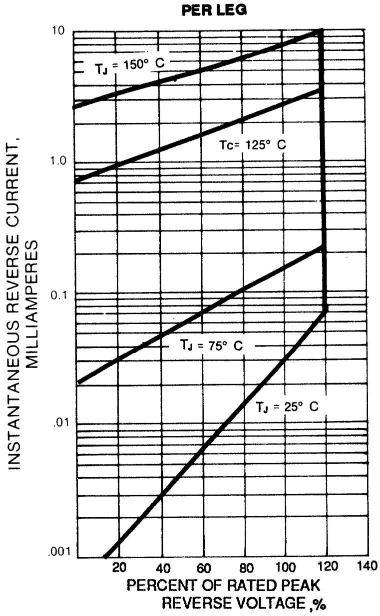


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

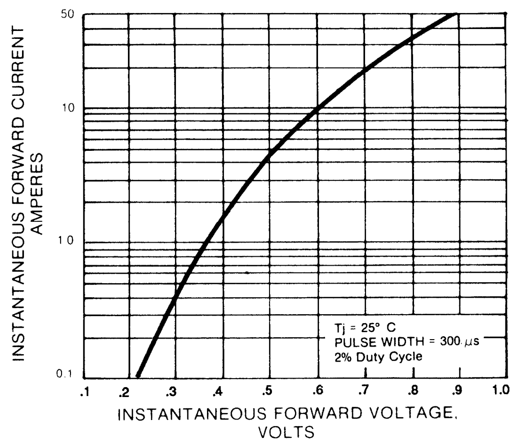
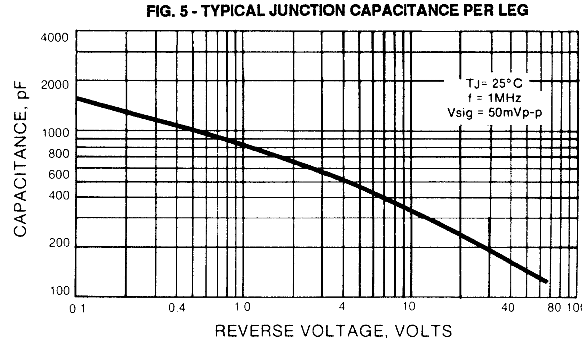


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



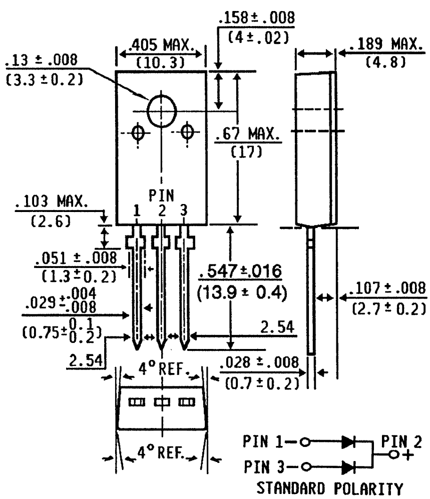
SBLF1630CT AND SBLF1640CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 16.0 Amperes*

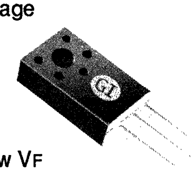
FEATURES

ITO-220CT



Dimensions in inches
and
(millimeters)

- Isolated Plastic Package has Underwriters Flammability Classification 94V-O
- Isolated overmolded package
- Metal to silicon rectifier, majority carrier conduction



- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5K V_{RMS}

MECHANICAL DATA

Case: Isolated TO-220CT Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SBLF1630CT*	*SBLF1640CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=95°C	$I_{(AV)}$	16.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum Instantaneous Forward Voltage per leg I_F=8.0A (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg T_C=25°C / T_C=100°C	I_R	0.5 / 50.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\Theta JC}$	2.2		°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.

FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

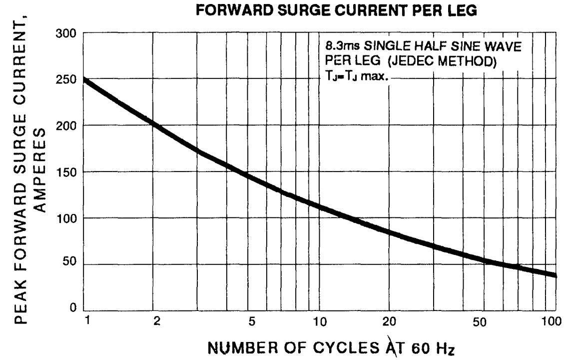


FIG. 1—FORWARD CURRENT DERATING CURVE

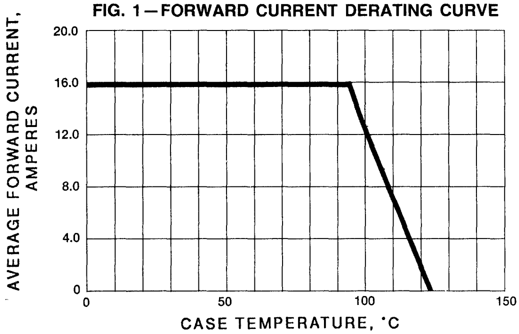


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

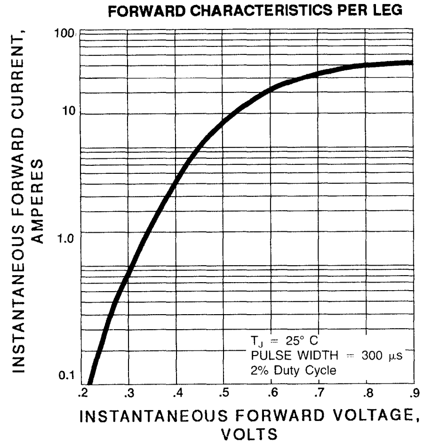


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

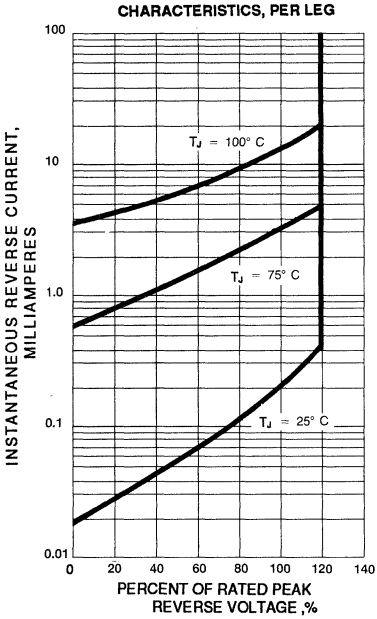
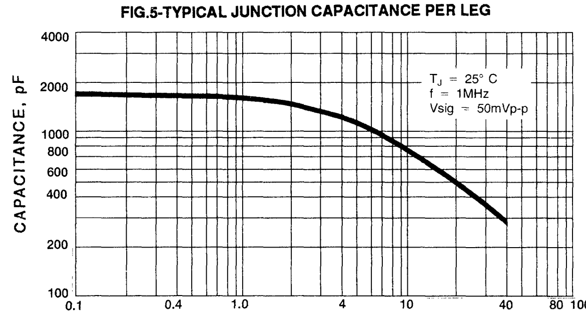


FIG.5-TYPICAL JUNCTION CAPACITANCE PER LEG



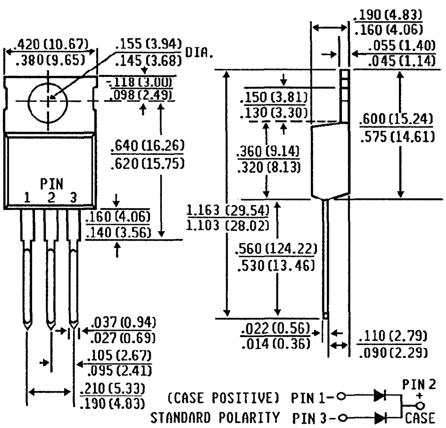
SBL1630CT AND SBL1640CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** -16.0 Amperes*

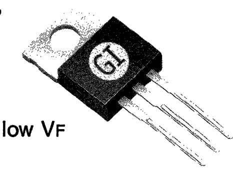
FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram
Mounting Torque: 5 in. - lbs. max.

CROSS REFERENCE GUIDE

GI	FUJI	SHINDENGEN
SBL1640CT	ESAD82-004	---

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SBL1630CT*	*SBL1640CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=95°C	$I_{(AV)}$	16.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum Instantaneous Forward Voltage per leg I_F=8.0A (NOTE 2)	V_F	0..55		Volts
Maximum Instantaneous Reverse Current at T_C=25°C rated DC Blocking Voltage per leg T_C=100°C	I_R	0.5 50.0		mA
Typical Thermal Resistance per leg (NOTE 1)	$R_{\Theta JC}$	3.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2 Pulse Test: 300μs Pulse Width, 2% Duty Factor.

FIG. 1 — FORWARD CURRENT DERATING CURVE

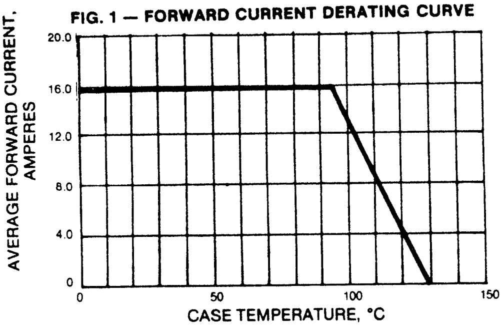


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

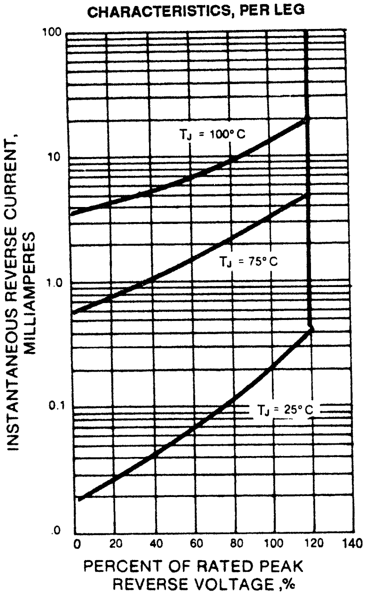


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

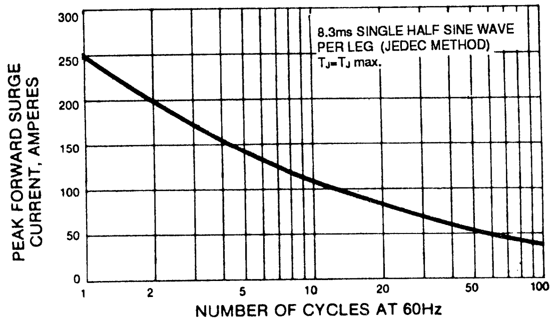


Fig. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

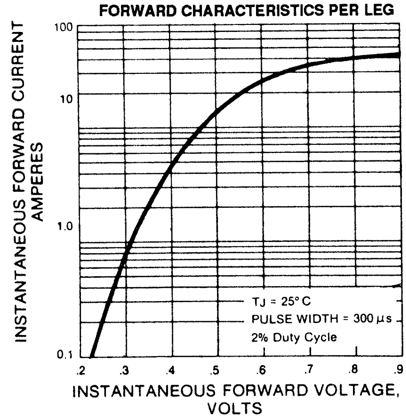
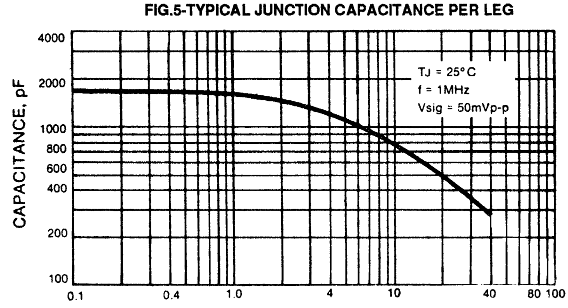


FIG.5-TYPICAL JUNCTION CAPACITANCE PER LEG

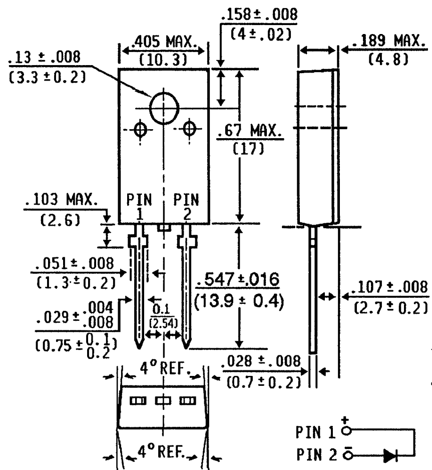


MBRF1635 AND MBRF1645

SCHOTTKY RECTIFIER

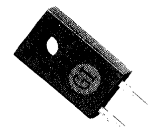
***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 16.0 Amperes*

ITO-220



Dimensions in inches and (millimeters)

FEATURES



- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: ITO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any ***Mounting Torque:*** 5 in. -lbs. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBRF1635*	*MBRF1645*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	16.0		Amps
Peak Repetitive Forward Current, (Square Wave, 20 KHz) at T_C= 125°C	I_{FSM}	32.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RSM}	1.0		Amps
Voltage Rate of Change at (Rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage at (NOTE 1) I_F=16A, T_C=125°C I_F=16A, T_C= 25°C	V_F	0.57 0.63		Volts Volts
Maximum Instantaneous Reverse Current T_C=125°C at Rated DC Blocking Voltage (NOTE 1) T_C= 25°C	I_R	40.0 0.2		mA
Typical Thermal Resistance, Junction to Case	$R_{\Theta JC}$	2.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Pulse Test: 300µs Pulse Width, 2% Duty Cycle.
2. 2.0µs Pulse Width, 1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

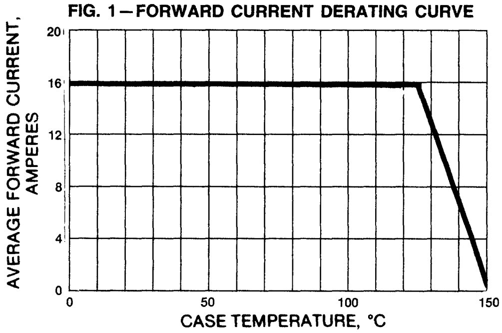


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

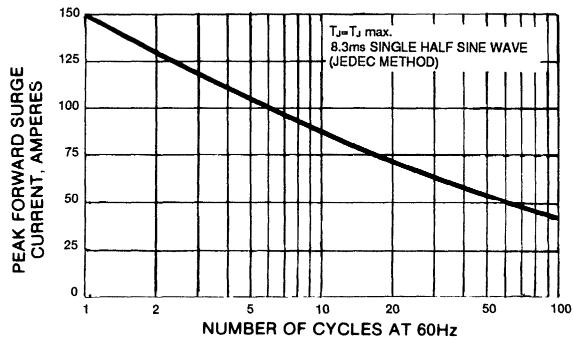


FIG. 3 —TYPICAL REVERSE CHARACTERISTICS

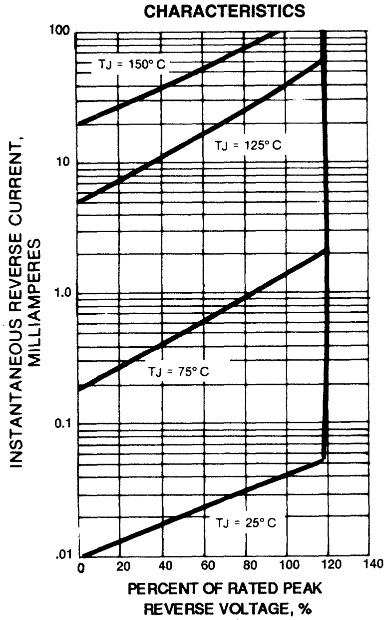


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

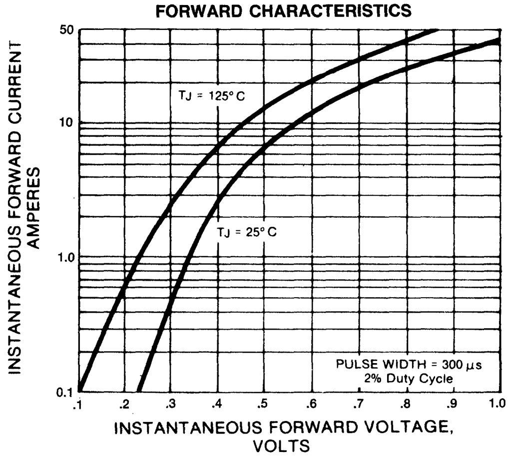
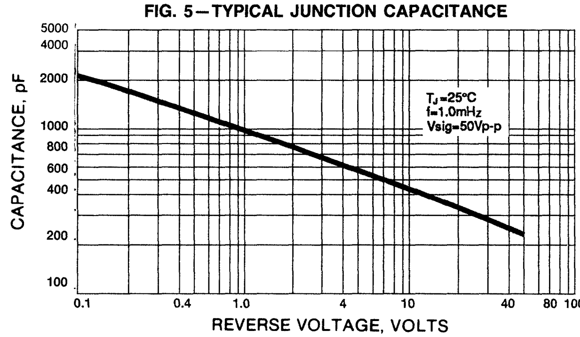


FIG. 5—TYPICAL JUNCTION CAPACITANCE

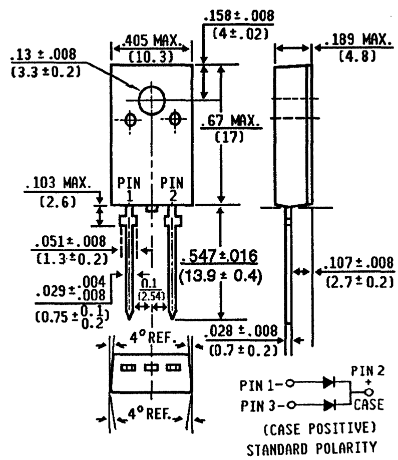


MBRF1650 AND MBRF1660

SCHOTTKY RECTIFIER

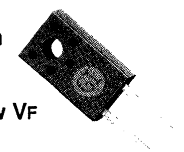
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 16.0 Amperes*

ITO-220



Dimensions in inches and (millimeters)

FEATURES



- Isolated Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: ITO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any ***Mounting Torque:*** 5 in. - lbs. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	MBRF1650	MBRF1660	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	16.0		Amps
Peak Repetitive Forward Current, (Square Wave, 20 KHz) at T_C=125°C	I_{FRM}	32.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RRM}	0.5		Amps
Voltage Rate of Change at (Rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage at (NOTE 1) I_F=16A, T_C=125°C I_F=16A, T_C=25°C	V_F	0.62 0.75		Volts Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage T_C=125°C (NOTE 1) T_C=25°C	I_R	50.0 1.0		mA
Typical Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Pulse Test: 300µs Pulse Width, 2% Duty Cycle.
2. 2.0µs Pulse Width, 1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

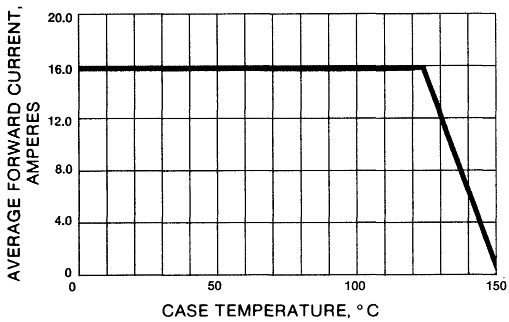


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

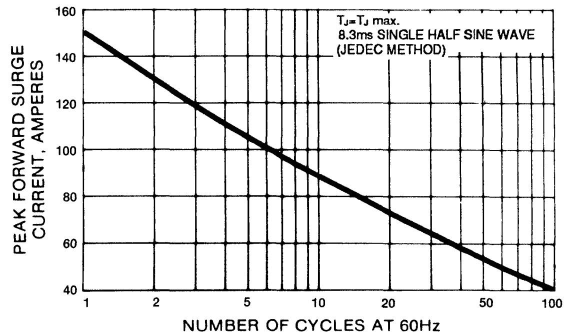


FIG. 3—TYPICAL REVERSE CHARACTERISTICS

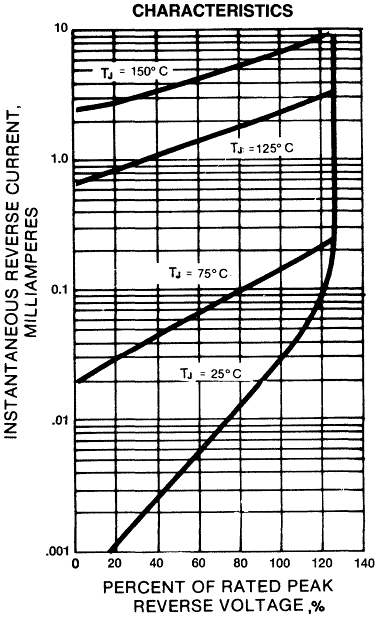


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

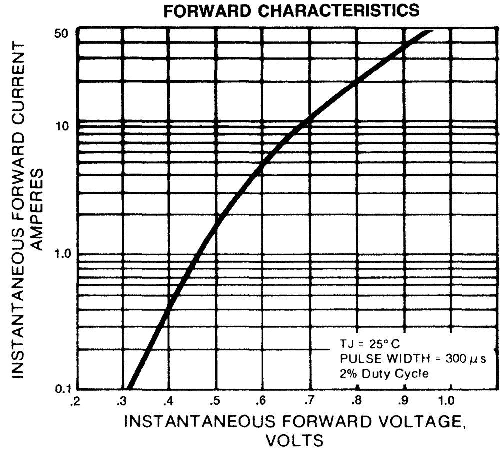
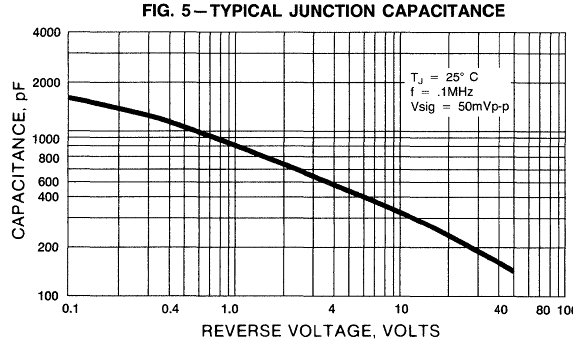


FIG. 5—TYPICAL JUNCTION CAPACITANCE



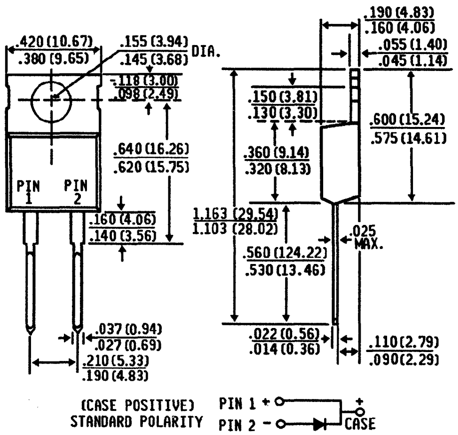
General Instrument

MBR1635 AND MBR1645

SCHOTTKY RECTIFIER

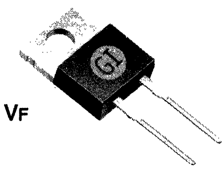
***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 16 .0 Amperes*

TO-220AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	MBR1635	MBR1645	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	16.0		Amps
Peak Repetitive Forward Current, (Rated V_R, Sq. Wave 20 KHz) at T_C=125°C	I_{FRM}	32.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RRM}	1.0		Amps
Voltage Rate of Change, (rated V_R)	dv/dt	1000		V/µs
Maximum Instantaneous Forward Voltage (NOTE 1) I_F=16A, T_C=25°C I_F=16A, T_C=125°C	V_F	0.63 0.57		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage T_C=25°C (NOTE 1) T_C=125°C	I_R	0.2 40.0		mA
Maximum Thermal Resistance (NOTE 3)	$R_{\theta JC}$	1.5		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Pulse Test Pulse Width 300µs, Duty Cycle 2%.
2. 2.0µs Pulse Width, 1.0 KHz
3. Thermal Resistance from Junction to Case.

FIG. 1 — FORWARD CURRENT DERATING CURVE

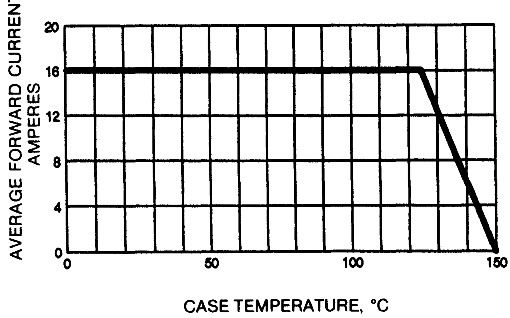


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

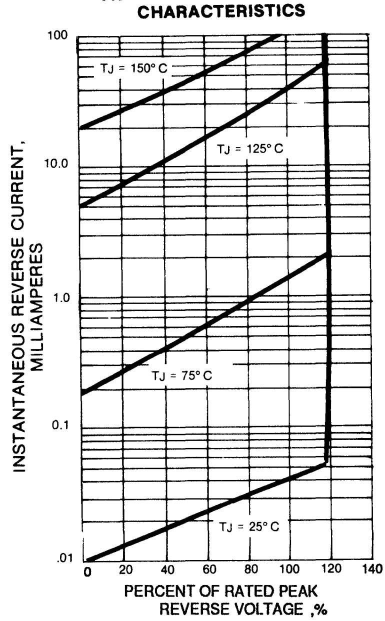


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

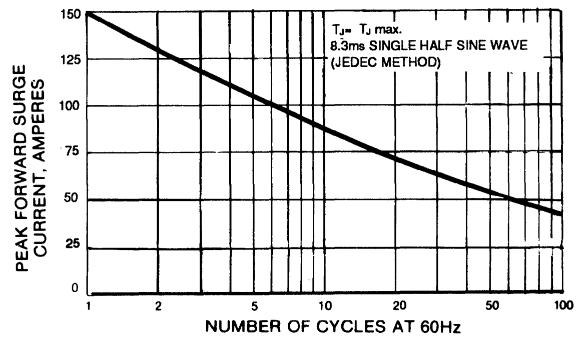


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

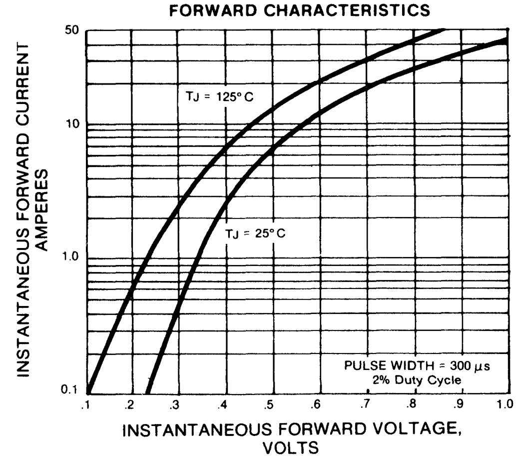
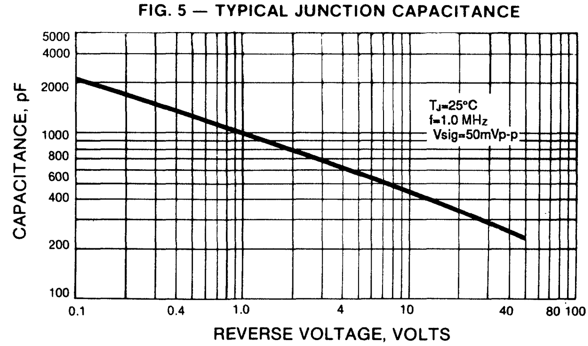


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



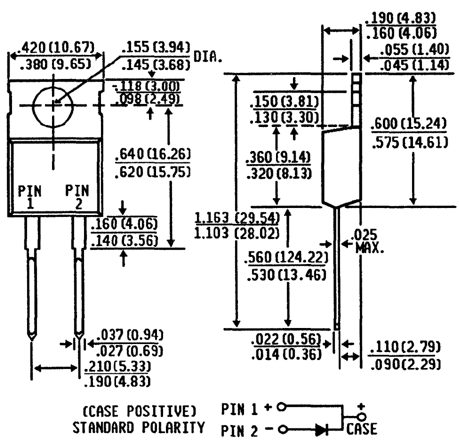
MBR1650 AND MBR1660

SCHOTTKY RECTIFIER

VOLTAGE RANGE - 50 and 60 Volts CURRENT - 16.0 Amperes

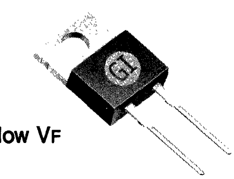
FEATURES

TO-220AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBR1650*	*MBR1660*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	16.0		Amps
Peak Repetitive Forward Current (Rated V_R, Sq. Wave, 20 KHz) at T_C=125°C	I_{FRM}	32.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Pead Repetitive Reverse SurgeCurrent (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage Per Leg I_F=16A, T_C = 25°C I_F=16A, T_C=125°C (NOTE 2)	V_F	0.75 0.65		Volts
Maximum Instantaneous Reverse Current at T_C= 25°C rated DC Blocking Voltage T_C=125°C	I_R	1.0 50.0		mA
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/µs
Maximum Typical Thermal Resistance (NOTE 1)	RθJC	3.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +150		°C

NOTES:
1. Thermal Resistance from Junction to Case.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

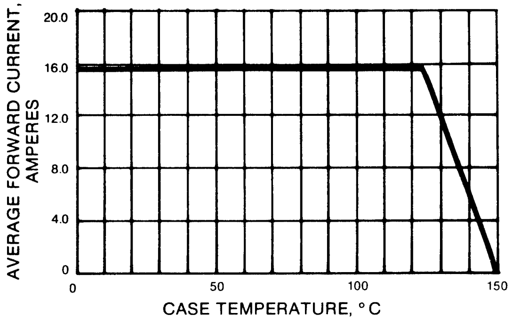


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

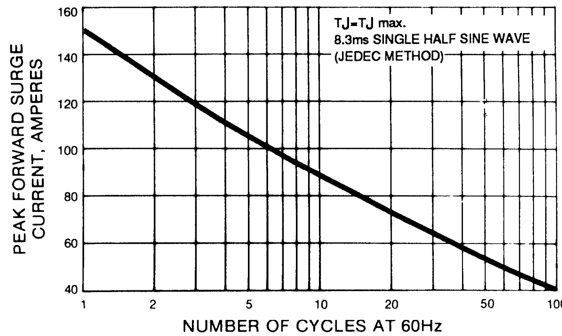


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

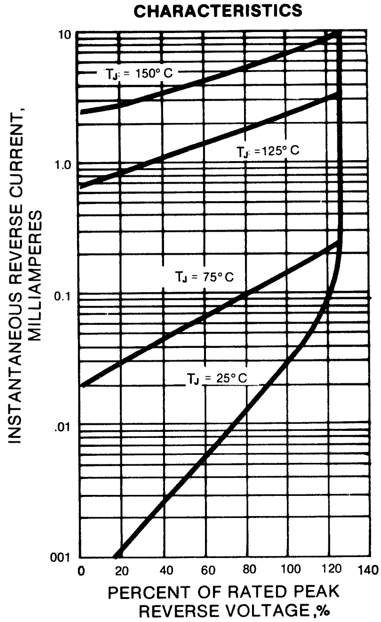


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

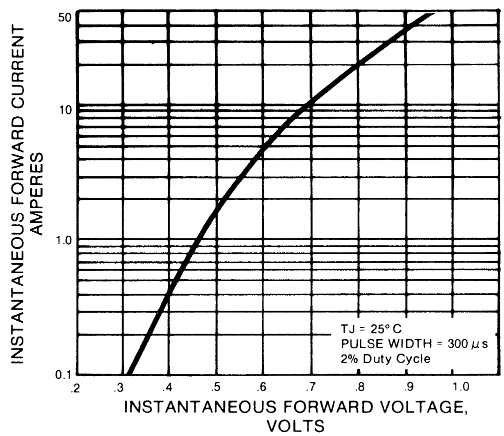
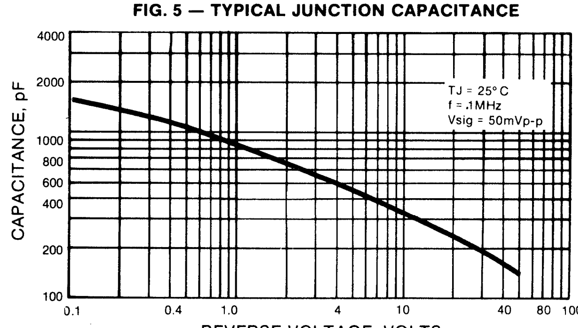


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



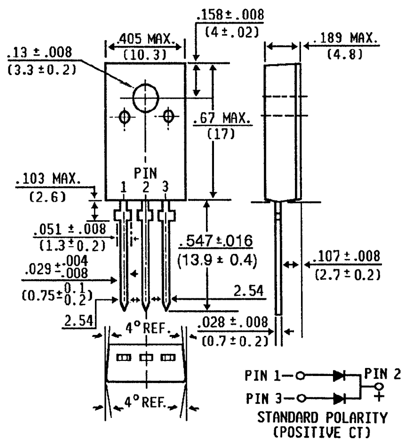
MBRF2035CT AND MBRF2045CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 20.0 Amperes*

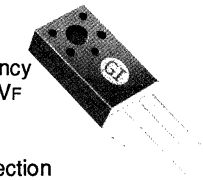
FEATURES

ITO-220CT



Dimensions in inches and (millimeters)

- Isolated plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: Isolated TO-220CT Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lbs. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	MBRF2035CT	MBRF2045CT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=135°C	$I_{(AV)}$	20.0		Amps
Peak Repetitive Forward Current per diode leg (Rated V_R, Sq. wave, 2.0KHz) at T_C=135°C	I_{FRM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage Per Leg (NOTE 2) I_F= 10A, T_C = 125°C / I_F= 20A, T_C=25°C / I_F= 20A, T_C=125°C	V_F	0.57 / 0.84 / 0.72		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage per element T_C = 25°C / T_C =125°C	I_R	0.1 / 25.0		mA
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance per element (NOTE 1)	RΘJC	2.2		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs, Pulse Width f=1KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

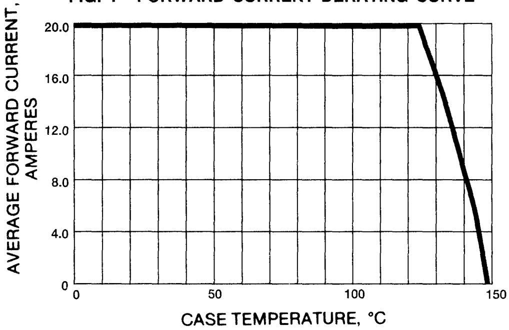


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

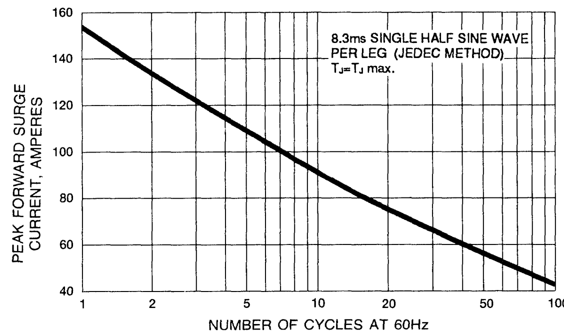


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

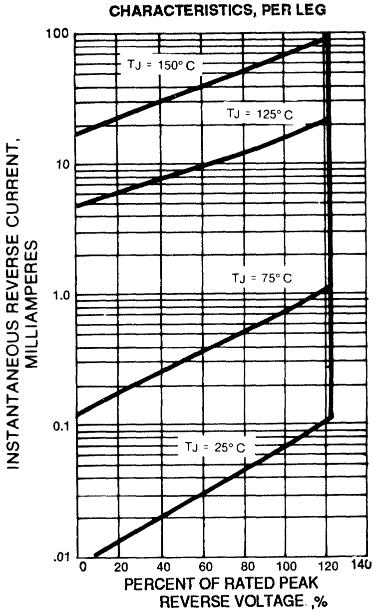


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

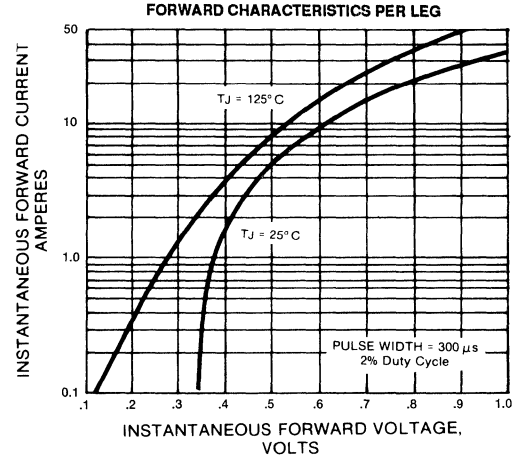
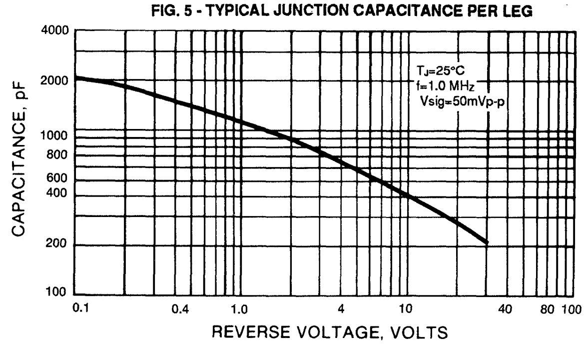


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



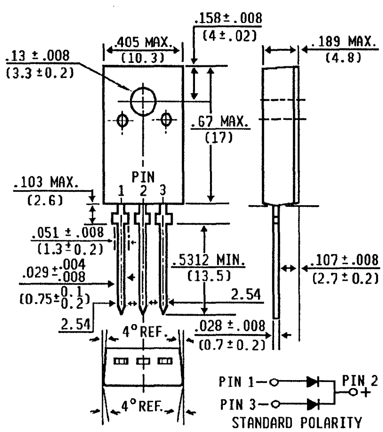
MBRF2050CT AND MBRF2060CT

SCHOTTKY RECTIFIER

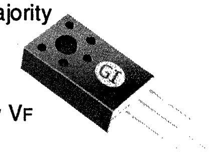
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 20.0 Amperes*

FEATURES

ITO-220CT



Dimensions in inches and (millimeters)



- ◆ Isolated Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- ◆ Metal to silicon rectifier, majority carrier conduction
- ◆ Low power loss, high efficiency
- ◆ High current capability, low V_F
- ◆ High surge capacity
- ◆ Epitaxial construction
- ◆ For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- ◆ High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- ◆ Guardring for transient protection
- ◆ Internal Insulation:1.5k V_{RMS}

MECHANICAL DATA

Case: Isolated TO-220CT Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any ***Mounting Torque:*** 5 in. - lbs. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	*MBRF2050CT*	*MBRF2060CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=133°C	$I_{(AV)}$	20.0		Amps
Peak Repetitive Forward Current per leg (Rated V_R,Sq. wave, 2.0 KHz) at T_C=133°C	I_{FRM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage per leg (NOTE 2) I_F=10A, T_C=25°C I_F=10A, T_C=125°C I_F=20A, T_C=25°C I_F=20A, T_C=125°C	V_F	0.80 0.70 0.95 0.85		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage per leg T_C=25°C T_C=125°C	I_R	0.15 150.0		mA
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/µs
Typical Thermal Resistance per leg (NOTE 1)	$R_{\Theta JC}$	2.2		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1.Thermal Resistance from Junction to Case per element.
2. Pulse Test: 300µs Pulse Width 300µs, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

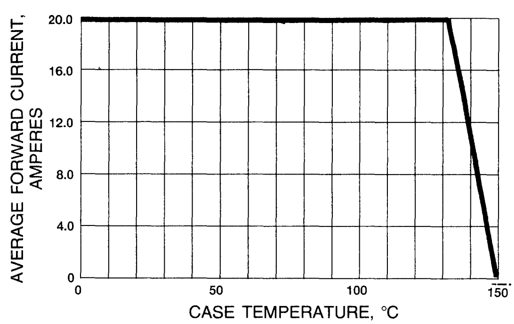


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

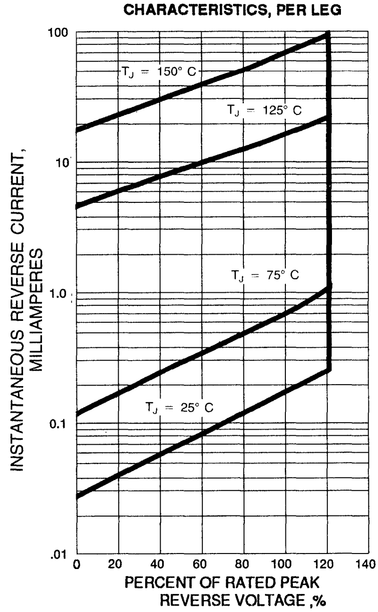


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

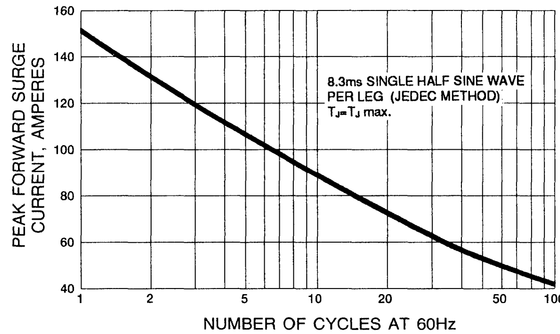


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

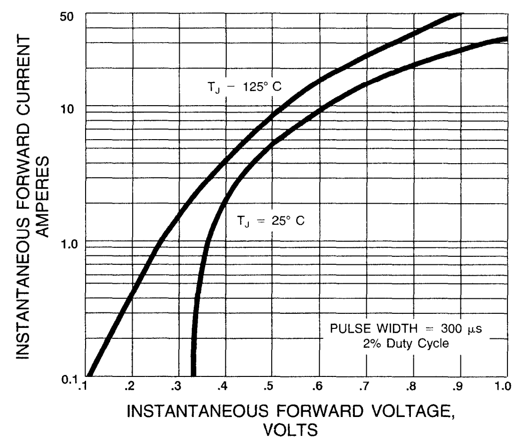
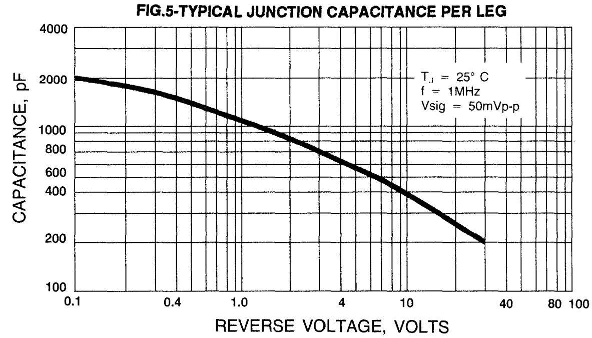


FIG.5-TYPICAL JUNCTION CAPACITANCE PER LEG



General Instrument

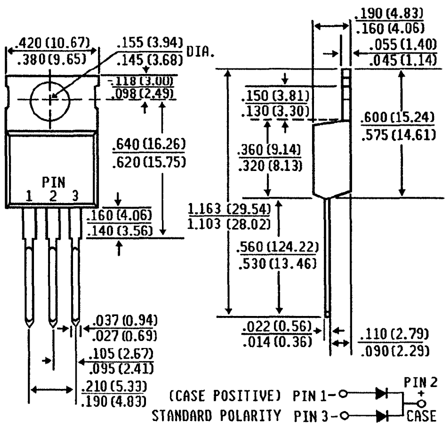
MBR2035CT AND MBR2045CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 20.0 Amperes*

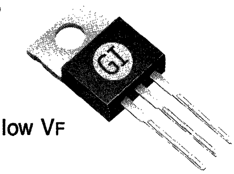
FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- Plastic Package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- Guardring for transient protection
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Weight: .08 ounces, 2.24 gram
Mounting Torque: 5 in. - lbs.max.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBR2035CT*	*MBR2045CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=135°C	$I_{(AV)}$	20.0		Amps
Peak Repetitve Forward Current per leg (Rated V_R, Sq. wave 2.0 KHz) at T_C=135°C	I_{FRM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage per leg (NOTE 2) I_F=10A, T_C=125°C I_F=20A, T_C=25°C I_F=20A, T_C=125°C	V_F	0.57 0.84 0.72		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage per leg T_C=25°C T_C=125°C	I_R	0.1 15.0		mA
Voltage Rate of Change, (Rated V_R)	dv/dt	1000		V/μs
Typical Thermal Resistance per leg (NOTE 1)	$R\Theta JC$	2.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.
3. 2.0μs Pulse Width, f=1 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

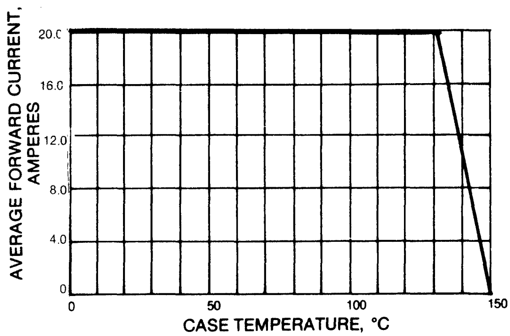


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

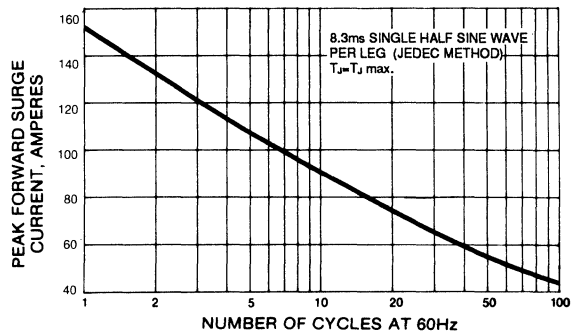


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

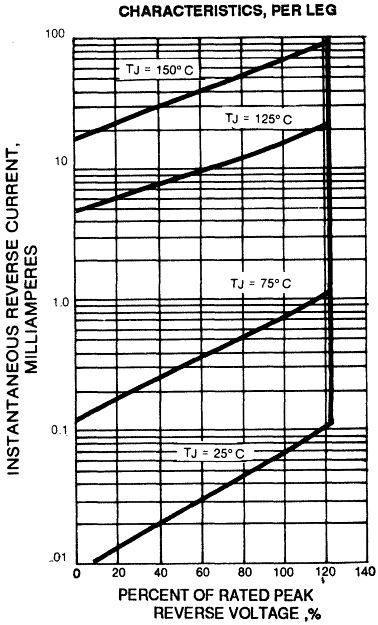


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

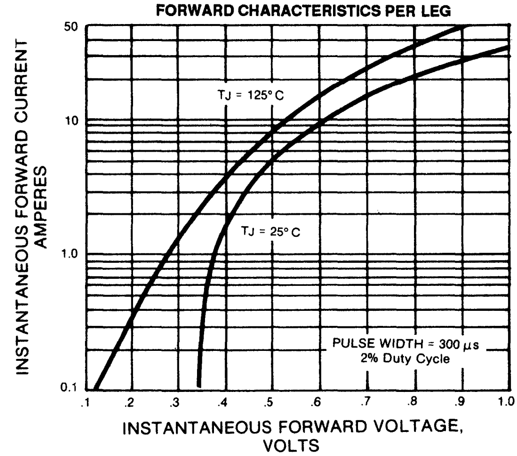
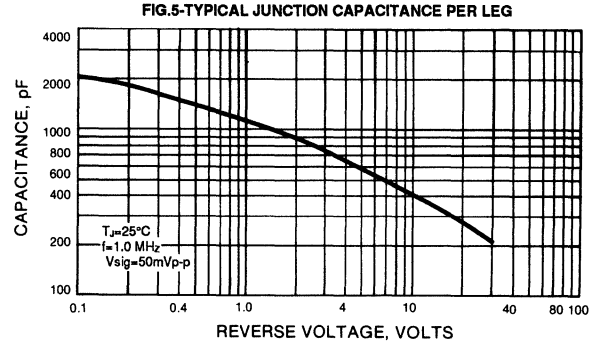


FIG.5-TYPICAL JUNCTION CAPACITANCE PER LEG



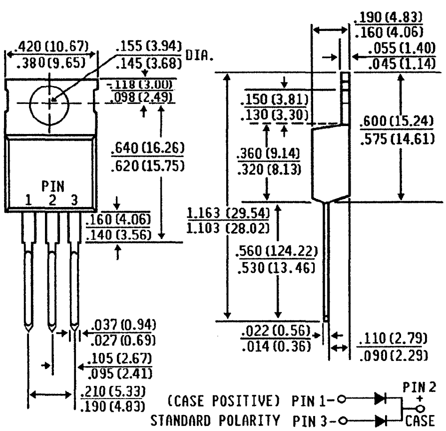
MBR2050CT AND MBR2060CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 20.0 Amperes*

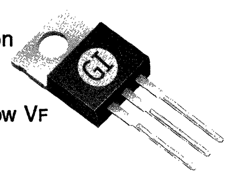
FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Weight:.08 ounces, 2.24 gram
Mounting Torque: 5 in. - lbs. max.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	MBR2050CT	MBR2060CT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=133°C	$I_{(AV)}$	20.0		Amps
Peak Repetitive Forward Current per leg (Rated V_R, Sq. wave, 2.0 KHz) at T_C=133° C	I_{FRM}	20.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage per leg (NOTE 2) I_F 10A, T_C=25°C I_F=10A, T_C=125°C I_F=20A, T_C=25°C I_F=20A, T_C=125°C	V_F	0.80 0.70 0.95 0.85		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage per leg T_C=25°C T_C=125°C	I_R	0.15 150.0		mA
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/µs
Maximum Thermal Resistance per leg (NOTE 1)	$R_{\Theta JC}$	2.0		°C/W
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs, Pulse Width, f=1 KHz.

FIG 1 - FORWARD CURRENT DERATING CURVE

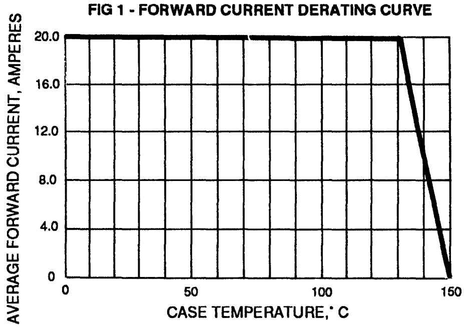


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

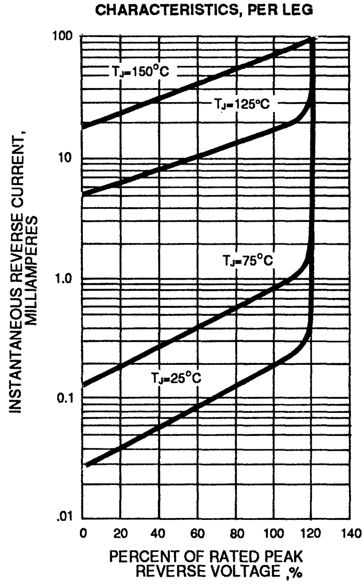


FIG 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

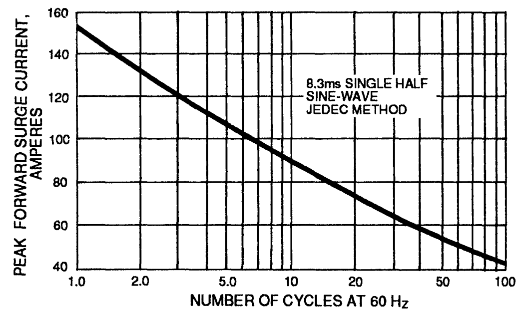


FIG 4 - TYPICAL REVERSE CHARACTERISTICS

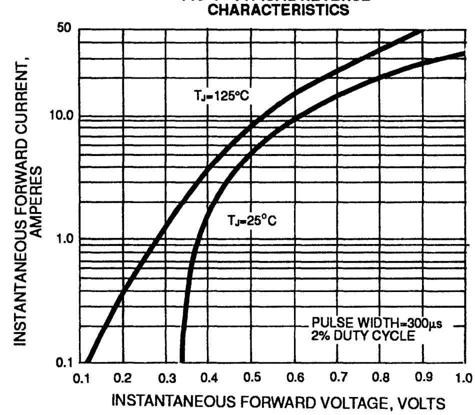
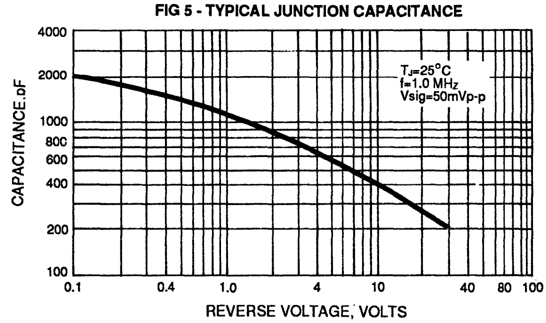


FIG 5 - TYPICAL JUNCTION CAPACITANCE



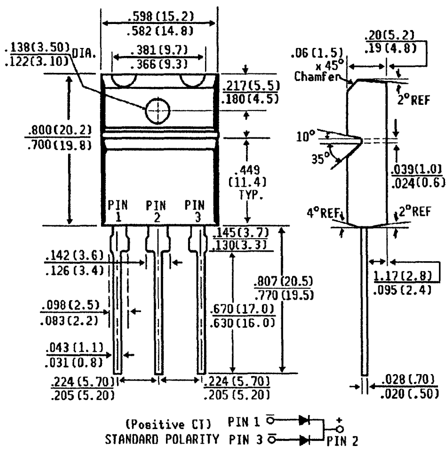
SBLF2030PT AND SBLF2040PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 20.0 Amperes*

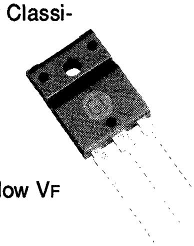
FEATURES

ITO-3P



Dimensions in inches
and
(millimeters)

- Dual rectifier construction, positive center-tap
- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.17", (4.3mm) lead lengths at 5 lbs. (2.3kg) tension
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: Isolated TO-3P Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in. - lb. max.
Weight: .47 ounces, 13.2 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SBLF2030PT*	*SBLF2040PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	20.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum Instantaneous Forward Voltage Per Leg I_F=10.0A (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage per leg T_C=100°C	I_R	1.0 50.0		mA
Typical Thermal Resistance (NOTE 1)	$R\theta JC$	2.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.

FIG. 1—FORWARD CURRENT DERATING CURVE

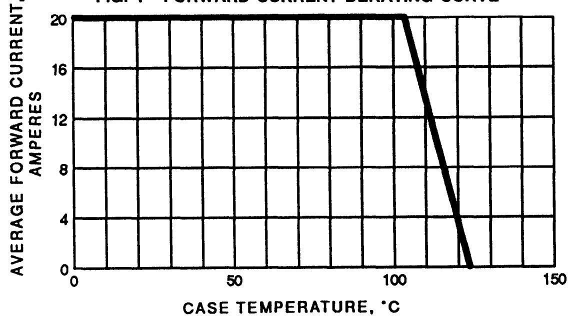


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

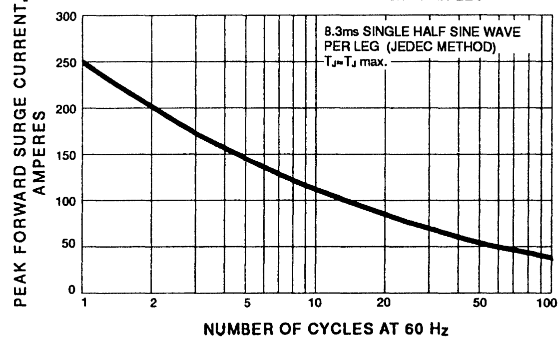


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

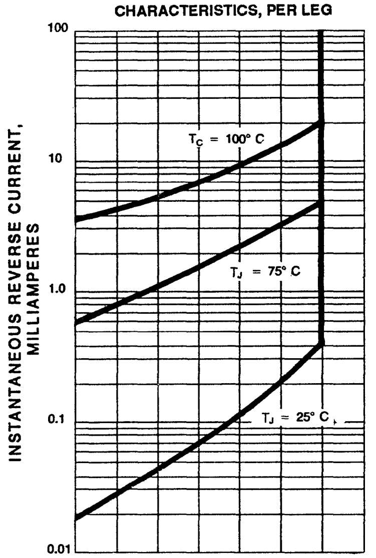


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

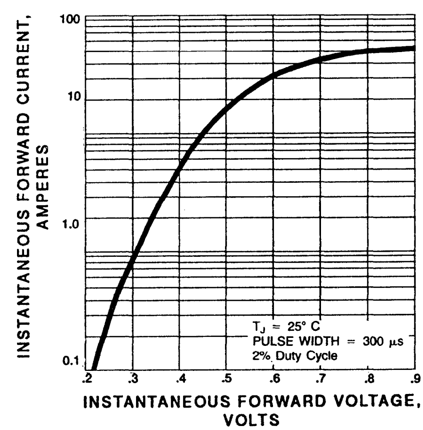
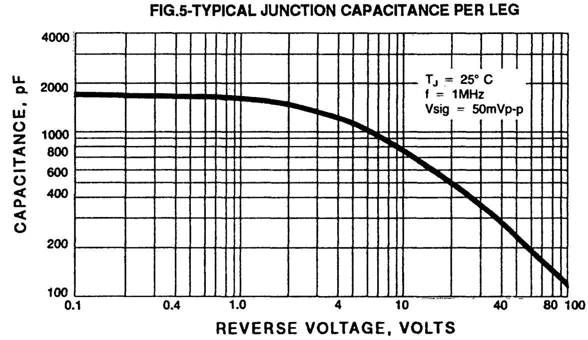


FIG.5-TYPICAL JUNCTION CAPACITANCE PER LEG

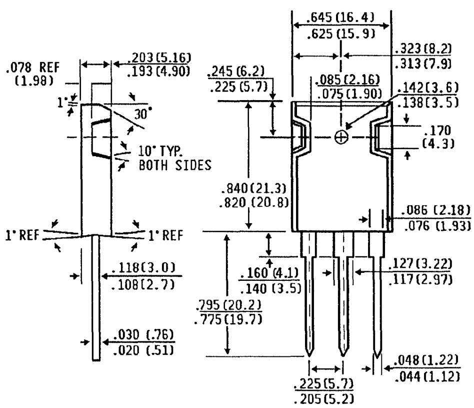


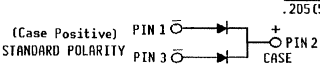
SBL2030PT AND SBL2040PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 20.0 Amperes*

TO-247AD

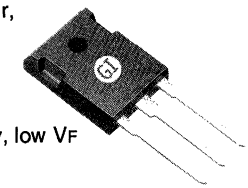




Dimensions in inches
and
(millimeters)

FEATURES

- Dual rectifier construction, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.17",(4.3mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Plastic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.2 ounces, 5.6 gram
Mounting Torque: 10 in. - lbs. max.

CROSS REFERENCE GUIDE

GI	FUJI	SHINDENGEN
SBL2040PT	ESA83-004	-

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*SBL2030PT*	*SBL2040PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	20.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0		Amps
Maximum Instantaneous Forward Voltage per leg I_F=10.0A (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Current at Rated DC Blocking Voltage per leg T_C=25°C / T_C=100°C	I_R	1.0 / 50.0		mA
Typical Thermal Resistance per leg (NOTE 1)	$R_{\Theta JC}$	1.5		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-40 to +125		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.

FIG. 1 — FORWARD CURRENT DERATING CURVE

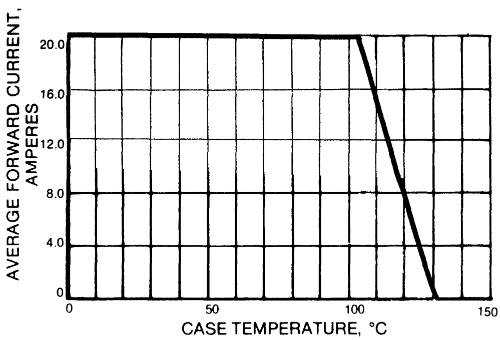


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

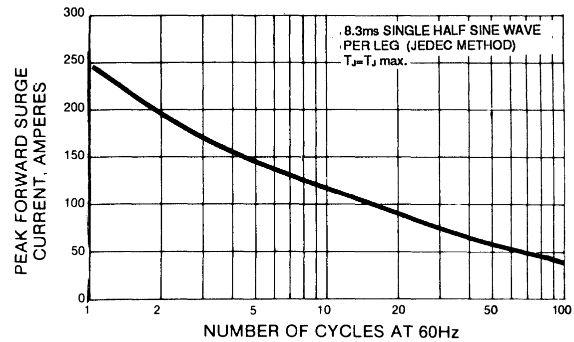


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

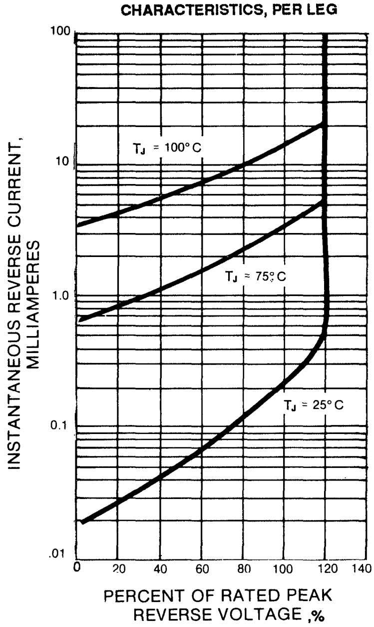


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

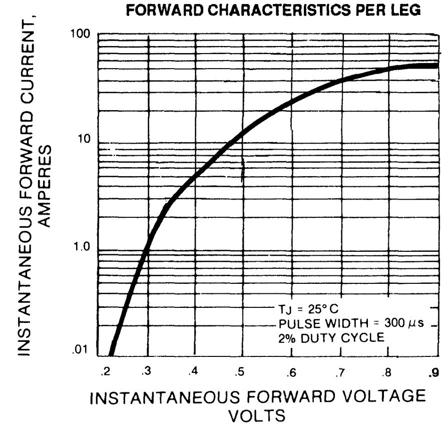
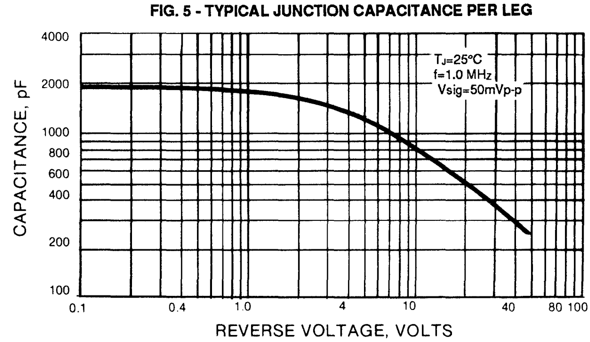


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



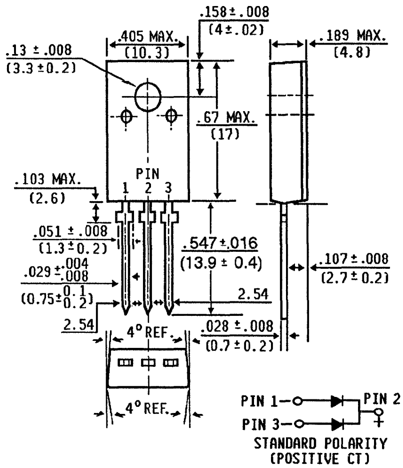
MBRF2535CT AND MBRF2545CT

SCHOTTKY RECTIFIER

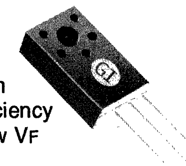
VOLTAGE RANGE - 35 and 45 Volts CURRENT - 30.0 Amperes

FEATURES

ITO-220CT



Dimensions in inches and (millimeters)



- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power, loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: Isolated TO-220CT Fully Overmolded Plastic
Terminals: Leads, solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5in. - lb. max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*MBRF2535CT*	*MBRF2545CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=130°C	$I_{(AV)}$	30.0		Amps
Peak Repetitive Forward Current per leg (rated V_R, Square Wave, 20 KHz) at T_C=130°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage Per Leg I_F=30A, T_C=25°C (NOTE 2) I_F=30A, T_C=125°C	V_F	0.82 0.73		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage per leg (NOTE 2) T_C=125°C	I_R I_R	0.2 40.0		mA mA
Typical Thermal Resistance, (NOTE 1)	$R\Theta JC$	1.8		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Operating Junction Temperature Range	T_J	-65 to + 150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2%, Duty Factor
3. 2.0µs, Pulse Width 1 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

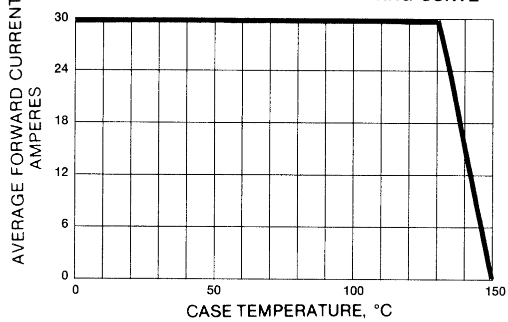


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

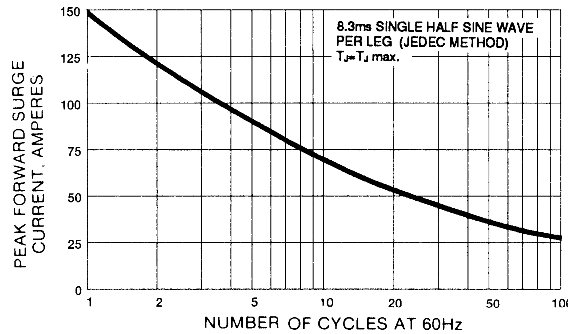


FIG. 3- TYPICAL REVERSE CHARACTERISTICS, PER LEG

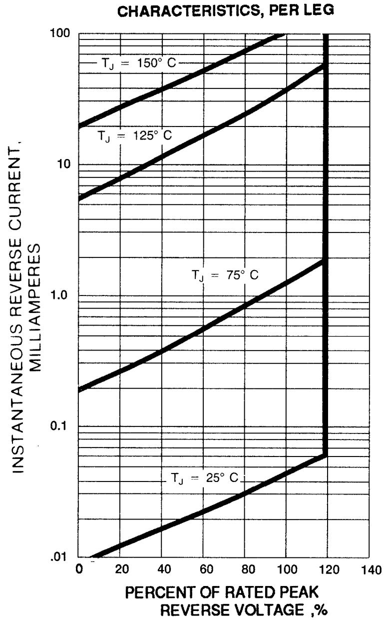


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

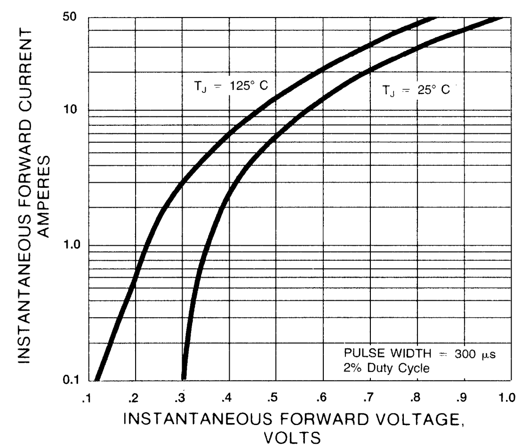
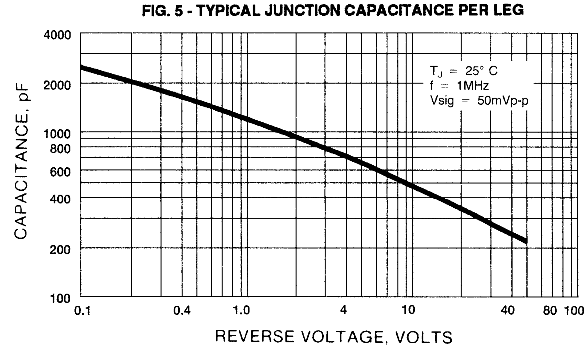


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



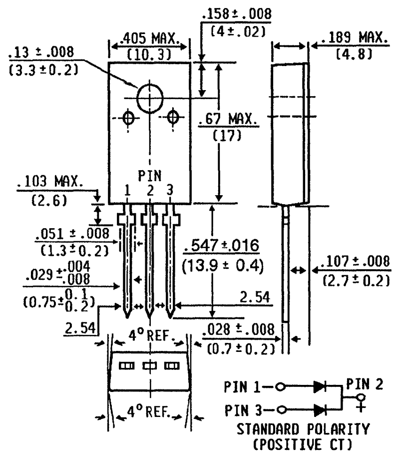
MBRF2550CT AND MBRF2560CT

SCHOTTKY RECTIFIER

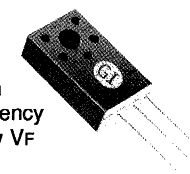
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 30.0 Amperes*

FEATURES

ITO-220CT



Dimensions in inches and (millimeters)



- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection
- Internal Insulation:1.5K V_{RMS}

MECHANICAL DATA

Case: Isolated TO-220CT Fully Overmolded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb max.
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBRF2550CT*	*MBRF2560CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	30.0		Amps
Peak Repetitve Forward Current per leg (Rated V_R, Sq. Wave, 20 KHz) at T_C=125°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Forward Voltage per leg I_F=15.0A, T_C=25°C (NOTE 2) I_F=15.0A, T_C=125°C	V_F	0.75 0.65		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg (NOTE 2) T_C=25°C T_C=125°C	I_R	1.0 50.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\Theta JC}$	1.8		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Operating Junction Temperature Range	T_J	-65 to + 150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2%, Duty Factor
3. 2.0µs, Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

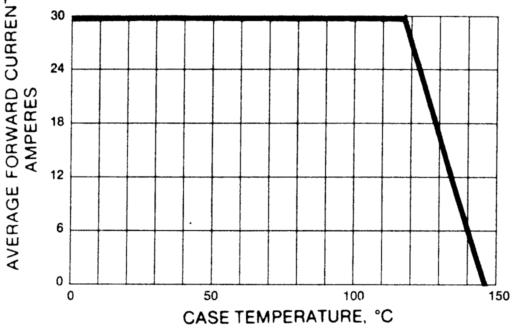


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

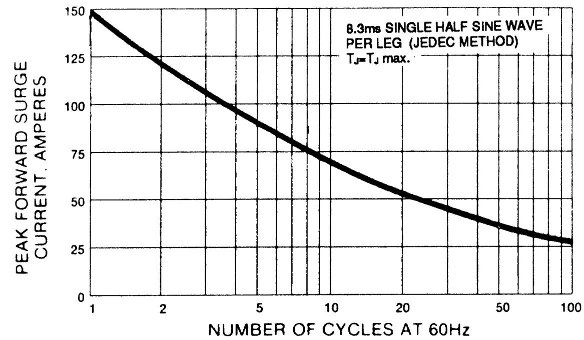


FIG. 3— TYPICAL REVERSE CHARACTERISTICS PER LEG

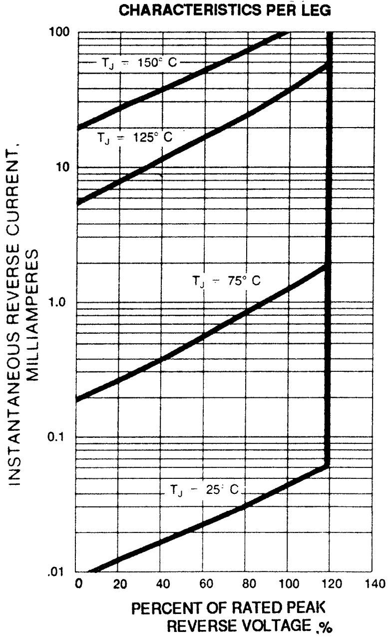


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

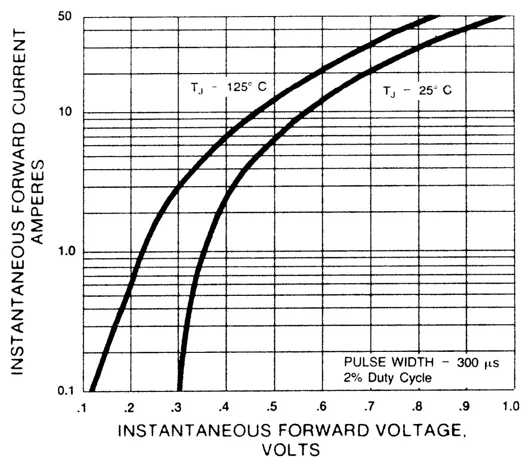
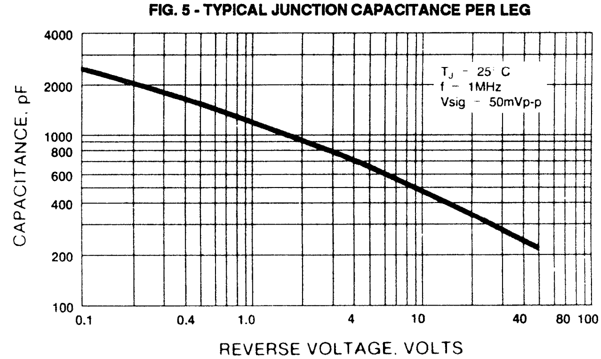


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



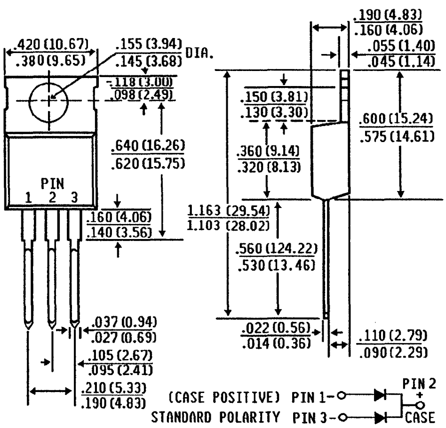
MBR2535CT AND MBR2545CT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 30.0 Amperes*

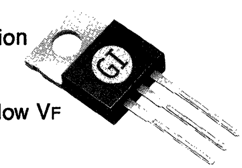
FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads, solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBR2535CT*	*MBR2545CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=130°C	$I_{(AV)}$	30.0		Amps
Peak Repetitive Forward Current per leg (rated V_R, Square Wave,20 KHz) at T_C=130°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage per leg I_F= 30A, T_C=25°C I_F= 30A, T_C=125°C (NOTE 2)	V_F	0.82 0.73		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Volltage per leg (NOTE 2) T_C=25°C T_C =125°C	I_R	0.2 40.0		mA
Maximum Thermal Resistance (NOTE 1)	$R\Theta JC$	1.5		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/us
Operating Junction Temperature Range	T_J	-65 to + 150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test:300μs Pulse Width, 2%, Duty Factor.
3. 2.0μs, Pulse Width, f=1 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

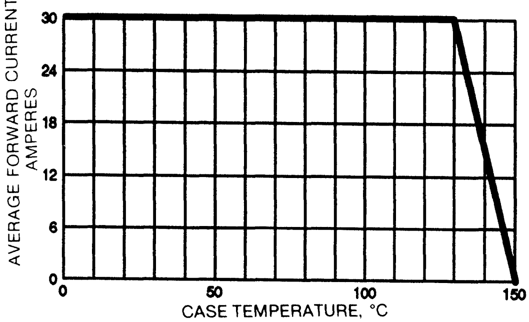


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

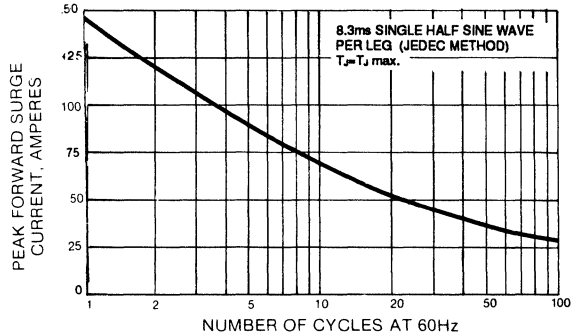


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

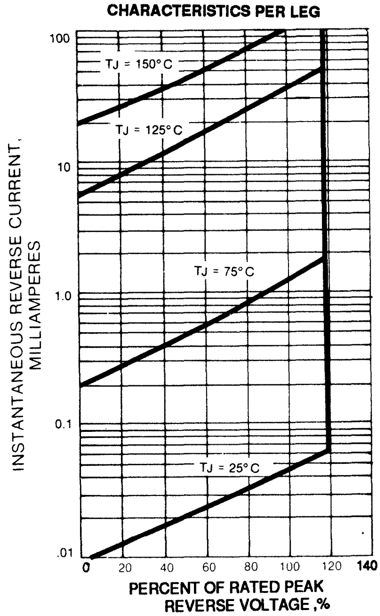


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

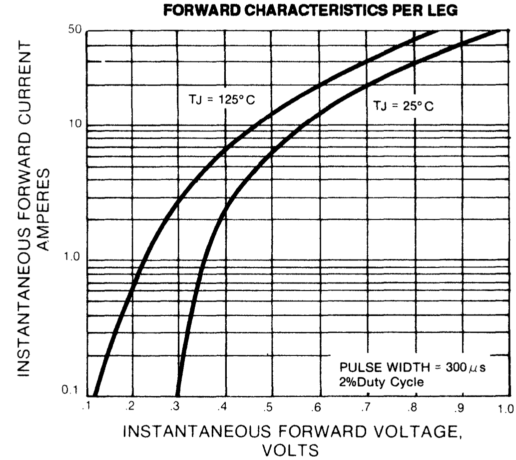
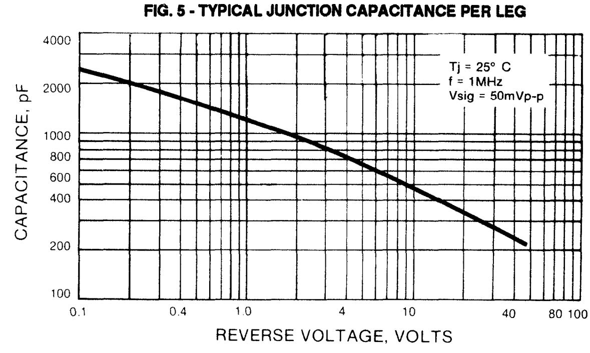


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



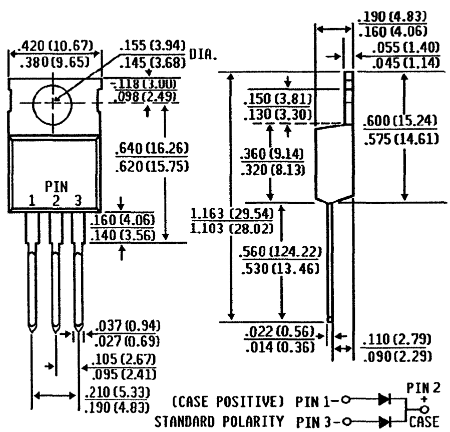
MBR2550CT AND MBR2560CT

SCHOTTKY RECTIFIER

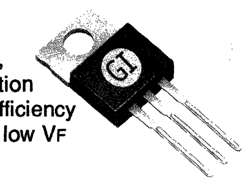
***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 30 Amperes*

FEATURES

TO-220AB



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classific-ations 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds/.25", (6.35mm) from case
- Guardring for transient protection

MECHANICAL DATA

Case: JEDEC TO-220 Molded Plastic
Terminals: Leads, solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: .08 ounces, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBR2550CT*	*MBR2560CT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	30.0		Amps
Peak Repetitive Forward Current per leg (rated V_R,Square wave, 20 KHz) at T_C=125°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	0.5		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=15.0A, T_C=25°C I_F=15.0A, T_C=125°C (NOTE 2)	V_F	0.75 0.65		Volts
Maximum Instantaneous Reverse Current at at Rated DC Blocking Voltage per leg (NOTE 2) T_C=25°C T_C=125°C	I_R	1.0 50.0		mA
Typical Thermal Resistance, (NOTE 1)	$R\Theta JC$	1.5		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Operating Junction Temperature Range	T_J	-65 to + 150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2%, Duty Factor.
3. 2.0µs, Pulse Width, f=1 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

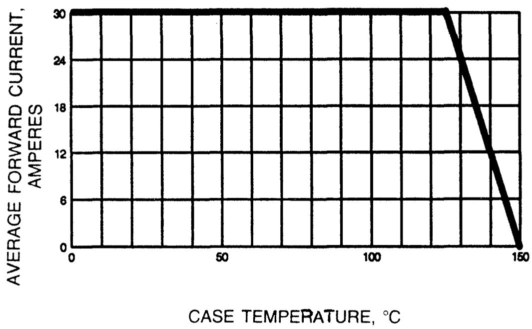


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

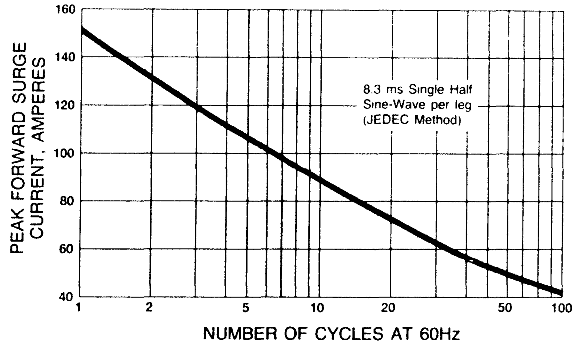


FIG. 3— TYPICAL REVERSE CHARACTERISTICS, PRE LEG

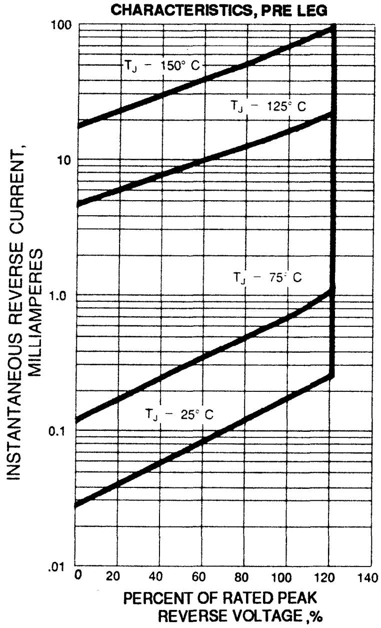


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

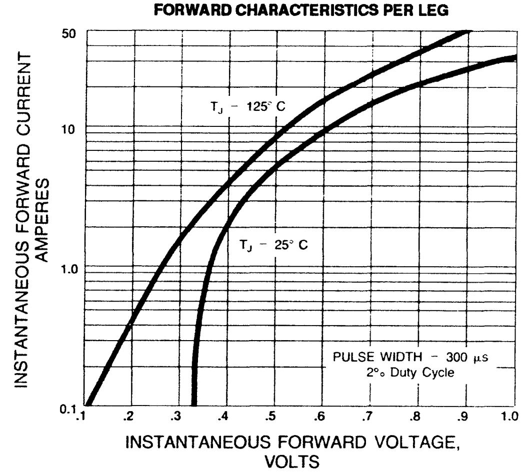
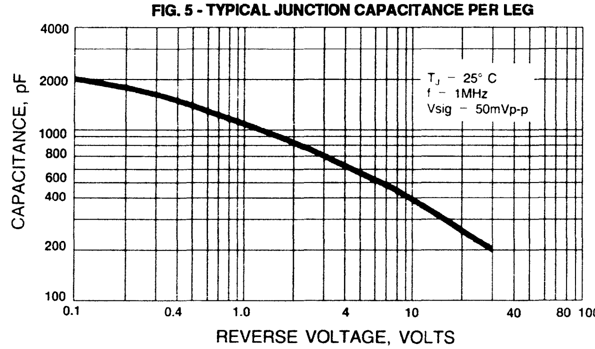


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



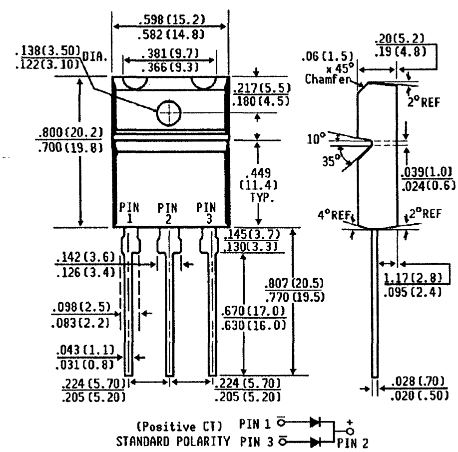
MBRF3035PT AND MBRF3045PT

SCHOTTKY RECTIFIER

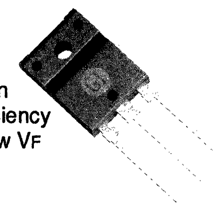
***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 30.0 Amperes*

FEATURES

ITO-3P



Dimensions in inches and (millimeters)



- Dual rectifier construction, positive center-tap
- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C, .17 (4.3mm) lead length at 5 lbs. (2.3kg) tension
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: ITO-3P Fully Overmolded Plastic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb. max.
Weight: .47 ounces, 13.2 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.Resistive or inductive load.

	SYMBOLS	*MBRF3035PT*	*MBRF3045PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	30.0		Amps
Peak Repetitve Forward Current per leg (rated V_R, Square wave, 20 KHz) at T_C=105°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current, 8.3ms single half sine -wave superimposed on rated load (JEDEC Method)	I_{FSM}	200		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RSM}	2.0		Amps
Maximum Instantaneous Forward Voltage per leg at I_F= 20A, T_C=125°C (NOTE 2) / I_F=30A, T_C=25°C / I_F=30A, T_C=125°C	V_F	0.60 0.76 0.72		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg at (NOTE 2) T_C=25°C / T_C=125°C	I_R	1.0 60.0		mA
Typical Thermal Resistance (NOTE 1)	RθJC	1.7		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/µs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1.0KHz

FIG. 1 - FORWARD CURRENT DERATING CURVE

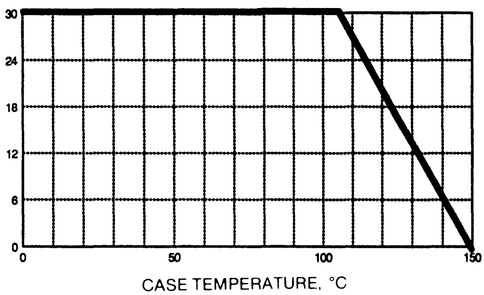


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

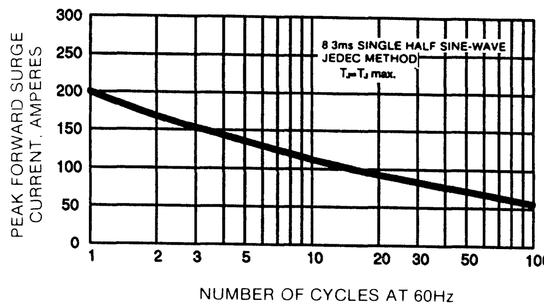


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS, PER LEG

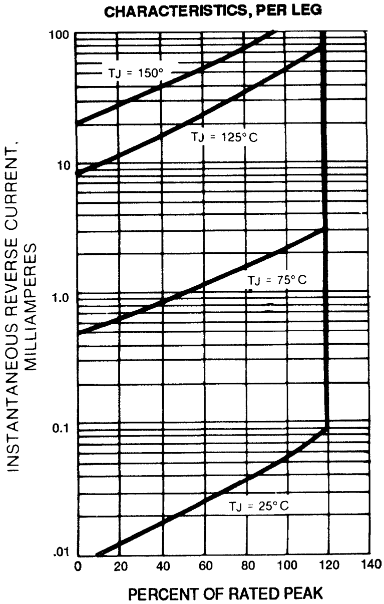


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

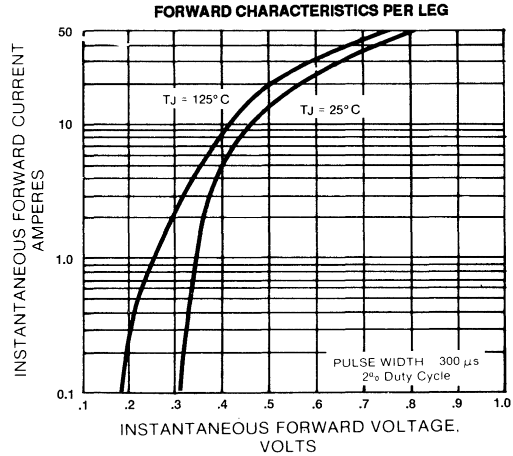
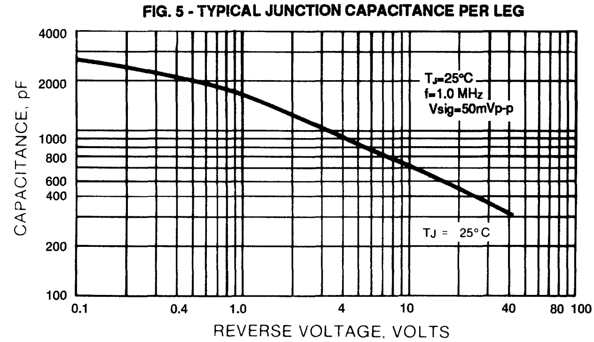


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



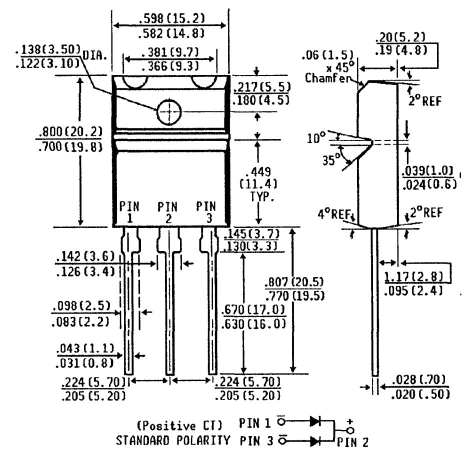
MBRF3050PT AND MBRF3060PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 50 and 60 Volts*　　***CURRENT** - 30.0 Amperes*

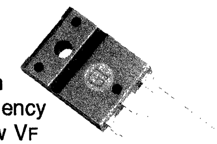
FEATURES

ITO-3P



Dimensions in inches and (millimeters)

- Dual rectifier construction, positive center-tap
- Isolated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C, .17 (4.3mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-3P Fully Overmolded Plastic
Terminals: Lead Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb. max.
Weight: .47 ounces, 13.2 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBRF3050PT*	*MBRF3060PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	30.0		Amps
Peak Repetitve Forward Current per leg (rated V_R, Square wave, 20 KHz) at T_C=105°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RSM}	1.0		Amps
Maximum Instantaneous Forward Voltage per leg at (NOTE 2) I_F=20A, T_C=25°C I_F=20A, T_C=125°C	V_F	0.75 0.65		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg (NOTE 2) T_C =25°C T_C=125°C	I_R	5.0 100.0		mA
Typical Thermal Resistance (NOTE 1)	RΘJC	1.7		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/μs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.
3. 2.0μs Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

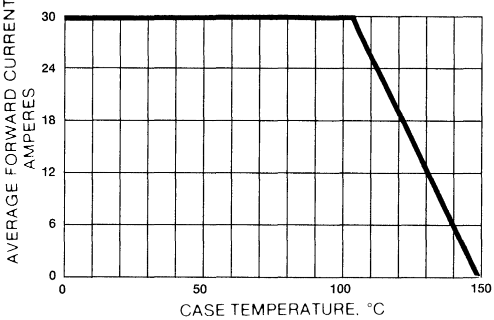


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

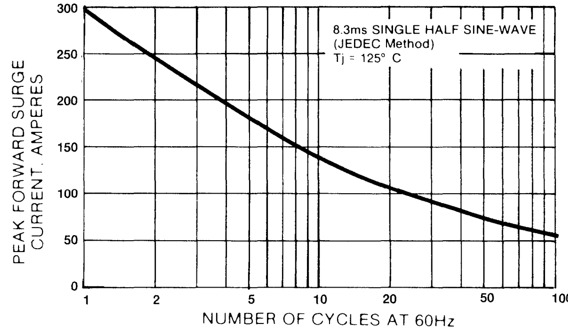


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

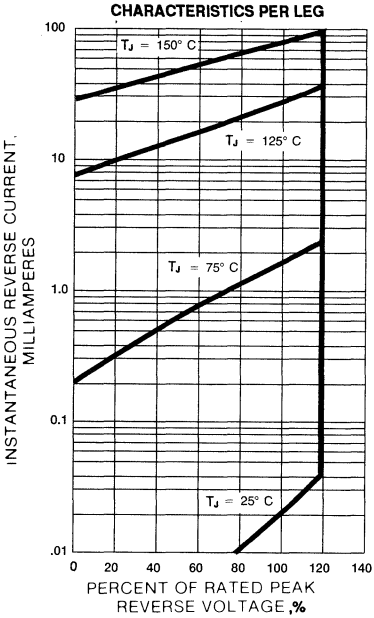


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

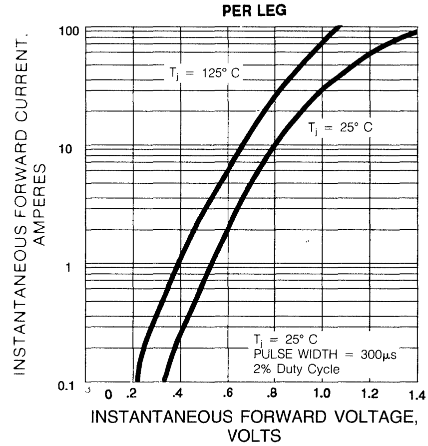
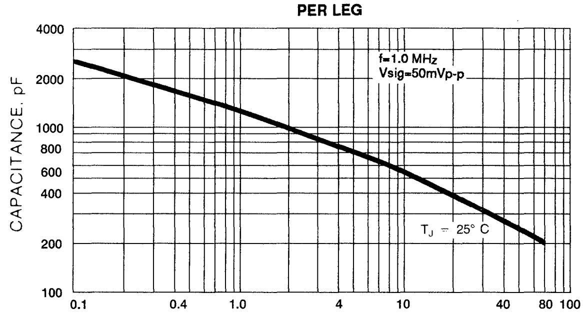


FIG. 5—TYPICAL JUNCTION CAPACITANCE PER LEG



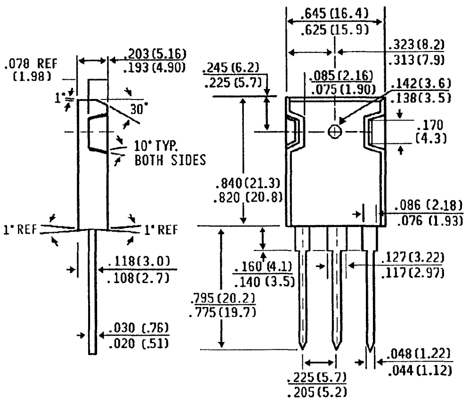
MBR3035PT AND MBR3045PT

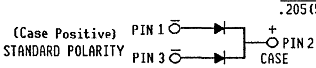
SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 30.0 Amperes*

FEATURES

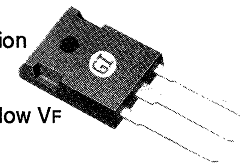
TO-247AD





Dimensions in inches and (millimeters)

- Dual rectifier construciton, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds, .17 (4.3mm) from case
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Plastic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.2 ounces, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBR3035PT*	*MBR3045PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	30.0		Amps
Peak Repetitve Forward Current per leg (rated V_R, Square wave, 20 KHz) at T_C=105°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 2)	I_{RSM}	2.0		Amps
Maximum Instantaneous Forward Voltage per leg I_F=20A, T_C=125°C (NOTE 3) I_F=30A, T_C=25°C I_F=30A, T_C=125°C	V_F	0.60 0.76 0.72		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage T_C=25°C per leg (NOTE 3) T_C=125°C	I_R	1.0 60.0		mA
Maximum Thermal Resistance (NOTE 1)	$R_{\Theta JC}$	1.4		°C/W
Voltage Rate of Change at (Rated V_R)	dv/dt	1000		V/µs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. 2.0µs, Pulse Width, f=1.0 KHz.
3. Pulse Test: 300µs Pulse Width, 2% Duty Factor.

FIG. 1 — FORWARD CURRENT DERATING CURVE

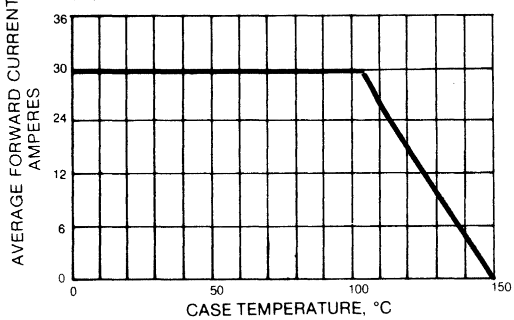


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

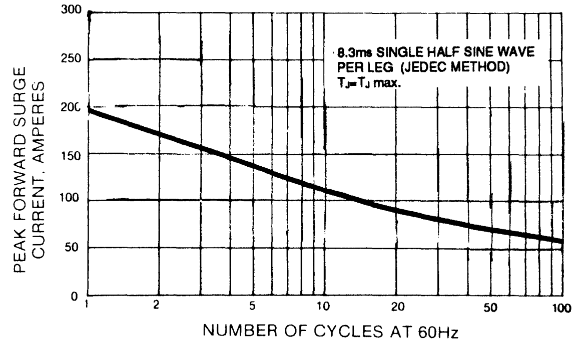


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

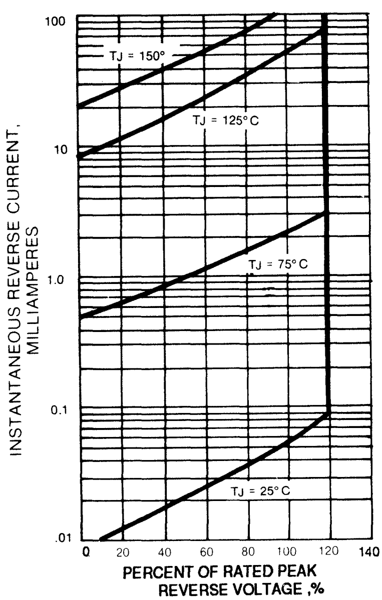


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

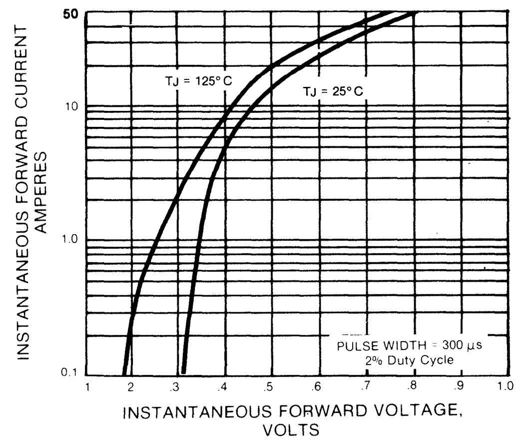
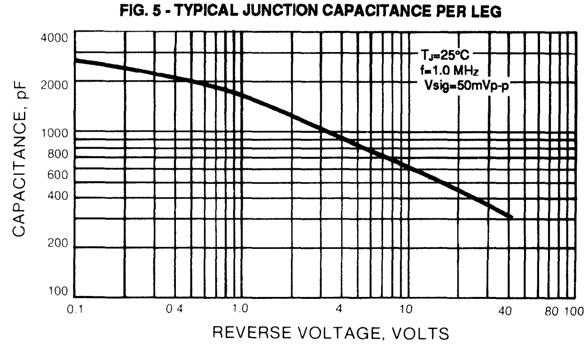


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



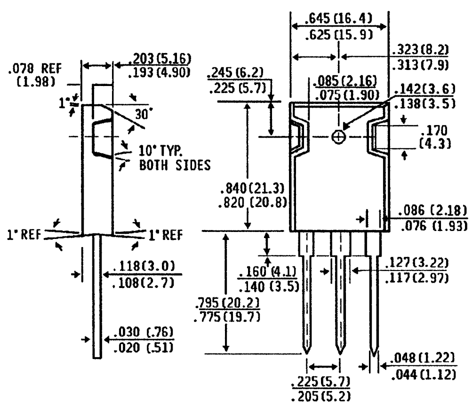
MBR3050PT AND MBR3060PT

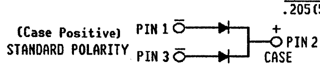
SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 30.0 Amperes*

FEATURES

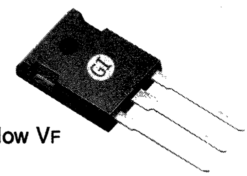
TO-247AD





Dimensions in inches and (millimeters)

- Dual rectifier construction, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds, .17 (4.3mm) from case



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Platsic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.2 ounces, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	MBR3050PT	MBR3060PT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	30.0		Amps
Peak Repetitve Forward Current per leg (rated V_R, Square wave, 20 KHz) at T_C=105°C	I_{FRM}	30.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0		Amps
Peak Repetitive Reverse Current (NOTE 3)	I_{RSM}	1.0		Amps
Maximum Instantaneous Forward Voltage Per Leg at I_F=20A, T_C=125°C (NOTE 2) I_F=20A, T_C=25°C	V_F	0.65 0.75		Volts
Maximum Instantaneous Reverse Current at rated DC Blocking Voltage per leg (NOTE 2) T_C=25°C T_C=125°C	I_R	5.0 100.0		mA
Maximum Thermal Resistance (NOTE 1)	$R_{\theta JC}$	2.0		°C/W
Voltage Rate of Change (rated V_R)	dv/dt	1000		V/μs
Operating JunctionTemperature Range	T_J	-65 to + 150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. 300μs Pulse Width, 2% Duty Factor.
3. 2.0μs Pulse Width, f=1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

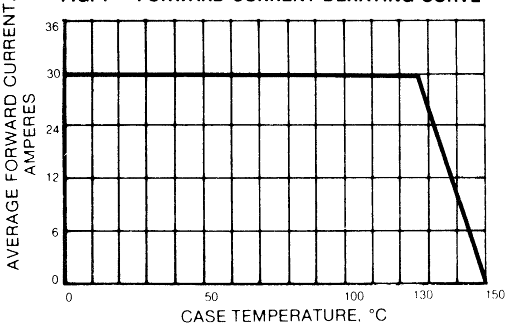


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

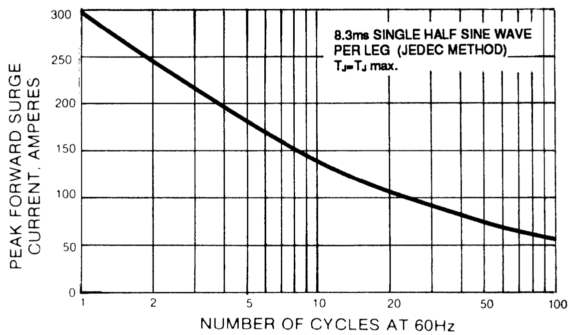


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

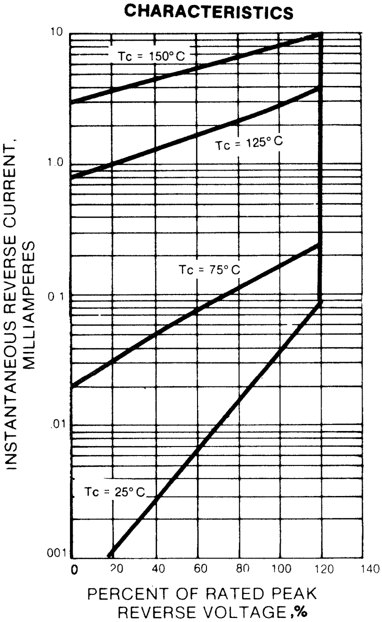


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER ELEMENT

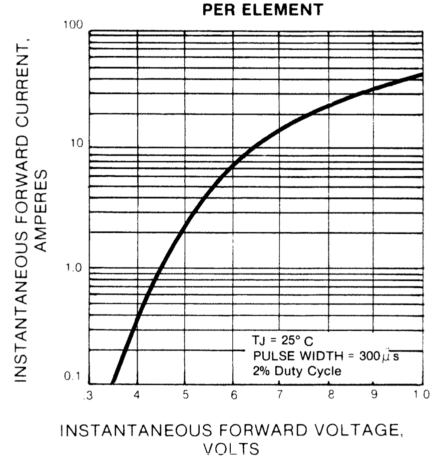
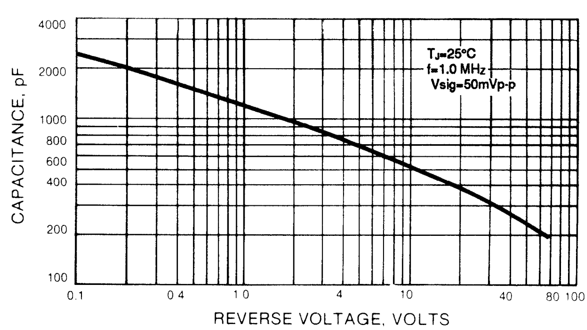


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER ELEMENT



General Instrument

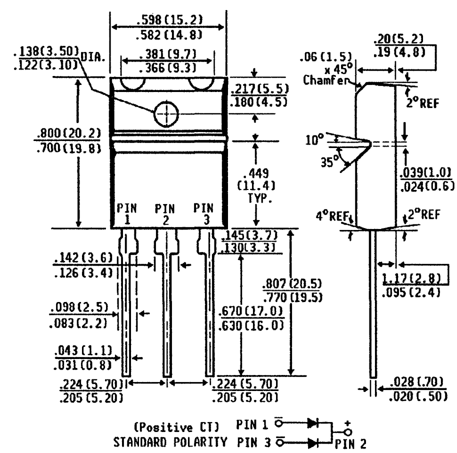
SBLF3030PT AND SBLF3040PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 30.0 Amperes*

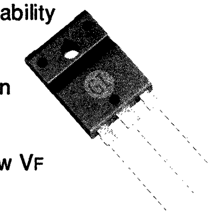
FEATURES

ITO-3P



Dimensions in inches and (millimeters)

- Dual rectifier construction, positive center-tap
- Isolated Plastic (1500 V_{RMS}) package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds,17 (4.3mm) from case
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-3P Fully Overmolded Plastic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in.- lb. max.
Weight: .47 ounces, 13.2 ounces

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SBLF3030PT*	*SBLF3040PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	30.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	275.0		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=15A, T_C=25°C (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage per leg (NOTE 2) T_C=100°C	I_R	1.0 75.0		mA
Maximum Thermal Resistance (NOTE 1)	$R_{\theta JC}$	2.5		°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.

FIG. 1 — FORWARD CURRENT DERATING CURVE

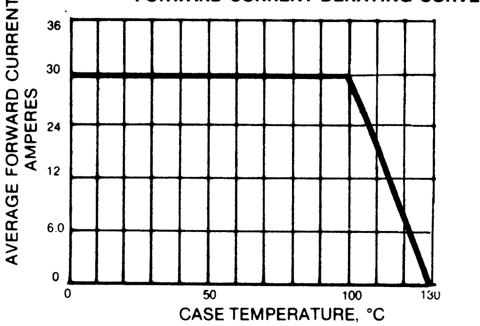


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

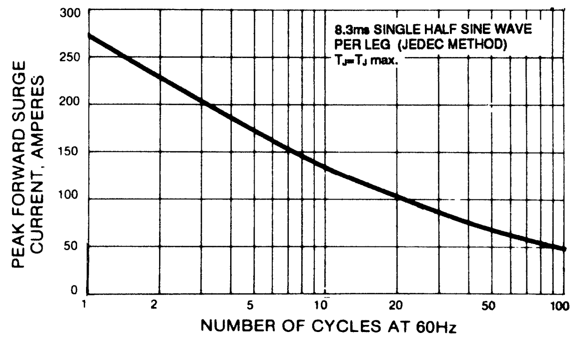


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

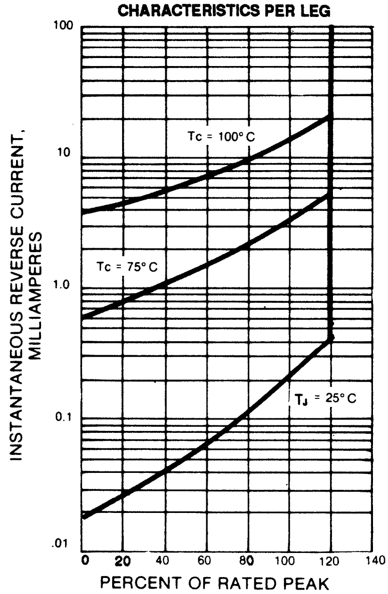


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER LEG

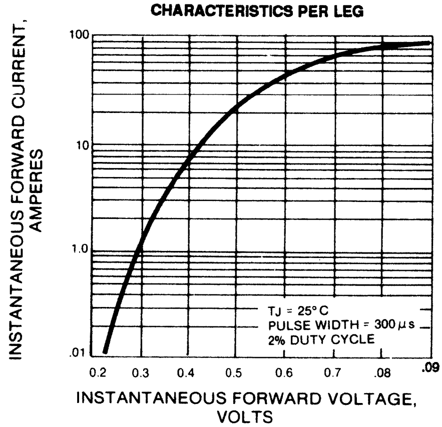
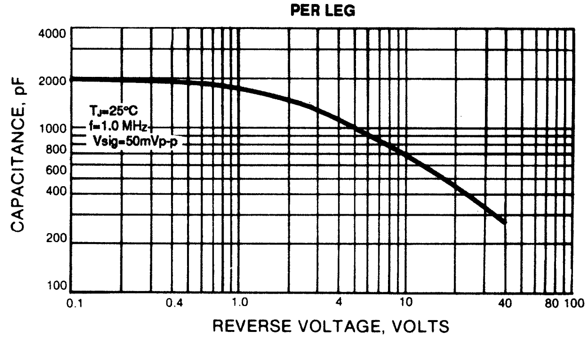


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER LEG

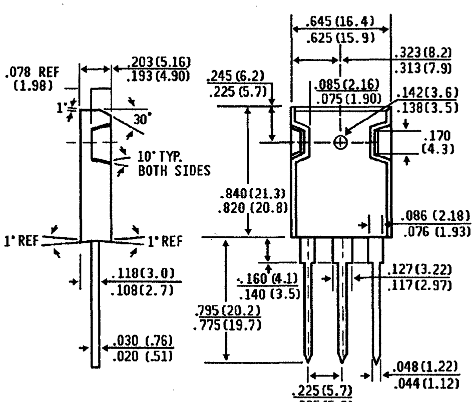


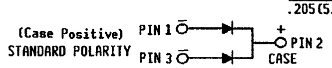
SBL3030PT AND SBL3040PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 30 and 40 Volts* ***CURRENT** - 30.0 Amperes*

TO-247AD

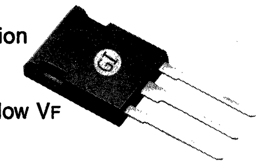




Dimensions in inches and (millimeters)

FEATURES

- Dual rectifier construction, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds,17 (4.3mm) lead lengths at 5 lbs., (2.3kg) tension
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Plastic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.2 ounces, 5.6 gram

CROSS - REFERENCE GUIDE

GI	FUJI	SHINDENGEN
SBL3030PT	- - -	S30SC3M
SBL3040PT	ESAD83-004	S30SCAM

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SBL3030PT*	*SBL3040PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	30	40	Volts
Maximum RMS Voltage	V_{RMS}	21	28	Volts
Maximum DC Blocking Voltage	V_{DC}	30	40	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	30.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	275.0		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=15A, T_C=25°C (NOTE 2)	V_F	0.55		Volts
Maximum Instantaneous Reverse Current at Rated DC Blocking Voltage per leg (NOTE 2) T_C=25°C / T_C=100°C	I_R	1.0 / 75.0		mA
Maximum Thermal Resistance (NOTE 1)	$R_{\theta JC}$	2.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-40 to +125		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.

FIG. 1 — FORWARD CURRENT DERATING CURVE

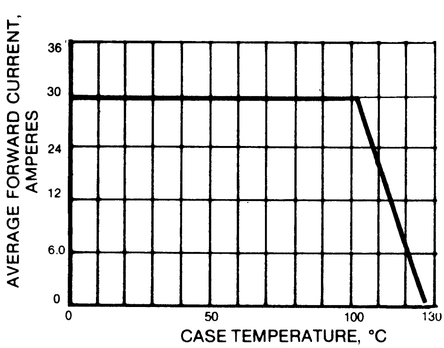


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

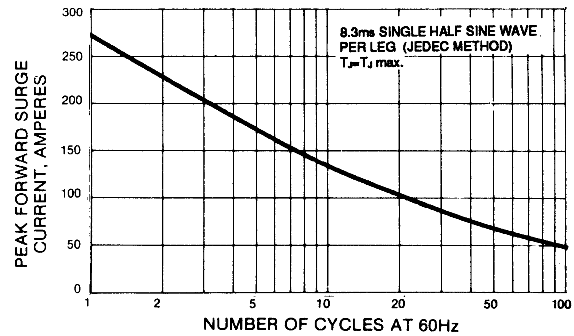


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

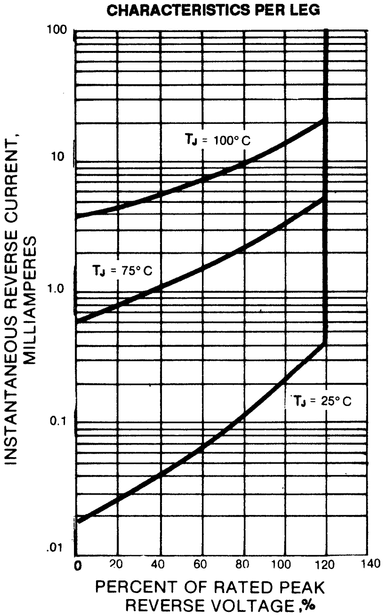


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER LEG

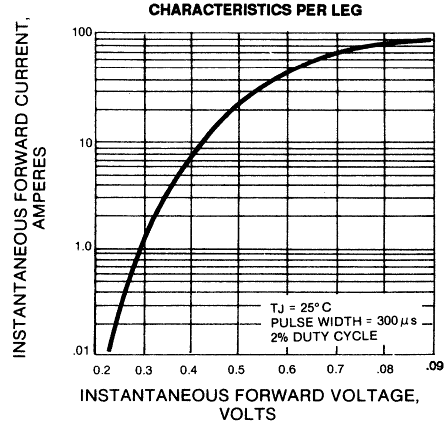
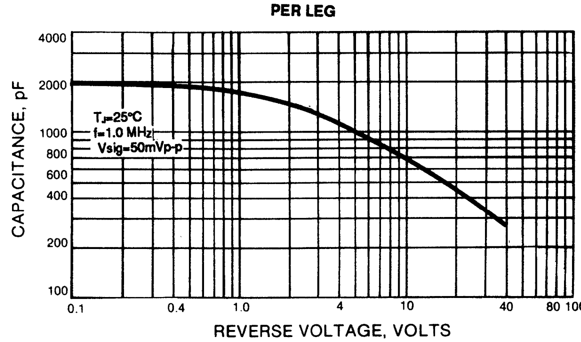


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER LEG



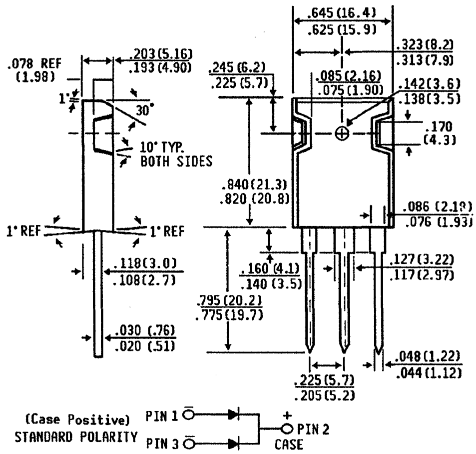
SD241P

SCHOTTKY RECTIFIERS

***VOLTAGE RANGE** - 45 Volts* ***CURRENT** - 30.0 Amperes*

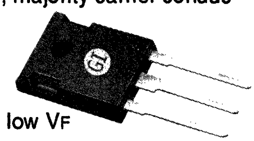
FEATURES

TO-247AD



Dimensions in inches and (millimeters)

- Dual rectifier construction, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction using an epitaxial construction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering guaranteed: 250°C, .17", 4.3mm from case for 10 seconds
- Guardring for transient protection



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Plastic
Terminals: Lead solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.2 ounces, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SD241P*	*UNITS*
Maximum Recurrent Peak Reverse Voltage at T_C= 25°C	V_{RRM}	45	Volts
Maximum Blocking Voltage at T_C=25°C	V_{DC}	45	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	35	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	30.0	Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0	Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RSM}	2.0	Amps
Maximum Instantaneous Forward Voltage per leg at (NOTE 2) I_F=10A, T_C=125°C / I_F=20A, T_C=125°C	V_F	0.47 / 0.60	Volts
Maximum Instantaneous Reverse Current Reverse Voltage per leg at V_R=35V (NOTE 2) T_C=25°C / T_C=125°C	I_R	1.0 / 100.0	mA
Voltage Rate of Change at V_R= 35V	dv/dt	1000	V/μs
Maximum Thermal Resistance (NOTE 1)	$R_{\theta JC}$	1.4	°C
Operating Junction Temperature Range	T_J	-65 to +150	°C
Storage Temperature Range	T_{STG}	-65 to +175	°C

NOTES:
1. Thermal Resistance from Junction of Case per leg.
2. Pulse Test: Pulse Width=300μs, Duty Cycle=2%.
3. 2.0μs Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

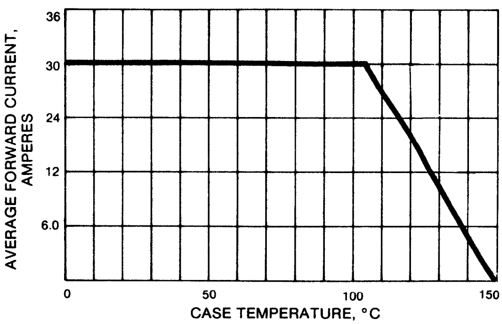


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

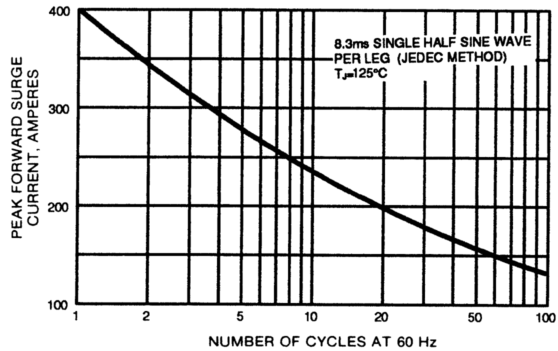


FIG 3-TYPICAL REVERSE CHARACTERISTICS PER LEG

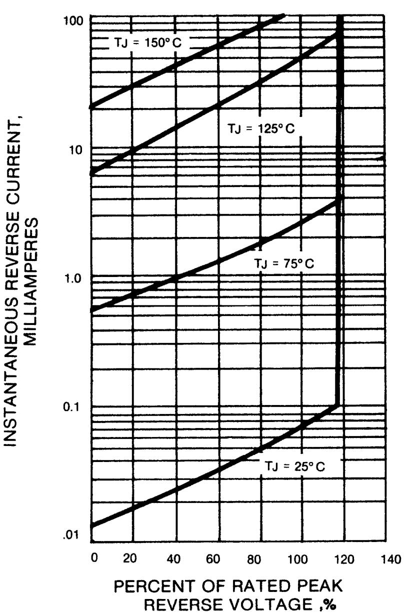


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

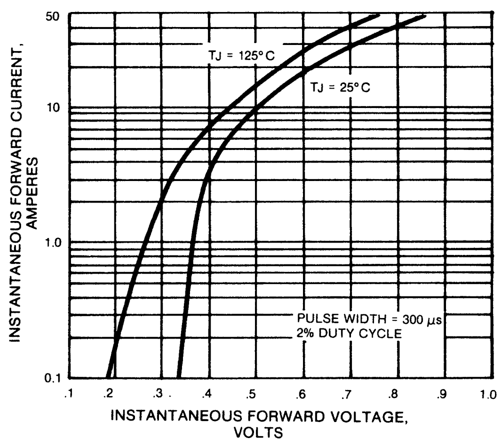
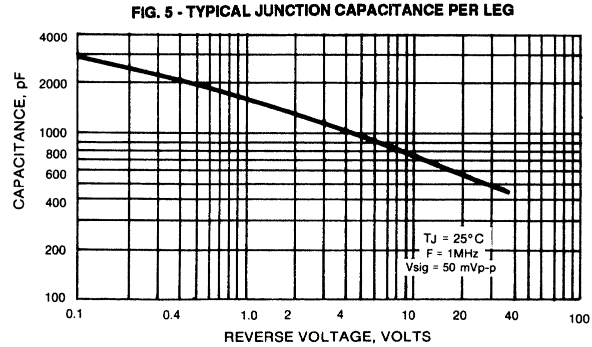


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



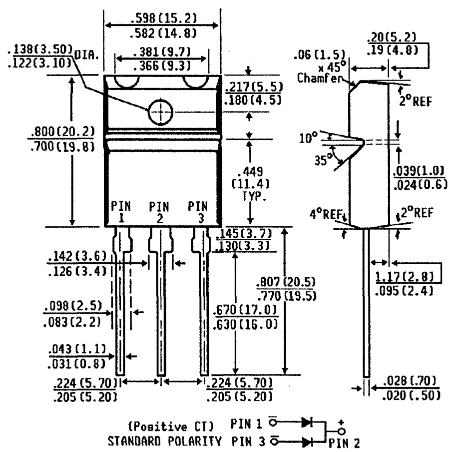
MBRF4035PT AND MBRF4045PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 35 and 45 Volts* ***CURRENT** - 40.0 Amperes*

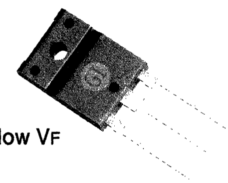
FEATURES

ITO-3P



Dimensions in inches and (millimeters)

- Dual rectifier constrution, positive center-tap
- Isoated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}
- High temperature soldering guaranteed: 250°C/10 seconds .17"(4.3mm) from case



MECHANICAL DATA

Case: ITO-3P Fully Overmolded Plastic
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb. max.
Weight: .47 ounces, 13.2 ounces

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*MBRF4035PT*	*MBRF4045PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Voltage	V_{RWM}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C=120°C	$I_{(AV)}$	40.0		Amps
Peak Repetitive Forward Current per leg (Rated V_R, Square wave, 20 KHz) at T_C=120°C	I_{FRM}	40.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	2.0		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=20A, T_C=25°C (NOTE 2) I_F=20A, T_C=125°C	V_F	0.70 0.60		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage per leg (NOTE 2) T_C=125°C	I_R	10.0 100.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\theta JC}$	1.6		°C/W
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/μs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.
3. 2.0μs Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

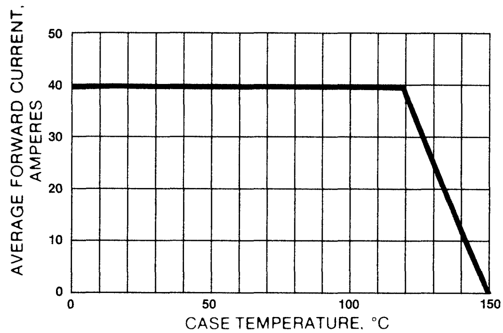


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

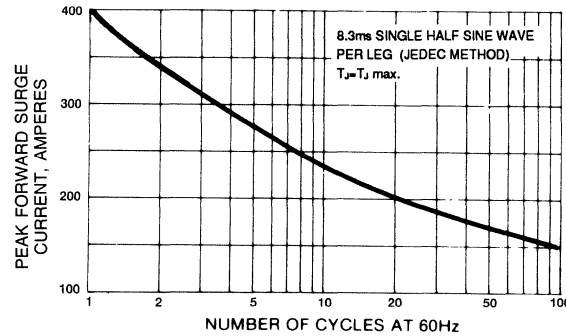


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

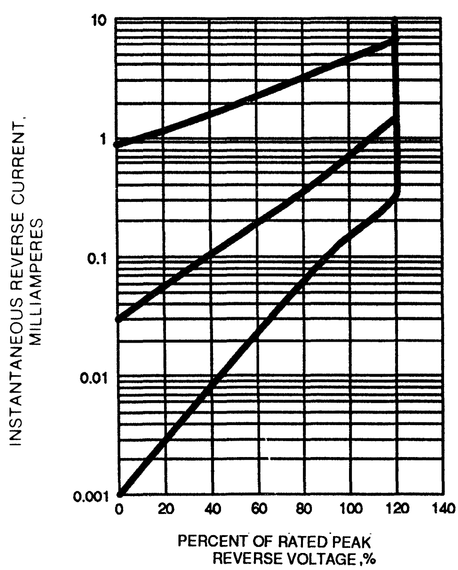


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

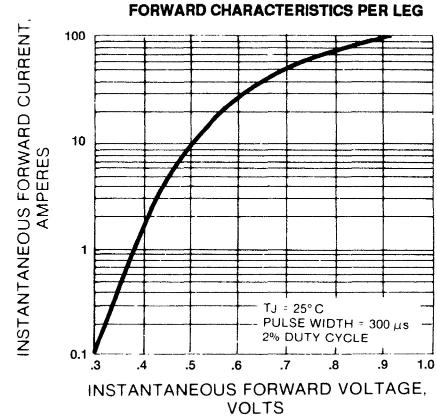
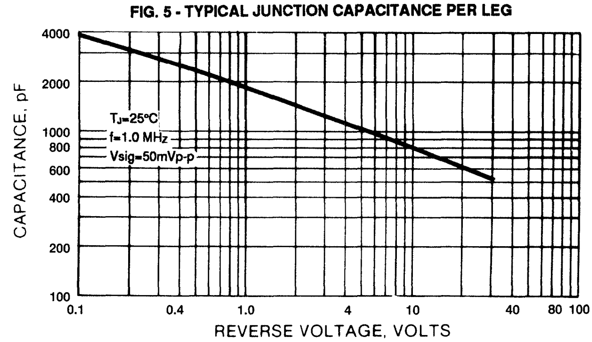


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



General Instrument

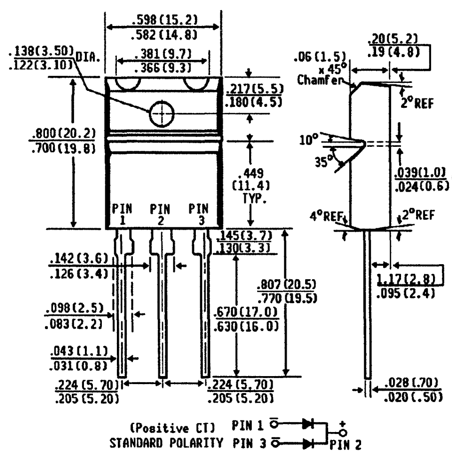
MBRF4050PT AND MBRF4060PT

SCHOTTKY RECTIFIER

VOLTAGE RANGE - 50 and 60 Volts CURRENT - 40.0 Amperes

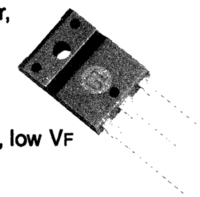
FEATURES

ITO-3P



Dimensions in inches and (millimeters)

- Dual rectifier constrution, positive center-tap
- Isoated plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- Internal Insulation: 1.5k V_{RMS}
- High temperature soldering guaranteed: 250°C/10 seconds .17"(4.3mm) from case



MECHANICAL DATA

Case: ITO-3P Fully Overmolded Plastic
Terminals: Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Mounting Torque: 5 in. - lb. max.
Weight: .47 ounces, 13.2 ounces

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBRF4050PT*	*MBRF4060PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=120°C	$I_{(AV)}$	40.0		Amps
Peak Repetitive Forward Current per leg (Rated V_R, Square wave, 20 KHz) at T_C=120°C	I_{FRM}	40.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage per leg I_F=20A, T_C=25°C (NOTE 2) I_F=20A, T_C=125°C	V_F	0.80 0.70		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage per leg (NOTE 2) T_C=125°C	I_R	10.0 100.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\theta JC}$	1.6		°C/W
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/µs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300µs Pulse Width, 2% Duty Factor.
3. 2.0µs Pulse Width, f=1.0 KHz.

FIG. 1—FORWARD CURRENT DERATING CURVE

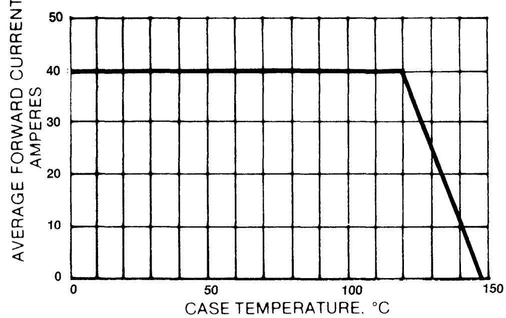


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

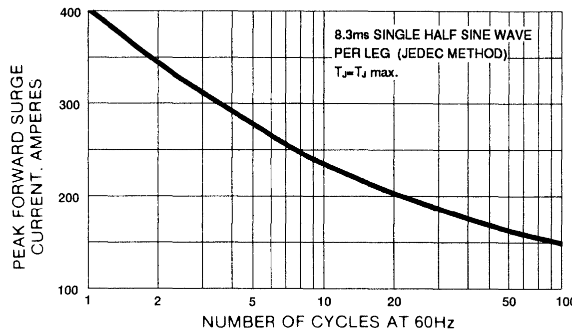


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER LEG

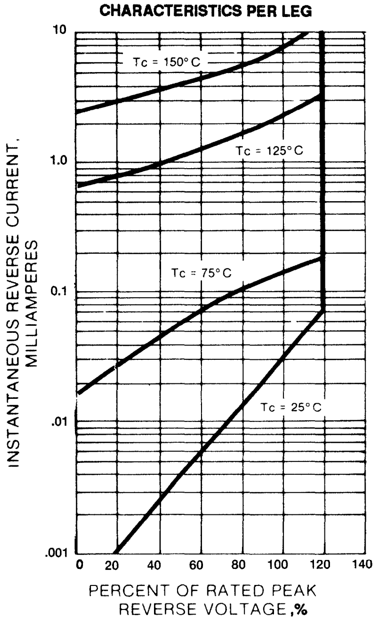


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

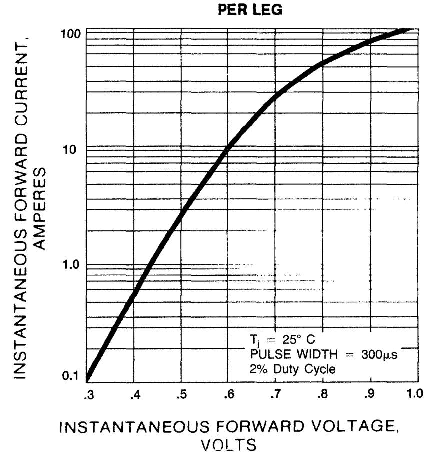
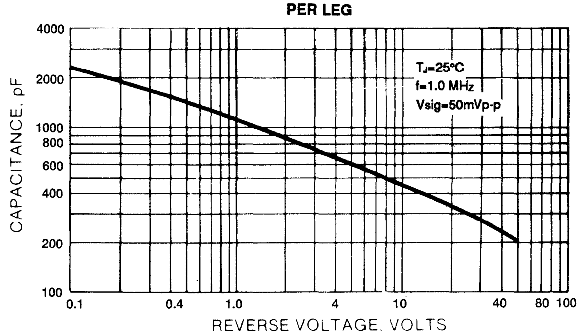


FIG. 5—TYPICAL JUNCTION CAPACITANCE PER LEG

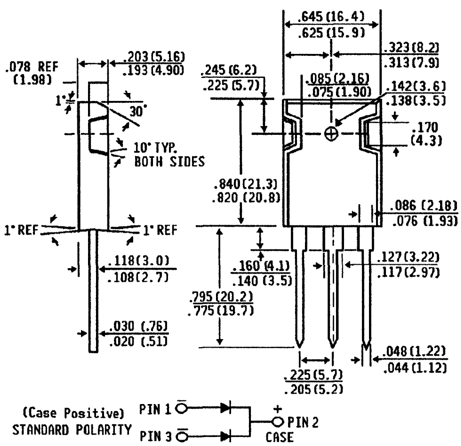


MBR4035PT AND MBR4045PT

SCHOTTKY RECTIFIER

VOLTAGE RANGE - 35 and 45 Volts CURRENT - 40 .0 Amperes

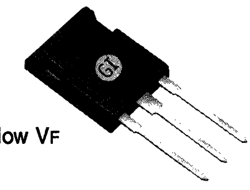
TO-247AD



Dimensions in inches and (millimeters)

FEATURES

- Dual rectifier constrution, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- High temperature soldering guaranteed: 250°C/10 seconds .17"(4.3mm) from case



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Plastic
Terminals: Leads Solderable per MIL-STD-750, Method 2026
Polarity: As marked ***Mounting Position:*** Any
Weight: 0.2 ounces, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*MBR4035PT*	*MBR4045PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	35	45	Volts
Maximum Working Peak Reverse Voltage	V_{RMS}	35	45	Volts
Maximum DC Blocking Voltage	V_{DC}	35	45	Volts
Maximum Average Forward Rectified Current at T_C = 125°C	$I_{(AV)}$	40.0		Amps
Peak Repetitive Forward Current per leg (Rated V_R, Square wave, 20 KHz) at T_C=120°C	I_{FRM}	40.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	2.0		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=20A, T_C=25°C (NOTE 2) I_F=20A, T_C=125°C	V_F	0.70 0.60		Volts
Maximum Instantaneous Reverse Current at T_C=25°C rated DC Blocking Voltage per leg (NOTE 2) T_C=125°C	I_R	10.0 100.0		mA
Typical Thermal Resistance per leg (NOTE 1)	RθJC	1.4		°C/W
Voltage Rate of Change (Rated V_R)	dv/dt	1000		V/μs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.
3. 2.0μs Pulse Width, f=1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

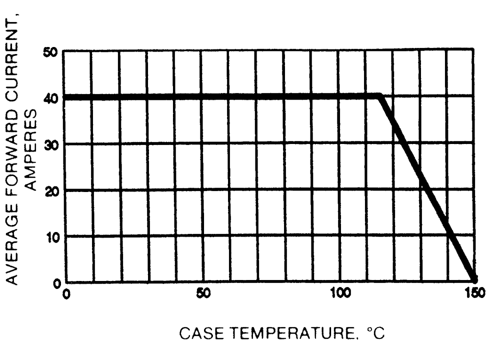


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

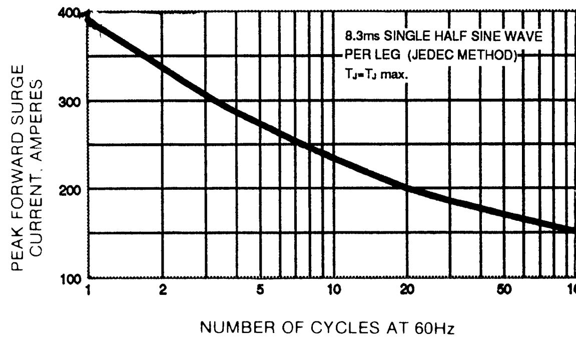


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

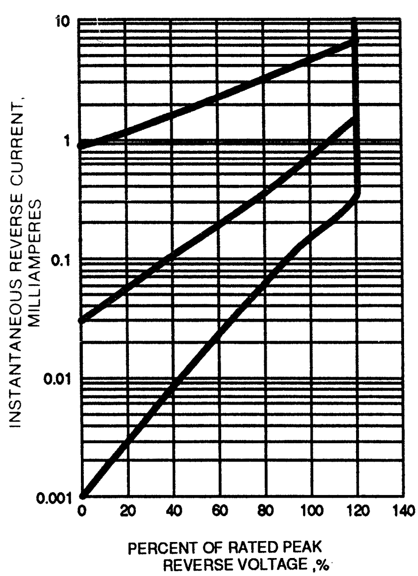


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

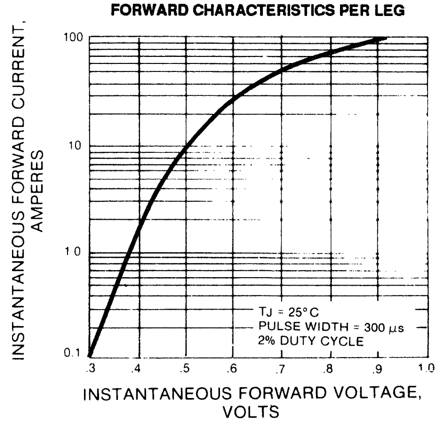
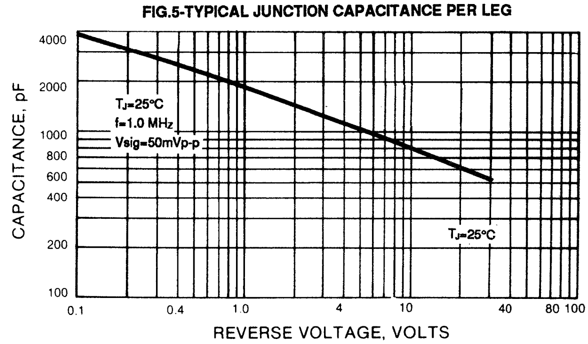


FIG.5-TYPICAL JUNCTION CAPACITANCE PER LEG



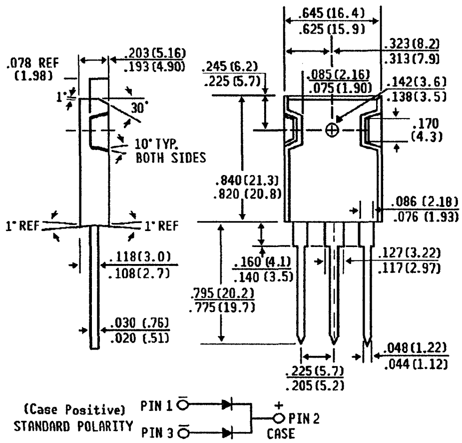
MBR4050PT AND MBR4060PT

SCHOTTKY RECTIFIER

***VOLTAGE RANGE** - 50 and 60 Volts* ***CURRENT** - 40.0 Amperes*

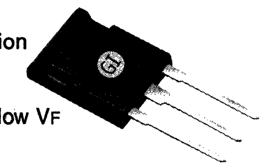
FEATURES

TO-247AD



Dimensions in inches and (millimeters)

- Dual rectifier construciton, positive center-tap
- Plastic package has Underwriters Laboratory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- High temperature soldering guaranteed: 250°C/10 seconds/.17"(4.3mm) from case



MECHANICAL DATA

Case: JEDEC TO-247AD Molded Plastic

Terminals: Leads Solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Weight: 0.2 ounces, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*MBR4050PT*	*MBR4060PT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	60	Volts
Maximum Working Peak Reverse Voltage	V_{RWM}	50	60	Volts
Maximum DC Blocking Voltage	V_{DC}	50	60	Volts
Maximum Average Forward Rectified Current at T_C=120°C	$I_{(AV)}$	40.0		Amps
Peak Repetitive Forward Current per leg (Rated V_R, Square wave, 20 KHz) at T_C=120°C	I_{FRM}	40.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0		Amps
Peak Repetitive Reverse Surge Current (NOTE 3)	I_{RRM}	1.0		Amps
Maximum Instantaneous Forward Voltage per leg at I_F=20A, T_C=25°C (NOTE 2) I_F=20A, T_C=125°C	V_F	0.80 0.70		Volts
Maximum Instantaneous Reverse Current at T_C=25°C Rated DC Blocking Voltage per leg (NOTE 2) T_C=125°C	I_R	10.0 100.0		mA
Typical Thermal Resistance (NOTE 1)	$R_{\Theta JC}$	1.4		°C/W
Voltage Rate of Change at (Rated V_R)	dv/dt	1000		V/μs
Operating Junction Temperature Range	T_J	-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +175		°C

NOTES:
1. Thermal Resistance from Junction to Case per leg.
2. Pulse Test: 300μs Pulse Width, 2% Duty Factor.
3. 2.0μs Pulse Width, f=1.0 KHz.

FIG. 1 — FORWARD CURRENT DERATING CURVE

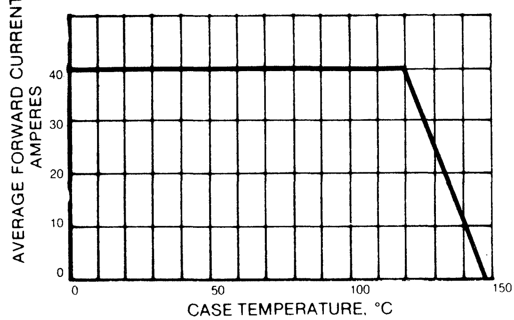


FIG. 3— TYPICAL REVERSE CHARACTERISTICS PER LEG

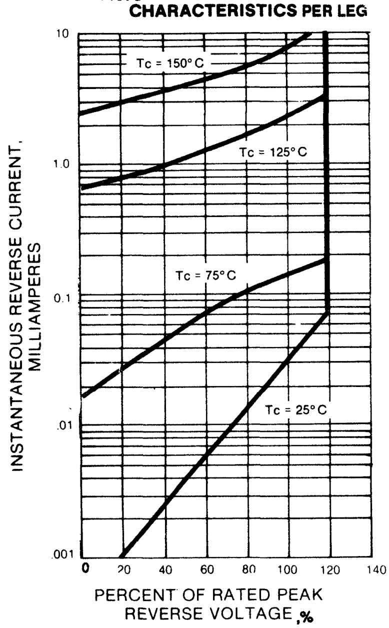


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

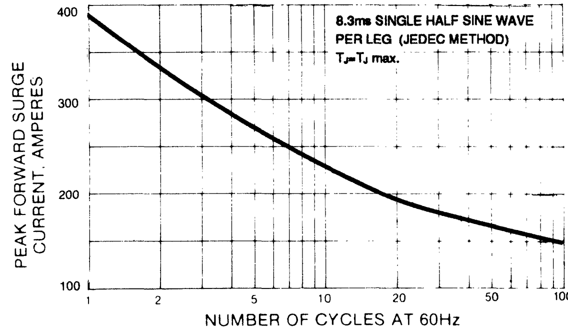


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

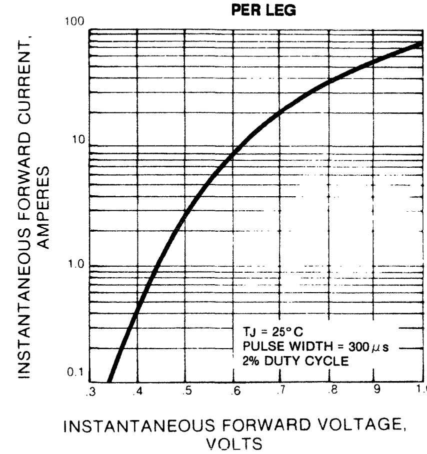
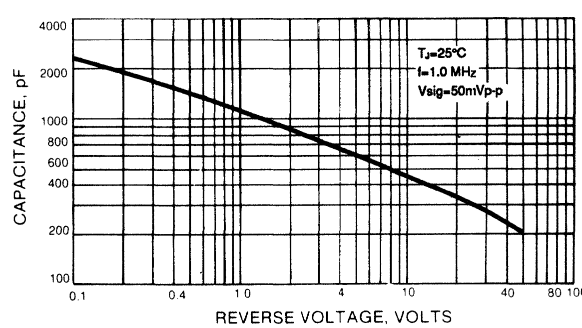


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER LEG



FAST EFFICIENT RECITFIERS

1.0 AMPERE TO 30.0 AMPERES

SEE NEW ISOLATED PACKAGES

General Instrument

LOW TO MEDIUM CURRENT AXIAL FAST EPITAXIAL RECTIFIERS

TYPE	UG06A thru UG06D	UG1A thru UG1D	FE1A thru FE1D	GI1001 thru GI1004	BYV26D thru BYV26E	UG2A thru UG2D	FE2A thru FE2D	BYV27-50 thru BYV27-200
PACKAGE	MPG06	DO-204AL	DO-204AP	DO-204AP	DO204AC	DO204AD	DO-204AP	DO-204AP
IO(A)	0.6	1.0	1.0	1.0	1.0	2.0	2.0	2.0
VR=50(V)	UG06A	UG1A	FE1A	GI1001		UG2A	FE2A	BYV27-50
VR=100(V)	UG06B	UG1B	FE1B	GI1002		UG2B	FE2B	BYV27-100
VR=150(V)	UG06C	UG1C	FE1C	GI1003		UG2C	FE2C	BYV27-150
VR=200(V)	UG06D	UG1D	FE1D	GI1004		UG2D	FE2D	BYV27-200
VR=300(V)								
VR=400(V)								
VR=500(V)								
VR=600(V)								
VR=800(V)					BYV26D			
VR=1000(V)					BYV26E			
trr (ns)	15	15	35	25/35	75	15	35	25

TYPE	GI1101 thru GI1104	FE3A thru FE3D	BYV28-50 thru BYV28-200	UG4A thru UG4D	FE5A thru FE5D	FE6A thru FE6D	GI1301 thru GI1304	SUF15G thru SUF15J	SUF30G thru SUF30J
PACKAGE	DO-204AP	G4	G4	DO-201AD	G4	G4	G4	DO201AD	P600
IO(A)	2.5	3.0	3.5	4.0	5.0	6.0	6.0	1.5	3.0
VR=50(V)	GI1101	FE3A	BYV28-50	UG4A	FE5A	FE6A	GI1301		
VR=100(V)	GI1102	FE3B	BYV28-100	UG4B	FE5B	FE6B	GI1302		
VR=150(V)	GI1103	FE3C	BYV28-150	UG4C	FE5C	FE6C	GI1303		
VR=200(V)	GI1104	FE3D	BYV28-200	UG4D	FE5D	FE6D	GI1304		
VR=300(V)									
VR=400(V)								SUF15G	SUF30G
VR=500(V)									
VR=600(V)								SUF15J	SUF30J
VR=800(V)									
VR=1000(V)									
trr (ns)	25/35	35	30	20	35	35	30/50	35	15

LOW TO MEDIUM CURRENT AXIAL FAST EFFICIENT RECTIFIERS

(cont.)

TYPE	EGP10A thru EGP10D	EGP20A thru EGP20D	EGP30A thru EGP30D	EGP50A thru EGP50D	UF4001 thru UF4007	UF5400 thru UF5408
PACKAGE	DO204AL	DO204AC	GP20	GP20	DO204AL	DO-201AD
IO(A)	1.0	2.0	3.0	5.0	1.0	3.0
VR=50(V)	EGP10A	EGP20A	EGP30A	EGP50A	UF4001	UF5400
VR=100(V)	EGP10B	EGP20B	EGP30B	EGP50B	UF4002	UF5401
UV=150(V)	EGP10C	EGP20C	EGP30C	EGP50C		
VR=200(V)	EGP10D	EGP20D	EGP30D	EGP50D	UF4003	UF5402
VR=300(V)	EGP10F	EGP20F	EGP30F	EGP50F		UF5403
VR=400(V)	EGP10G	EGP20G	EGP30G	EGP50G	UF4004	UF5404
UV=500(V)						UF5405
VR=600(V)					UF4005	UF5406
VR=800(V)					UF4006	UF5407
VR=1000(V)					UF4007	UF5408
trr (ns)	50	50	50	50	50/75	50/75

MEDIUM TO HIGH CURRENT FAST EPITAXIAL RECTIFIERS

SINGLE RECTIFIERS

TYPE	UGF8AT thru UGF8T	UG8AT thru UG8DT	FESF8AT thru FESF8JT	FES8AT thru FES8JT	GI1401 thru GI1404	BYW29-50 thru BYW29-200	FESF16AT thru FESF16JT	FES16AT thru FES16AT
PACKAGE	IT0-220	TO-220AC	ITO-220	TO-220AC	TO-220AC	TO-220AC	ITO-220	TO-220AC
IO(A)	8.0	8.0	8.0	8.0	8.0	8.0	16	16
VR=50(V)	UGF8AT	UG8AT	FESF8AT	FES8AT	GI1401	BYW29-50	FESF16AT	FES16AT
VR=100(V)	UGF8BT	UG8BT	FESF8BT	FES8BT	GI1402	BYW29-100	FESF16BT	FES16BT
VR=150(V)	UGF8CT	UG8CT	FESF8CT	FES8CT	GI1403	BYW29-150	FESF16CT	FES16CT
VR=200(V)	UGF8DT	UG8DT	FESF8DT	FES8DT	GI1404	BYW29-200	FESF16DT	FES16DT
VR=300(V)			FESF8FT	FES8FT			FESF16FT	FES16FT
VR=400(V)			FESF8GT	FES8GT			FESF16GT	FES16GT
VR=500(V)			FESF8HT	FES8HT			FESF16HT	FES16HT
VR=600(V)			FESF8JT	FES8JT			FESF16JT	FES16JT
trr (ns)	20	20	35/50	35/50	35	25	35/50	35/50

MEDIUM TO HIGH CURRENT FAST EPITAXIAL RECTIFIERS

DUAL RECTIFIERS

TYPE	FEPF6AT hru FEPF6DT	FEP6AT thru FEP6DT	FEPF16AT thru FEPF16JT	FEP16AT thru FEP16AT	GI2401 thru GI2404	UGF18ACT thru UGF18DCT	UG18ACT thru UG18DCT	BYV32-50 thru BYV32-200	UGF30APT thru UGF30DPT	UG30APT thru UG30DPT	FEPF30AP thru FEPF30JP	FEP30AP thru FEP30JP
PACKAGE	ITO-220CT	TO-220AB	ITO-220	ITO-220CT	TO-220AB	ITO-220CT	TO-220AB	TO-220AB	ITO-3P	TO-247AD	ITO-3P	TO-247AD
IO(A)	6	6	16	16	16	18	18	18	30	30	30	30
VR=50(V)	FEPF6AT	FEP6AT	FEPF16AT	FEP16AT	GI2401	UGF18ACT	UG18ACT	BYV32-50	UGF30APT	UG30APT	FEPF30AP	FEP30AP
VR=100(V)	FEPF6BT	FEP6BT	FEPF16BT	FEP16BT	GI2402	UGF18BCT	UG18BCT	BYV32-100	UGF30BPT	UG30BPT	FEPF30BP	FEP30BP
VR=150(V)	FEPF6CT	FEP6CT	FEPF16CT	FEP16CT	GI2403	UGF18CCT	UG18CCT	BYV32-150	UGF30CPT	UG30CPT	FEPF30CP	FEP30CP
VR=200(V)	FEPF6DT	FEP6DT	FEPF16DT	FEP16DT	GI2404	UGF18DCT	UG18DCT	BYV32-200	UGF30DPT	UG30DPT	FEPF30DP	FEP30DP
VR=300(V)			FEPF16FT	FEP16FT							FEPF30FP	FEP30FP
VR=400(V)			FEPF16GT	FEP16GT							FEPF30GP	FEP30GP
VR=500(V)			FEPF16HT	FEP16HT							FEPF30HP	FEP30HP
VR=600(V)			FEPF16JT	FEP16HT							FEPF30JP	FEP30JP
trr (ns)	35	35	35/50	35/50	35	20	20	25	20	20	35/50	35/50

GLASS PASSIVATED FAST EPITAXIAL RECTIFIERS

1.0 AMPERE TO 6.0 AMPERES

General Instrument

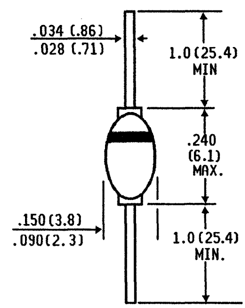
FE1A THRU FE1D

MINIATURE GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AP

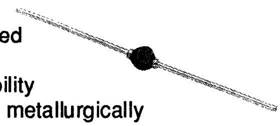


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low Leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Unitized glass hemetically sealed

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.002 ounce, 0.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

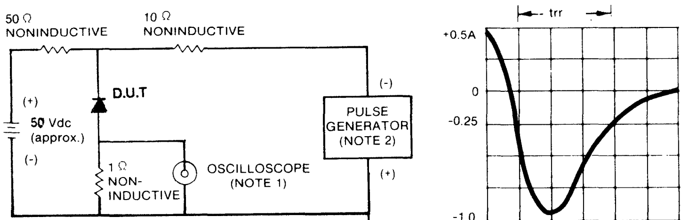
Ratings at 25°°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FE1A	FE1B	FE1C	FE1D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$	1.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	30.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	2.0 50.0				μA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	35.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	45.0				pf
Typical Thermal Resistance (NOTE 3)	RΘJA RΘJL	65.0 20.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
3. Thermal Resistance from Junction to Ambient and/or Lead, .375" (9.5mm) Lead Lengths mounted on P.C. board with .47in.^{2} (12mm^2) copper pads.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG 2-MAXIMUM FORWARD CURRENT DERATING

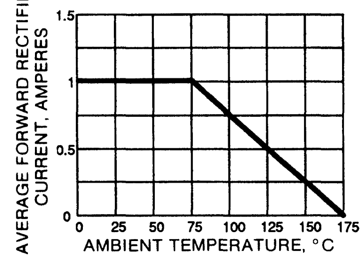


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

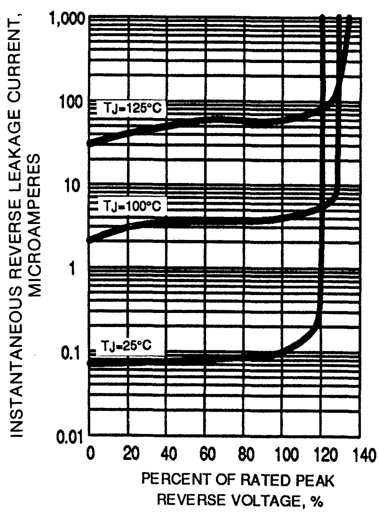


FIG 4-TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

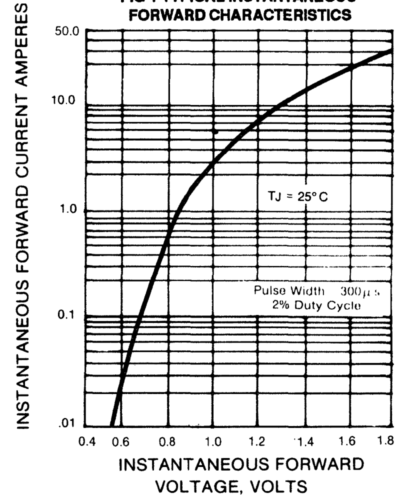


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

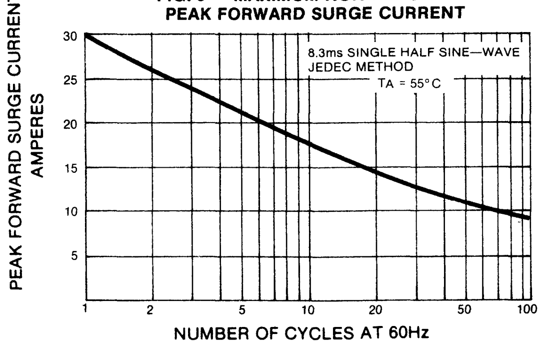
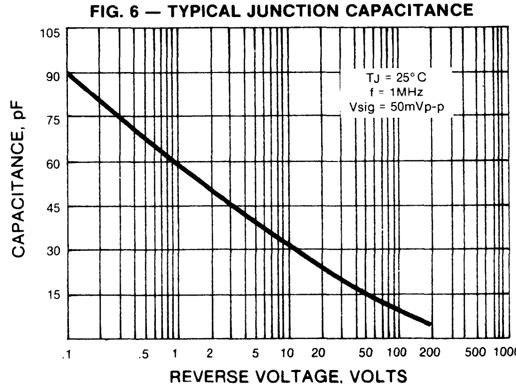


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



GI1001 THRU GI1004

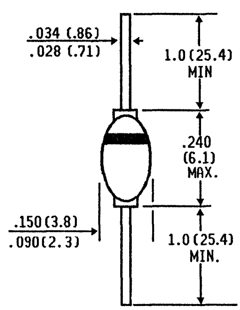
MINIATURE GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 2.5 Amperes*

FEATURES

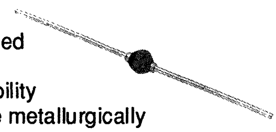
PATENTED*

DO-204AP



Dimensions in inches and (millimeters)

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low Leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP Unitized glass hemetically sealed

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.02 ounce, 0.6 gram

** Brazed-Lead assembly is covered by Patent No. 3,930,306 of 1976*

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

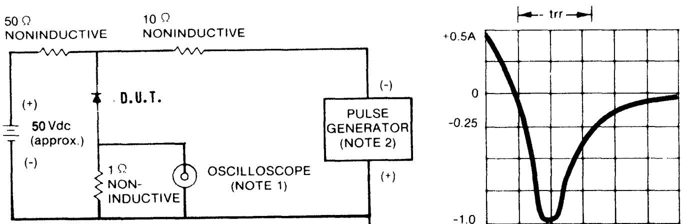
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	GI1001	GI1002	GI1003	GI1004	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L= 75°C	$I_{(AV)}$	1.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	0.975				Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	2.0 50.0				µA
Maximum Reverse Recovery Time T_J=25°C (NOTE 1)	T_{RR}	25.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	45.0				pf
Typical Thermal Resistance (NOTE 3,4)	$R\Theta JA$ $R\Theta JL$	65.0 20.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Lead ,.375" (9.5mm) Lead Lengths, both leads attached to heat sinks.
4. Thermal Resistance from Junction to Ambient, 375"(9.5mm) Lead Lengths mounted on P.C. board with ,47in.^{2} (12mm) copper pads

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG. 2 - MAXIMUM FORWARD CURRENT DERATING CURVE

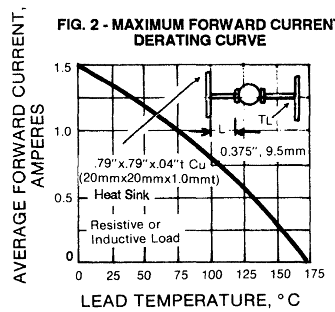


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

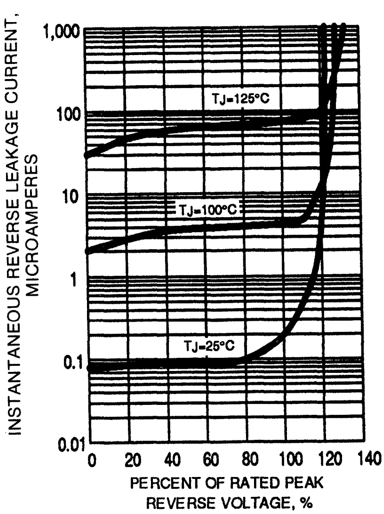


FIG. 4 — FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

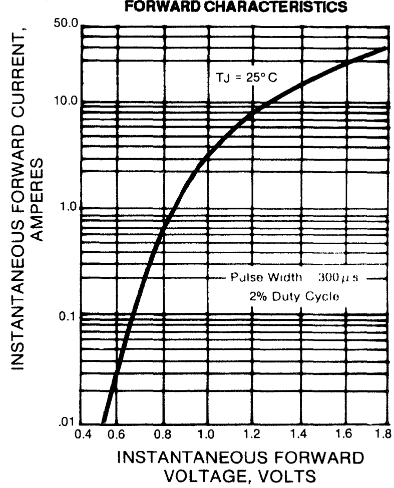


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

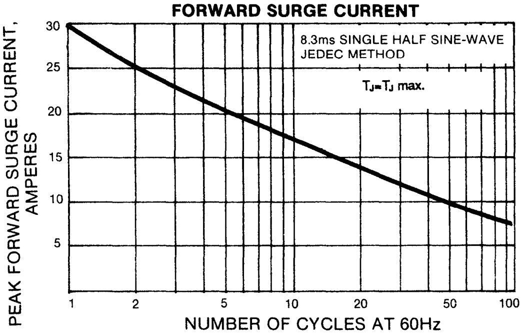
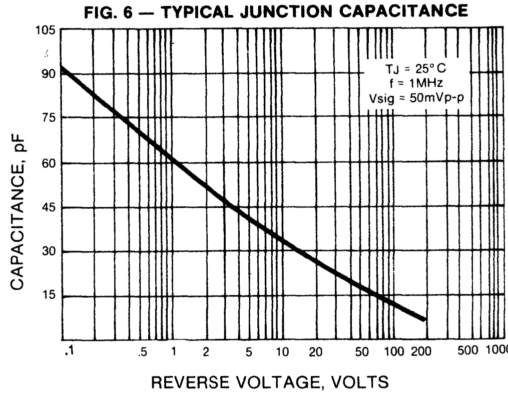


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



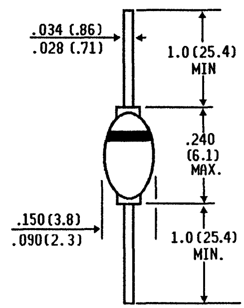
BYV26D AND BYV26E

MINIATURE GLASS PASSIVATED ULTRA FAST EPITAXIAL RECTIFIER

***Voltage** - 800 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AP

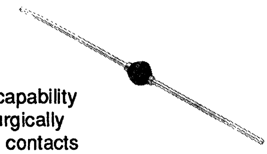


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low Leakage
- High surge capability
- Specified reverse surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.02 ounce, 0.56 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	BVY26D	BYV26E	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	800	1000	Volts
Minimum Avalanche Breakdown Voltage at 100 µA	V_{BR}	900	1100	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths See Fig. 1	$I_{(AV)}$	1.0		Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load T_J=T_J max.	I_{FSM}	30.0		Amps
Maximum Instantaneous Forward Voltage at 1.0A T_A=25°C T_J=175°C	V_F	 2.50 1.30		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_J=165°C	I_R	5.0 150.0		µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	75.0		ns
Non Repetitive Peak Reverse Energy (NOTE 4)	E_{RSM}	10.0		mj
Typical Junction Capacitance (NOTE 2)	C_J	15.0		pf
Typical Thermal Resistance (NOTE 3)	RΘJA RΘJL	70.0 16.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175		°C

NOTES:
1. Reverse Recovery Test Conditions: I_F =0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
3. Thermal Resistance from Junction to Ambient and/or Leads, .375" (9.5mm) Lead Lengths, mounted on P.C. Board with .47in^2 (12mm^2) copper pads.
4. Peak Reverse Energy measured at I_R=400mA, T_J=T_J max. on inductivve load.

FIG. 1 - MAXIMUM FORWARD CURRENT DERATING CURVE

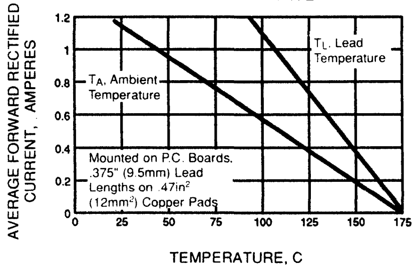


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

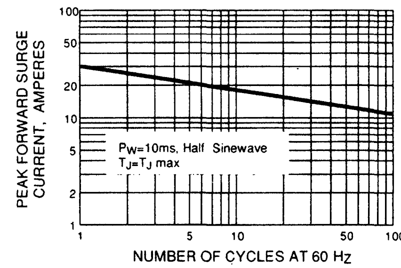


FIG. 3 - TYPICAL REVERSE LEAKAGE CHARACTERISTICS

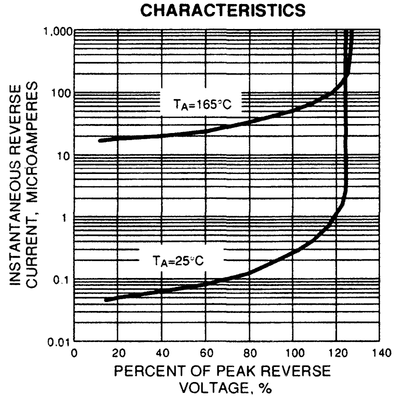


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS

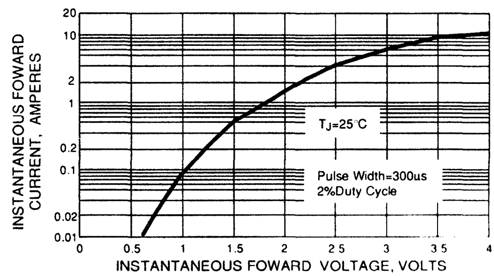


FIG. 5 - TYPICAL TRANSIENT THERMAL

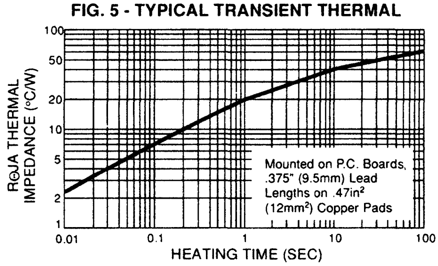
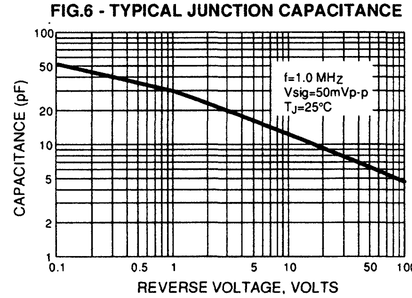


FIG.6 - TYPICAL JUNCTION CAPACITANCE



FE2A THRU FE2D

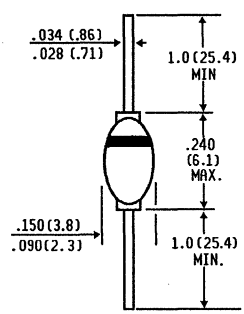
MINIATURE GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 2.0 Amperes*

FEATURES

PATENTED*

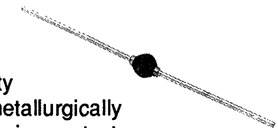
DO-204AP



Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP Unitized glass hemetically sealed

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.002 ounce, 0.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

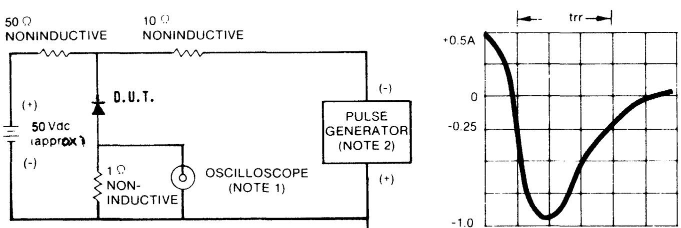
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FE2A	FE2B	FE2C	FE2D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=75°C	$I_{(AV)}$	2.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A= 55°C	I_{FSM}	50.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	2.0 50.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C (NOTE 1)	T_{RR}	35.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	45.0				pf
Typical Thermal Resistance (NOTE 3)	RΘJA	60.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient, .375" (9.5mm) Lead Lengths, mounted on P.C. Board with .47in.^{2}(12mm^2) copper pads.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

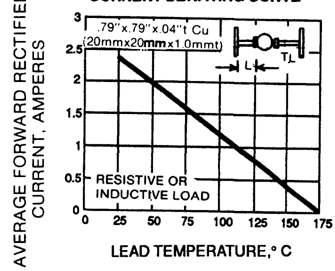


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

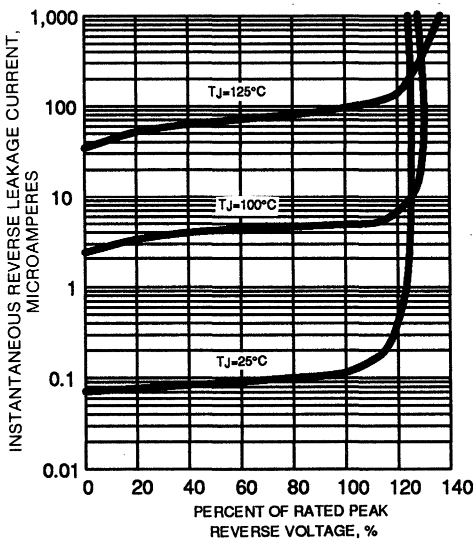


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

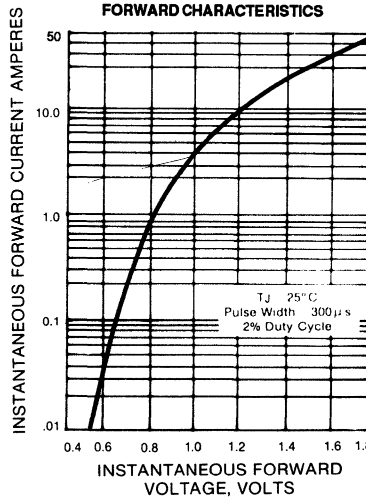


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

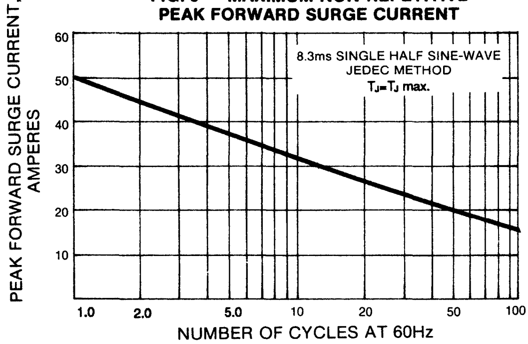
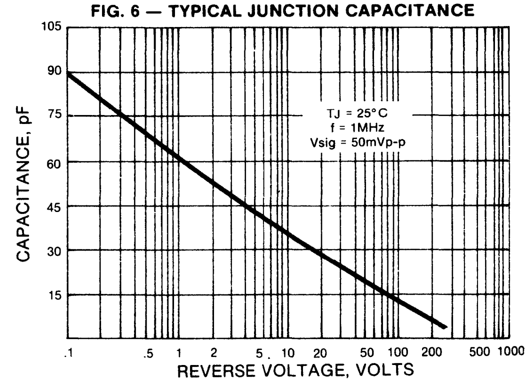


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



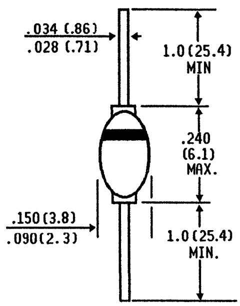
BYV27-50 THRU BYV27-200

MINIATURE GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 2.0 Amperes*

PATENTED*

DO-204AP

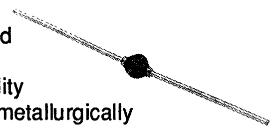


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP Unitized glass hermetically sealed

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.02 ounce, 0.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

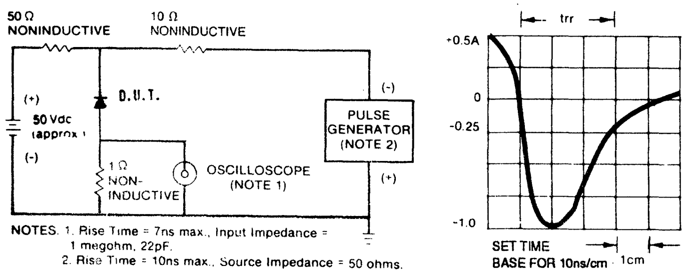
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	BYV27-50	BYV27-100	BYV27-150	BYV27-200	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Minimum Reverse Breakdown Voltage at 100μA	V_{BR}	55	110	165	220	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=85°C	$I_{(AV)}$	2.0				Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load T_A=175°C	I_{FSM}	50.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A T_J=175°C T_J=25°C	V_F	0.88 1.07				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C T_A=165°C	I_R	1.0 150.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	25.0				nS
Typical Junction Capacitance (NOTE 2)	C_J	45.0				pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JL$	20.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +175				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Lead at .375" (9.5mm) Lead Lengths, both leads attached to heatsinks.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES. 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

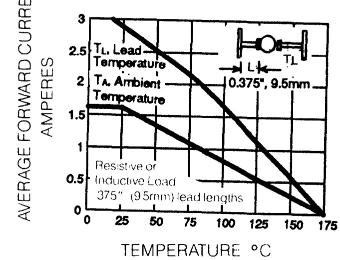


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

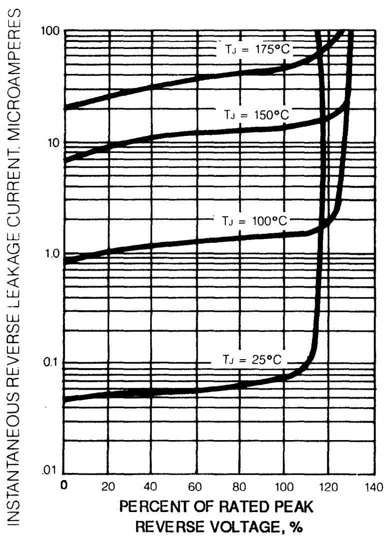


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

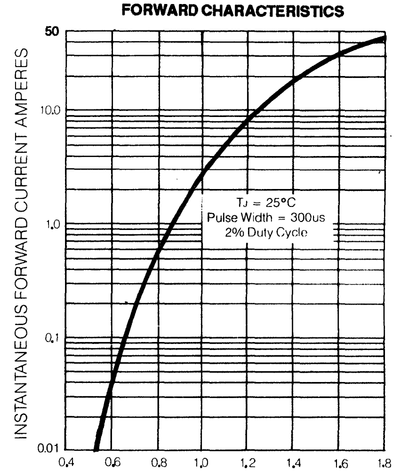


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

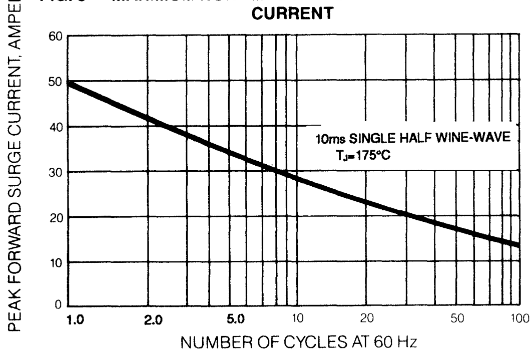
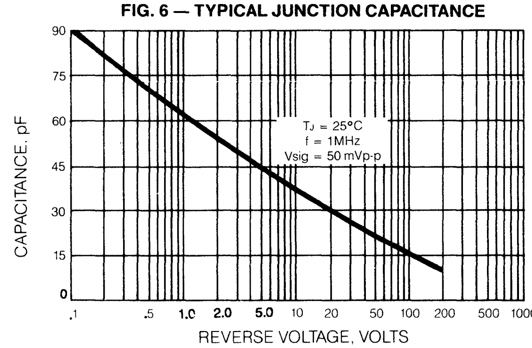


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



GI1101 THRU GI1104

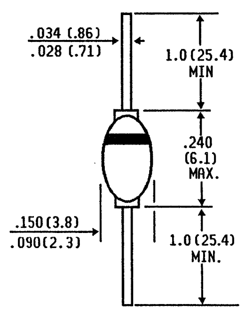
GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 2.5 Amperes*

FEATURES

PATENTED*

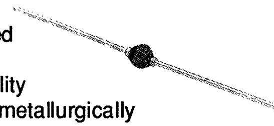
DO-204AP



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP Unitized glass hemetically sealed

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.02 ounce, 0.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

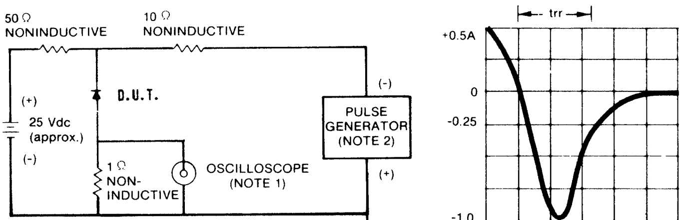
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	GI1101	GI1102	GI1103	GI1104	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths. See Fig. 2	$I_{(AV)}$		2.5		(NOTE 3) 2.0	Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}		50.0			Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F		.975		(NOTE 4) 1.25	Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R		2.0 50.0		10.0 200.0	µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}		25.0		50.0	ns
Typical Junction Capacitance (NOTE 2)	C_J		45.0			pf
Typical Thermal Resistance (NOTE 5)	$R_{\theta JL}$		20.0			°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$		-65 to 175		-65 to +150	°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. T_L= 55°C, .375" (9.5mm) Lead Length.
4. IFM=1.0A
5. Thermal Resistance from Junction to Lead at .375" (9.5mm) Lead Lengths, both leads attached to heat sinks.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

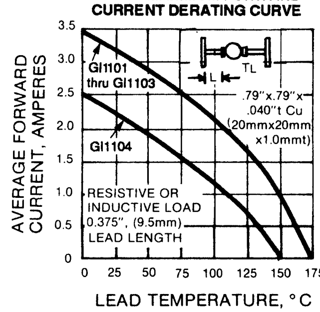


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

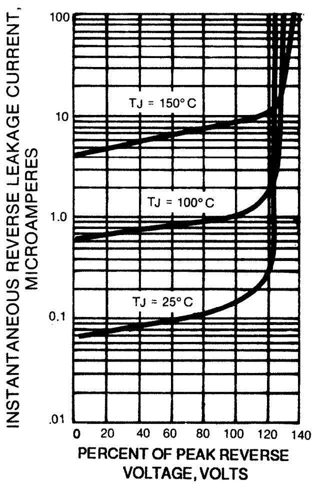


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

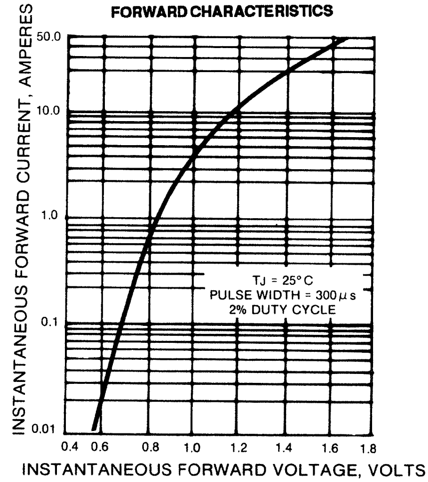


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

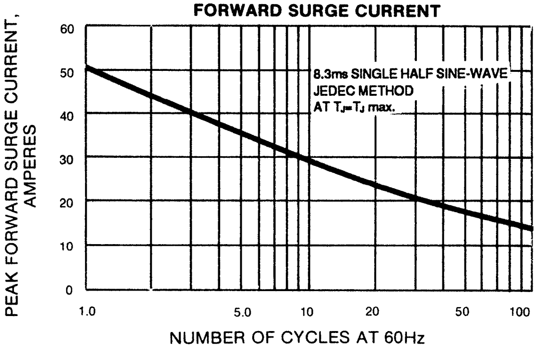
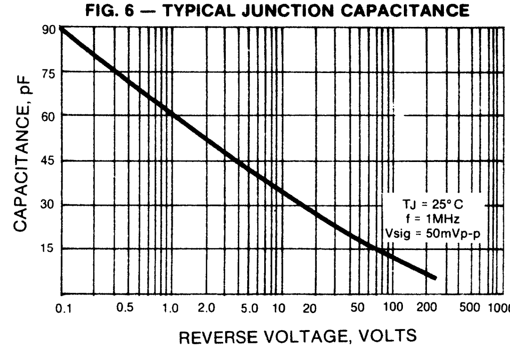


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



General Instrument

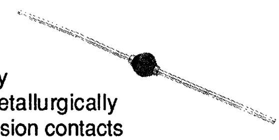
FE3A THRU FE3D

GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 3.0 Amperes*

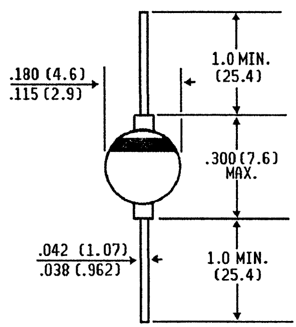
FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



PATENTED*

G4



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

MECHANICAL DATA

Case: Unitized glass hermetically sealed

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.037 ounce, 1.04 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

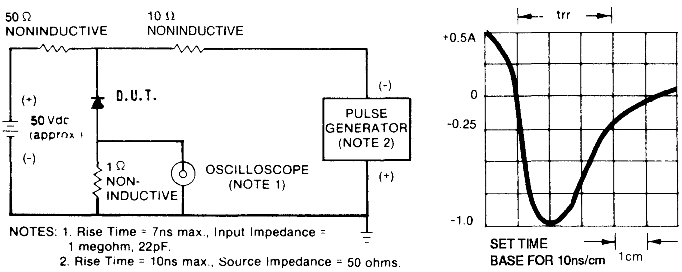
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FE3A	FE3B	FE3C	FE3D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	3.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	125.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A	VF	0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	35.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	100.0				pf
Typical Thermal Resistance (NOTE 3)	RΘJA RΘJL	55.0 20.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +175				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient, and/or Leads, .375" (9.5mm) Lead Lengths mounted on P.C. board.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

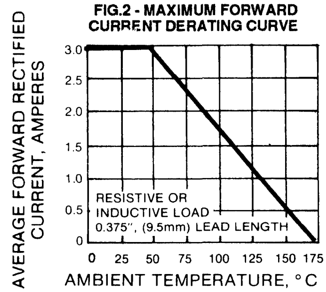


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

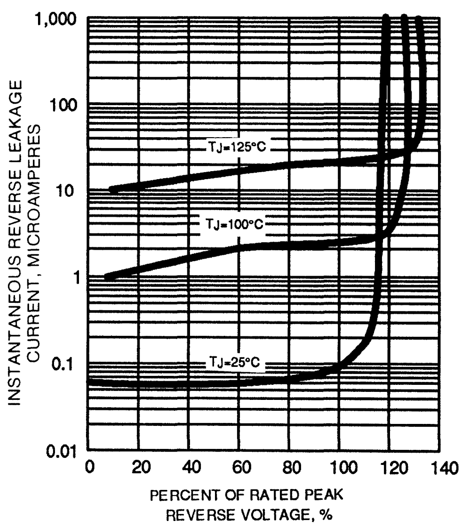


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS

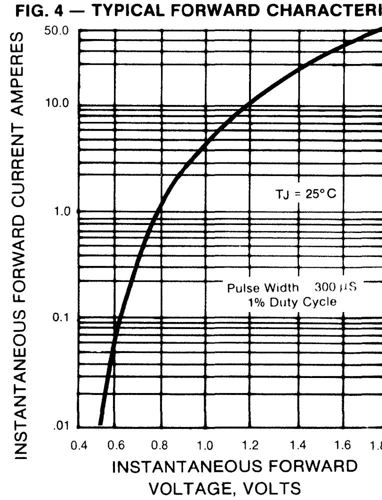


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

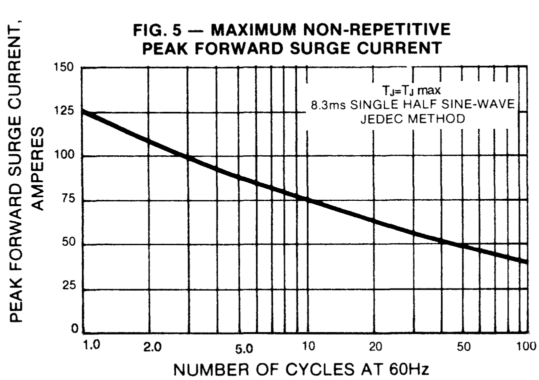
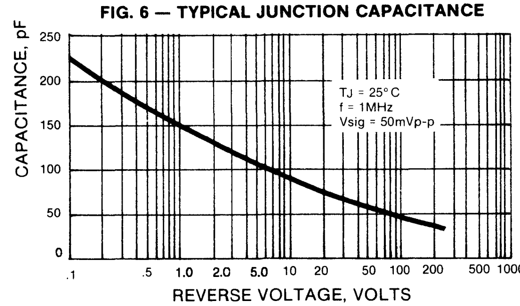


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



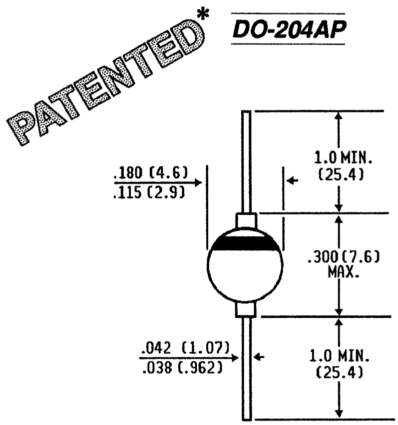
BYV28-50 THRU BYV28-200

GLASS PASSIVATED FAST EPITAXIAL RECTIFIERS

***Voltage** - 50 to 200 Volts* ***Current** - 3.5 Amperes*

FEATURES

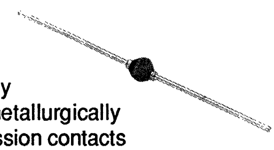
DO-204AP



Dimensions in inches
and
(millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Unitized glass hemetically sealed
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.037 ounce, 7.4 gram

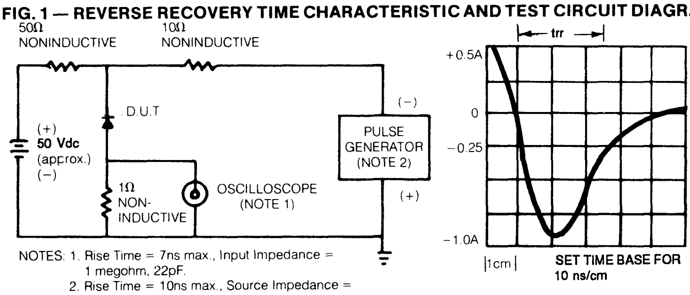
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	BYV28-50	BYV28-100	BYV28-150	BYV28-200	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Minimum Reverse Breakdown Voltage at 100µA	V_{BR}	55	110	165	220	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=85°C	$I_{(AV)}$	3.5				Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=175°C	I_{FSM}	90.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A T_J=175°C / T_J=25°C	V_F	0.89 / 1.1				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=165°C	I_R	1.0 / 150.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	30.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	100.0				pf
Typical Thermal Resistance (NOTE 3,4)	$R\Theta JA$ / $R\Theta JL$	55.0 / 20.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Lead at .375" (9.5mm) Lead Lengths, both leads attached to heatsinks.
4. Thermal Resistance from Junction to Ambient, .375" (9.5mm) Lead Lengths mounted on P.C. Board.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG. 2 - MAXIMUM AVERAGE FORWARD CURRENT DERATING CURVE

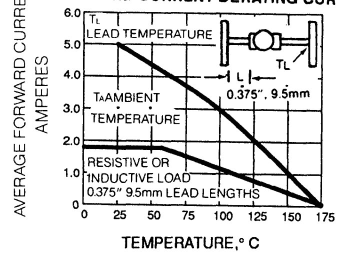


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

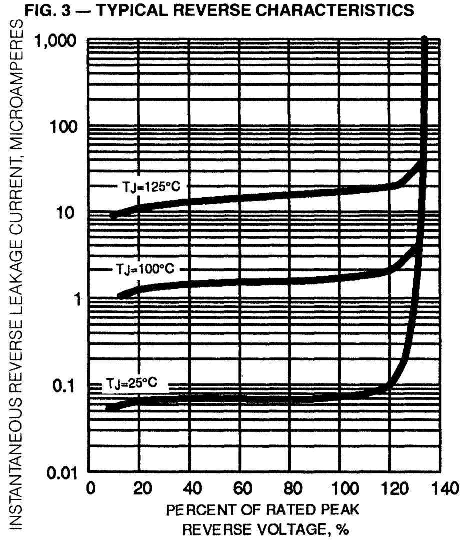


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

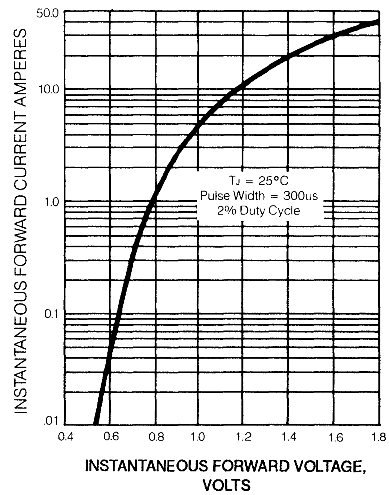


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

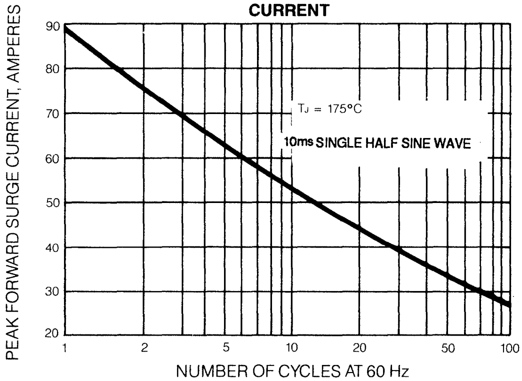
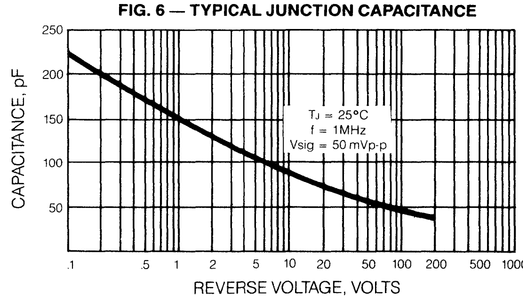


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



General Instrument

FE5A THRU FE5D

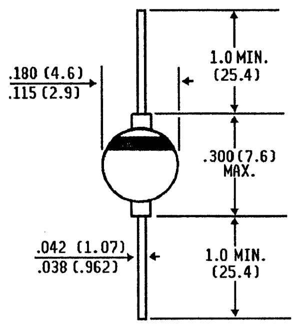
GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 5.0 Amperes*

FEATURES

PATENTED *

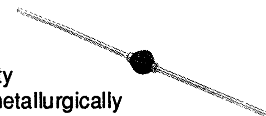
DO-204AP



Dimensions in inches and (millimeters)

**Brazed-lead assenmbly to Patent No. 3,930,306 of 1976*

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Unitized glass hemetically sealed
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.037 ounce, 1.04 gram

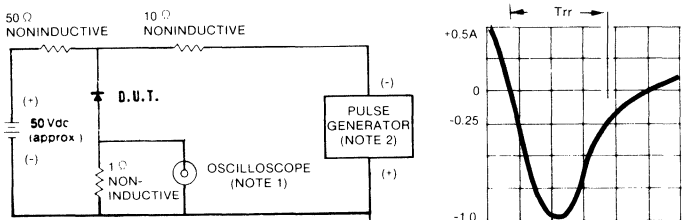
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FE5A	FE5B	FE5C	FE5D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=55°C	$I_{(AV)}$	5.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	135.0				Amps
Maximum Instantaneous Forward Voltage at 5.0A	V_F	0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	35.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	100.0				pf
Typical Thermal Resistance (NOTE 3,4)	$R\Theta JA$ $R\Theta JL$	55.0 20.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Lead, .375" (9.5mm) Lead Lengths, both leads attached to heatsinks.
4. Thermal Resistance from Junction to Ambient, .375"(9.5) Lead Lengths mounted on P.C.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time ≤ 7ns max., Input Impedance ≥ 1 megohm, 22pF.
2. Rise Time ≤ 10ns max., Source Impedance = 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

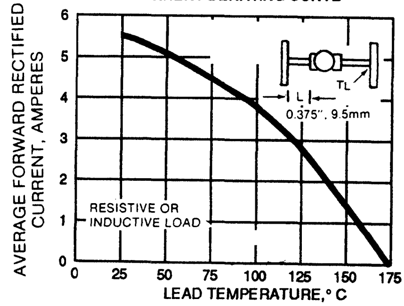


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

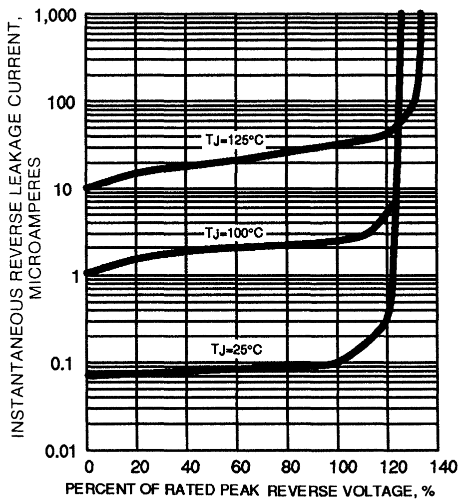


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

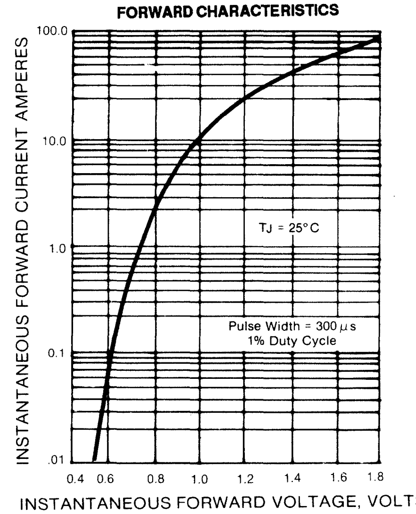


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

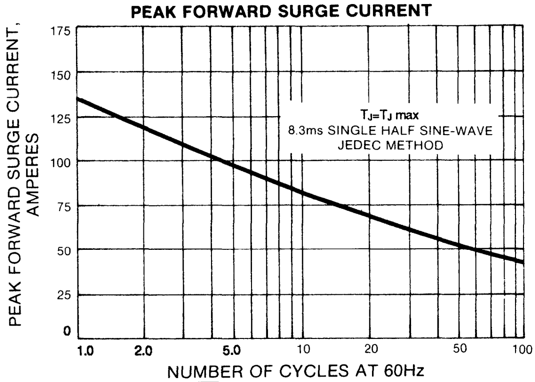
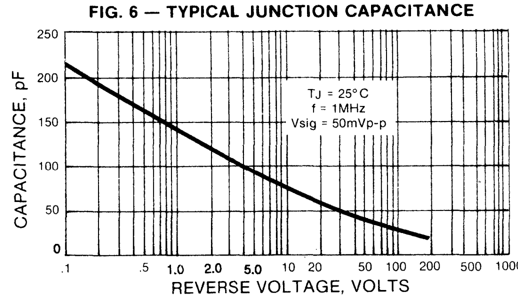


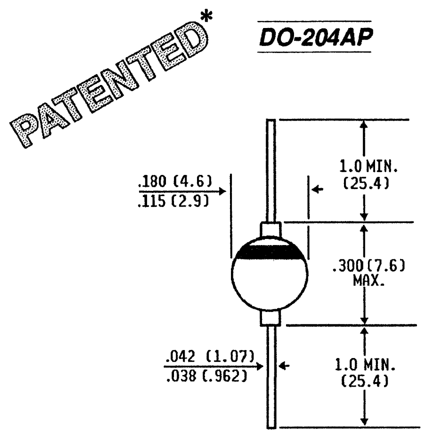
FIG. 6 — TYPICAL JUNCTION CAPACITANCE



FE6A THRU FE6D

GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 6.0 Amperes*

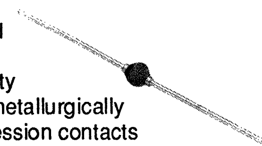


Dimensions in inches and (millimeters)

** Brazed - lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- ◆ Glass passivated cavity-free junction
- ◆ Superfast recovery times-epitaxial construction
- ◆ Low forward voltage, high current capability
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ Hermetically sealed
- ◆ Low leakage
- ◆ High surge capability
- ◆ High temperature metallurgically bonded, no compression contacts
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Unitized glass hemetically sealed
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.037 ounce, 1.04 gram

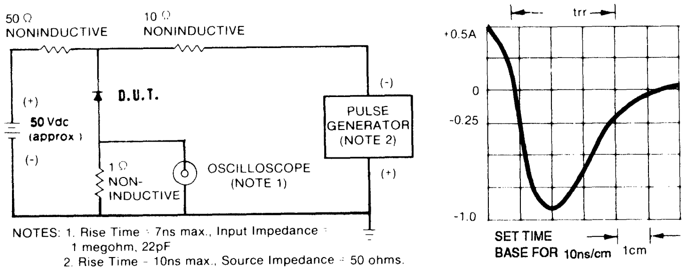
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FE6A	FE6B	FE6C	FE6D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=55°C	$I_{(AV)}$	6.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	135.0				Amps
Maximum Instantaneous Forward Voltage at 6.0A	V_F	0.975				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	35.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	100.0				pf
Typical Thermal Resistance (NOTE 3,4)	RΘJA RΘJL	55.0 18.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Lead at .375" (9.5mm) Lead Lengths, both leads attached to heatsinks.
4. Thermal Resistance from Junction to Ambient, 375" (9.5mm) Lead Lengths mounted on P.C. board.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG. 2 - MAXIMUM AVERAGE FORWARD CURRENT DERATING

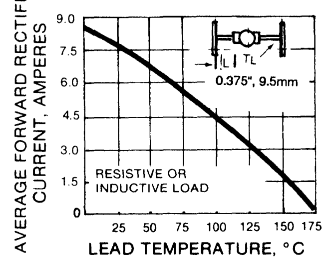


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

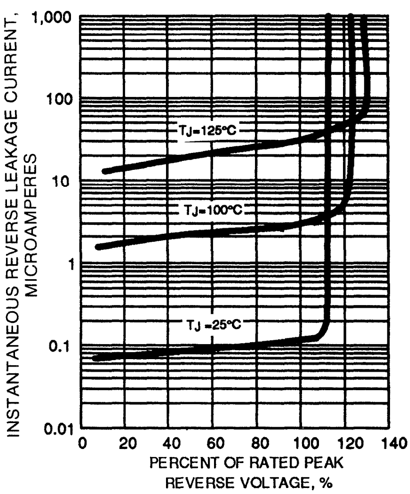


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

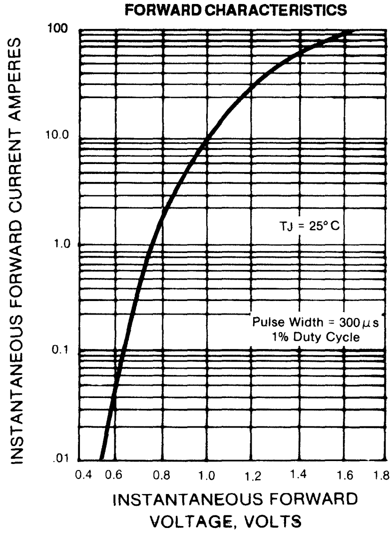


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

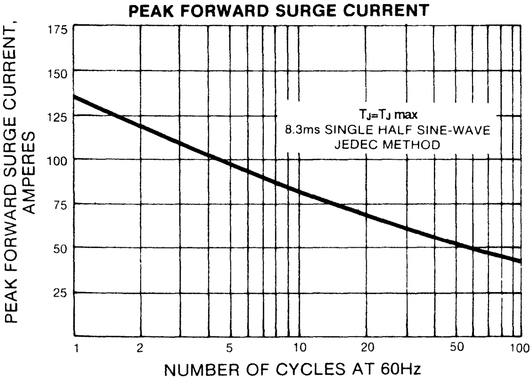
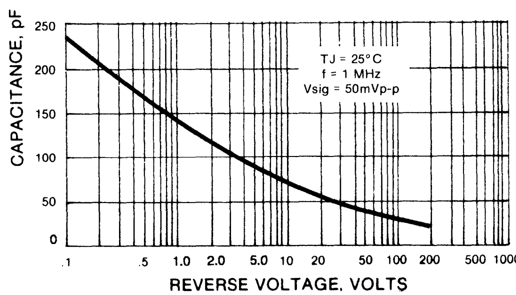


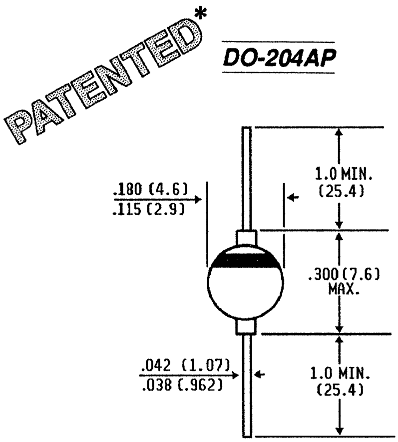
FIG. 6 — TYPICAL JUNCTION CAPACITANCE



GI1301 THRU GI1304

GLASS PASSIVATED FAST EPITAXIAL RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 6.0 Amperes*

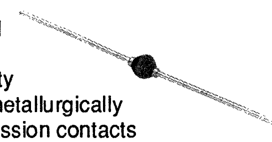


Dimensions in inches and (millimeters)

** Brazed - lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times-epitaxial construction
- Low forward voltage, high current capability
- Capable of meeting environmental standards of MIL-S-19500
- Hermetically sealed
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Unitized glass hemetically sealed
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.037 ounce, 1.04 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

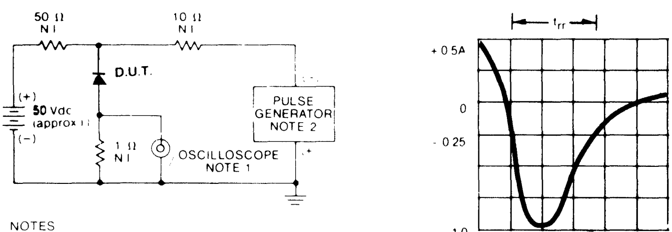
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	GI1301	GI1302	GI1303	GI1304	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at , See Fig. 2	$I_{(AV)}$		6.0		(NOTE 3) 5.0	Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			150.0		Amps
Maximum Instantaneous Forward Voltage at 6.0A	V_F		0.925		(NOTE 4) 1.25	Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R		5.0 150.0		20.0 500.0	µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}		30.0		50.0	ns
Typical Junction Capacitance (NOTE 2)	C_J			95.0		pf
Typical Thermal Resistance (NOTE 5, 6)	RΘJA RΘJL			55.0 18.0		°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$		-65 to +175		-65 to +150	°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R = 1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. T_L = 55°C, .375" (9.5mm) Lead Length.
4. I_{FM} = 3.0A_{DC}.
5. Thermal Resistance from Junction to Lead ,.375" (9.5mm) Lead Lengths, both leads attached to heatsinks.
6. Thermal Resistance from Junction to Ambient, 375"(9.5mm) Lead Lengths mounted on P.C. board.

FIG. 1 - REVERSE RECOVERY TIME CHARACATERISTIC AND TEST CIRCUIT DIAGRAM



NOTES
1 RISE TIME 7ns MAX. INPUT IMPEDANCE 1 MEGOHM, 22 pF
2 RISE TIME 10ns MAX. SOURCE IMPEDANCE 50 OHM

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

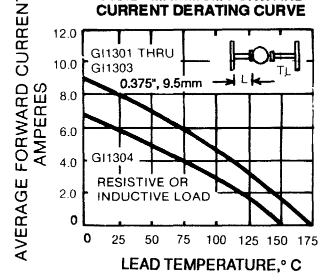


FIG. 3 — TYPICAL REVERSE CHARACTERISITCS

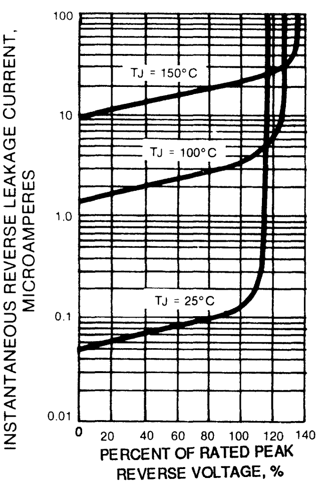


FIG. 5 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

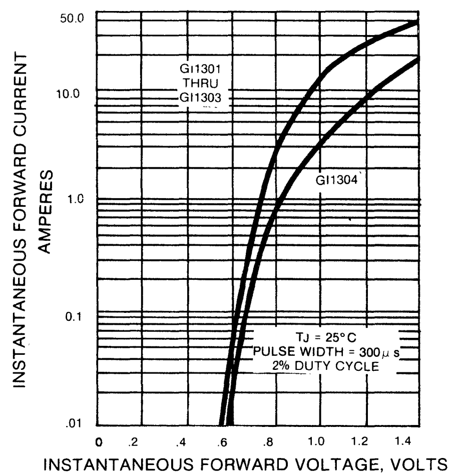


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

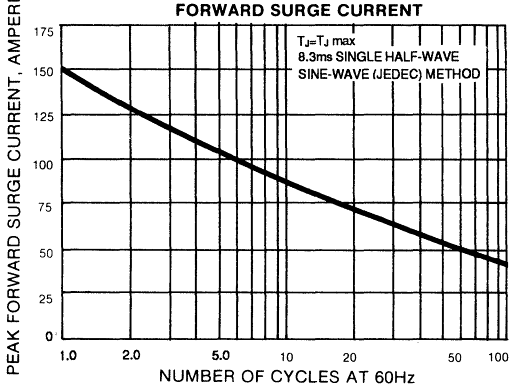
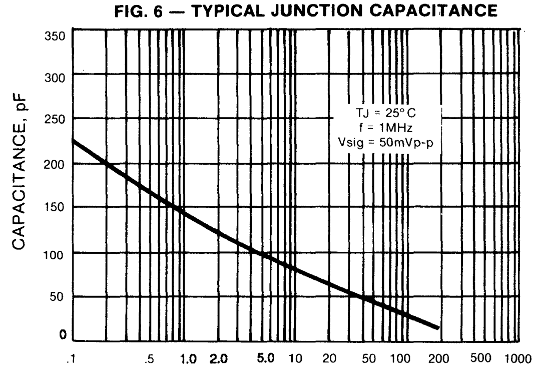


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



SUPERECTIFIER

GLASS PASSIVATED PLASTIC FAST EFFICIENT RECTIFIERS

1.0 AMPERE TO 5.0 AMPERES

General Instrument

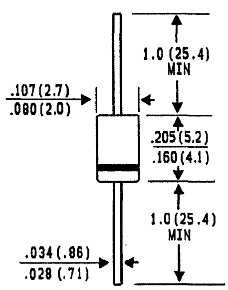
EGP10A THRU EGP10G

MINIATURE GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Voltage** - 50 to 400 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AL

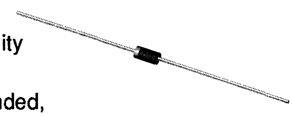


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed -lead assembly to Patent No. 3,930,306 of*

SUPERECTIFIER®

FEATURES



- Glass passivated cavity-free junction
- Superfast recovery times for high efficiency
- Low forward voltage, high current capability
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-41AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, 0 3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	EGP 10A	EGP 10B	EGP 10C	EGP 10D	EGP 10F	EGP 10G	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1.0						Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load T_A=55°C	I_{FSM}	30.0						Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	0.95				1.25		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 / 100						µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0						ns
Typical Junction Capacitance (NOTE 2)	C_J	20.0				10.0		pf
Typical Thermal Resistance (NOTE 3)	RθJA	50.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +150						°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient, .375"(9.5mm) lead lengths, P.C. board mounted.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM

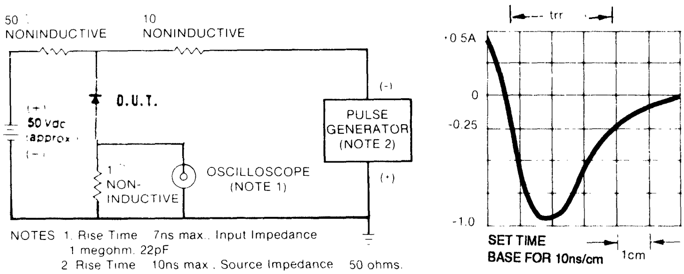


FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

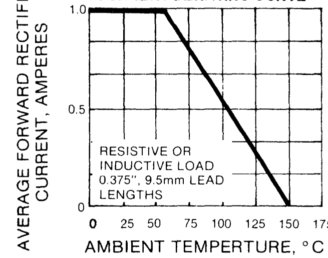


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

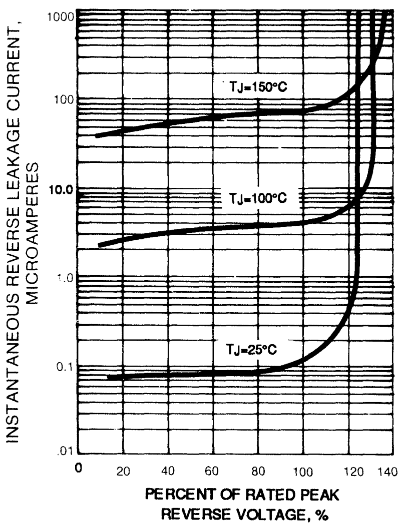


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

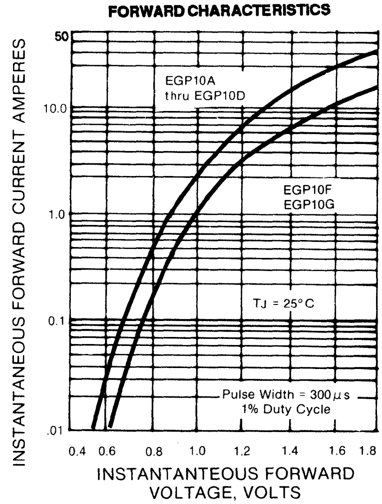


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

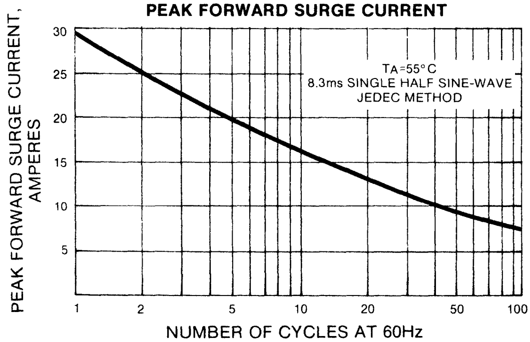
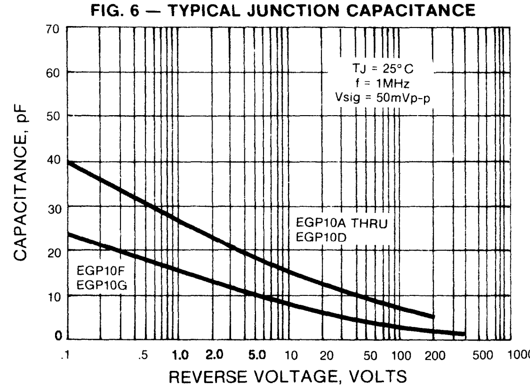


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



EGP20A THRU EGP20G

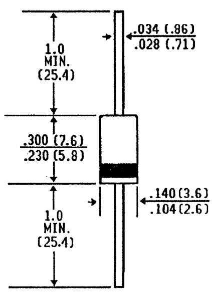
MINIATURE GLASS PASSIVATED FAST EFFICIENT RECTIFIER

Voltage *- 50 to 400 Volts* ***Current*** *- 2.0 Amperes*

FEATURES

PATENTED*

DO-204AC

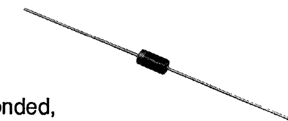


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

- Glass passivated cavity-free junction
- Superfast recovery times for high efficiency
- Low forward voltage, high current capability
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

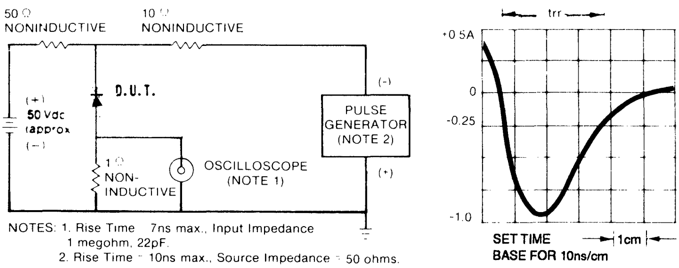
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*EGP 20A*	*EGP 20B*	*EGP 20C*	*EGP 20D*	*EGP 20F*	*EGP 20G*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	2.0						Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load T_A=55°C	I_{FSM}	75.0						Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	0.95				1.25		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0						μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0						ns
Typical Junction Capacitance (NOTE 2)	C_J	70.0				40.0		pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$	30.0						°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +150						°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient, .375"(9.5mm) lead lengths, P.C. board mounted.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time 7ns max., Input Impedance 1 megohm, 22pF.
2. Rise Time 10ns max., Source Impedance 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

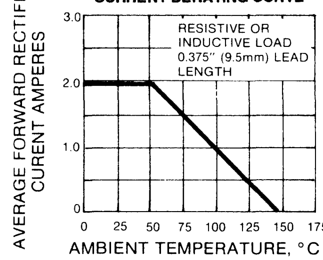


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

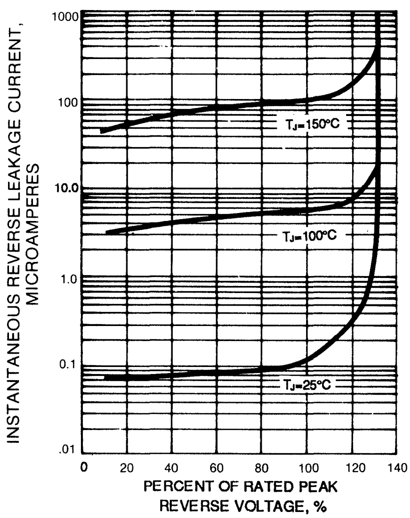


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

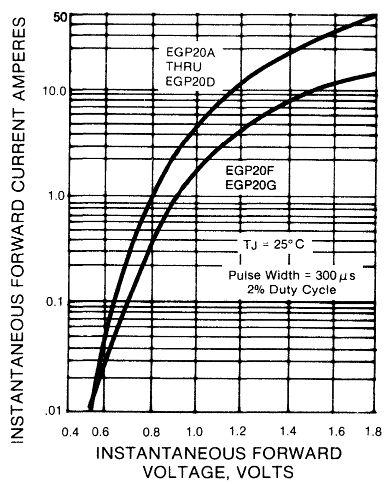


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

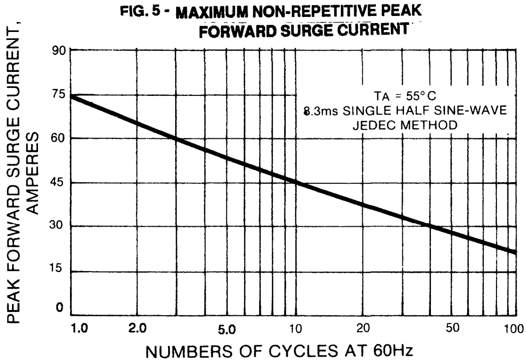
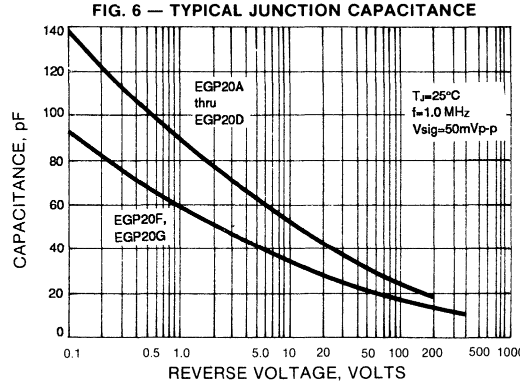


FIG. 6 — TYPICAL JUNCTION CAPACITANCE

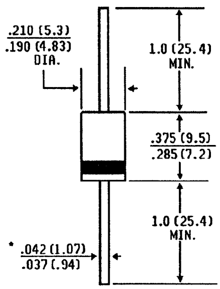


EGP30A THRU EGP30G

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Voltage** - 50 to 400 Volts*   ***Current** - 3.0 Amperes*

DO-201AA MODIFIED



Dimensions in inches and (millimeters)

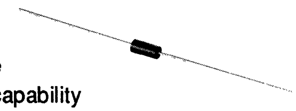
** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed -lead assembly to Patent No. 3,930,306 of*

®

*(Not to JEDEC Dimensions)

FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times for high efficiency
- Low forward voltage, high current capability



- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AA (Modified) Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

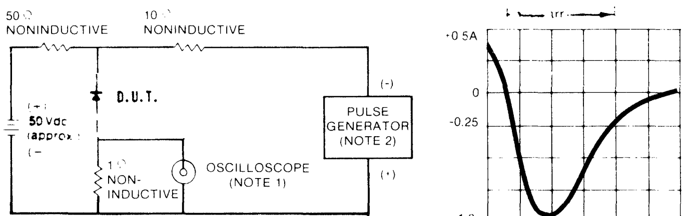
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	EGP 30A	EGP 30B	EGP 30C	EGP 30D	EGP 30F	EGP 30G	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	3.0						Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load T_A=55°C	I_{FSM}	125.0						Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	0.95				1.25		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 100						µA
Typical Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0						ns
Typical Junction Capacitance (NOTE 2)	C_J	90.0				55.0		pf
Typical Thermal Resistance (NOTE 3)	RΘJA	55.0						°C/W
Operating Junction and Storage Temperature Range	T_JT_{STG}	-65 to +150						°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R =1.0A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient, .375"(9.5mm) lead lengths, P.C. board mounted.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES 1 Rise Time 7ns max. Input Impedance 1 megohm, 22pF.
2 Rise Time 10ns max. Source Impedance 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

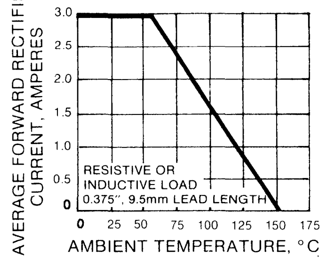


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

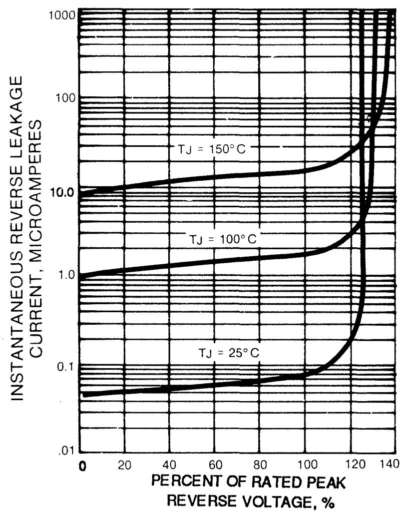


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

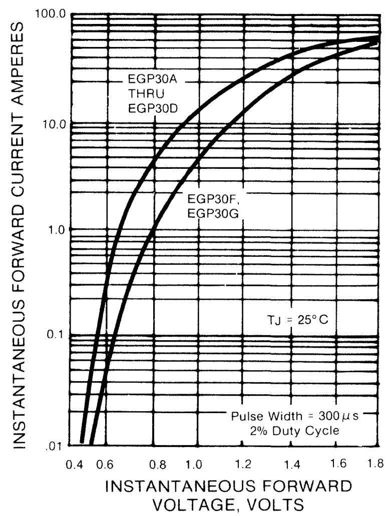


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

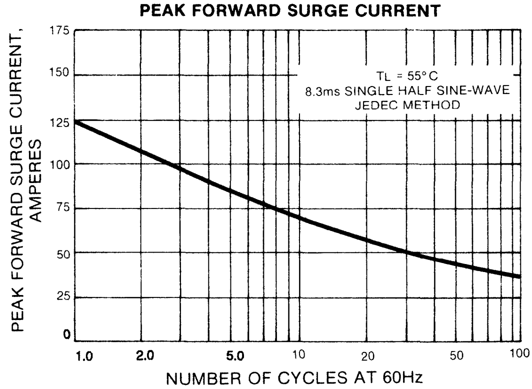
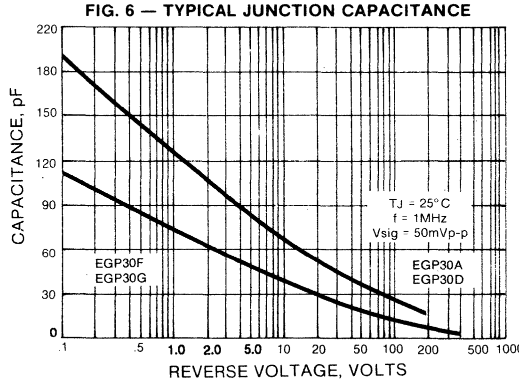


FIG. 6 — TYPICAL JUNCTION CAPACITANCE

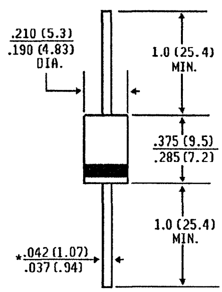


EGP50A THRU EGP50G

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

Voltage *- 50 to 400 Volts* ***Current*** *- 5.0 Amperes*

DO-201AA MODIFIED



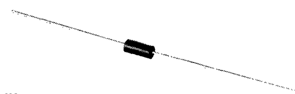
*(Not to JEDEC Dimensions)

Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed -lead assembly to Patent No. 3,930,306 of 1976

®

FEATURES

- Glass passivated cavity-free junction
- Superfast recovery times for high efficiency
- Low forward voltage, high current capability
- Low leakage
- High surge capability
- High temperature metallurgically bonded, no compression contacts
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AA (Modified) Molded plastic over glass

Terminals: Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.03 ounce, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

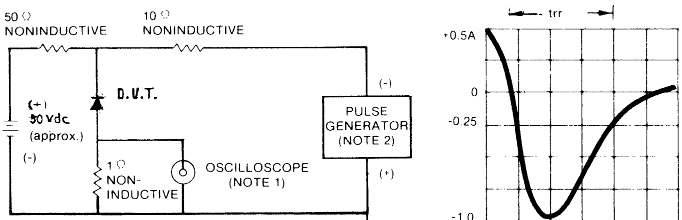
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*EGP 50A*	*EGP 50B*	*EGP 50C*	*EGP 50D*	*EGP 50F*	*EGP 50G*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=55°C	$I_{(AV)}$	5.0						Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load T_L=55°C	I_{FSM}	150.0						Amps
Maximum Instantaneous Forward Voltage at 5.0A	V_F	0.95				1.25		Volts
Maximum DC Reverse Current T_A = 25°C at Rated DC Blocking Voltage T_A = 125°C	I_R	5.0 50.0						µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0						ns
Typical Thermal Resistance (NOTE 3)	RΘJL	20.0						°C\W
Typical Junction Capacitance (NOTE 2)	C_J	100.0						pf
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +150						°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Lead at .375", 9.5mm Lead Lengths, both leads to heatsink.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

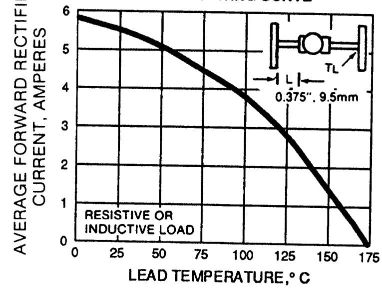


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

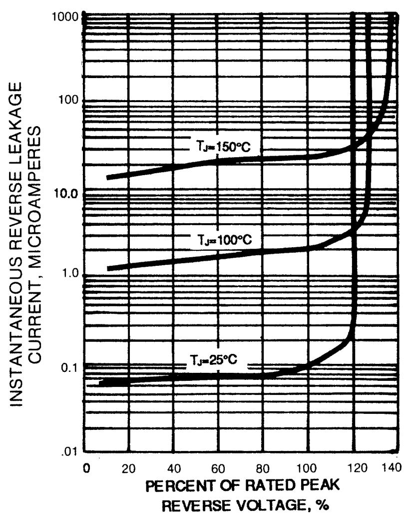


FIG. 4 — TYPICAL FORWARD CHRACTERISTICS

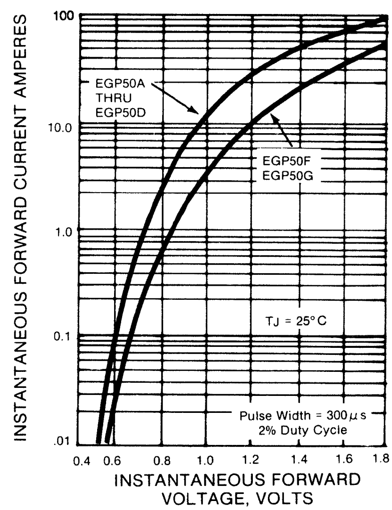


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

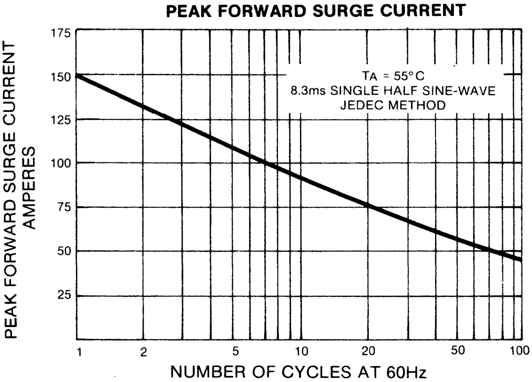
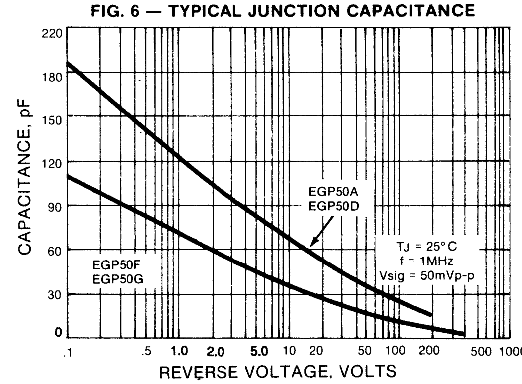


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



PLASTIC FAST EFFICIENT RECTIFIERS

1.0 AND 3.0 AMPERES

General Instrument

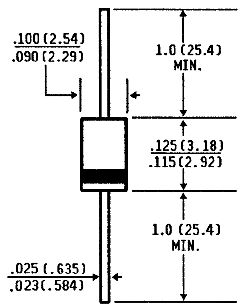
UG06A THRU UG06D

MINIATURE ULTRAFAST PLASTIC RECTIFIER

Voltage - *50 to 200 Volts* **Current** - *0.6 Amperes*

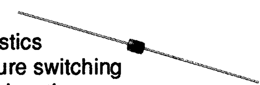
FEATURES

MPG06



Dimensions in inches and (millimeters)

- Ideally suited for use in very high frequency switching power supplies, inverters and as free wheeling diodes
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- Ultrafast 15 nanosecond reverse recovery times
- Soft recovery characteristics
- Excellent high temperature switching
- Nitride oxide passivated junction
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.0064 ounce, 0.181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UG06A	UG06B	UG06C	UG06D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=75°C, Fig. 1	$I_{(AV)}$	0.6				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0				Amps
Maximum Instantaneous Forward Voltage at 0.6A	V_F	0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 100.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	15.0				ns
Maximum Reverse Recovery Time T_J=25°C (NOTE 2) T_J=100°C	T_{RR}	25.0 35.0				ns
Maximum Stored Charge T_J=25°C (NOTE 2) T_J=100°C	Q_{RR}	8.0 20.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	10.0				pf
Typical Thermal Resistance (NOTE 4)	$R\theta JA$	60.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester I_F=0.6A: V_R = 30V, di\dt=50 A/μs.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths.

FIG. 1 - FORWARD CURRENT DERATING CURVE

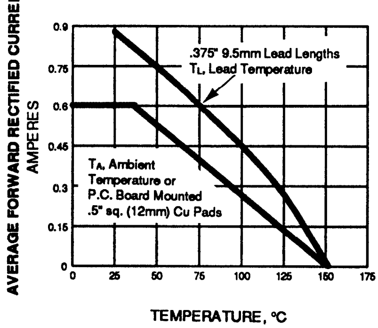


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

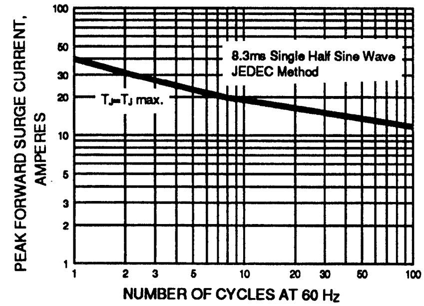


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

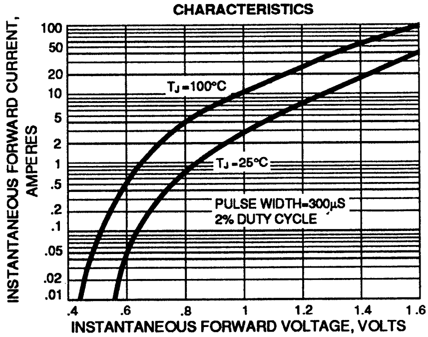


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

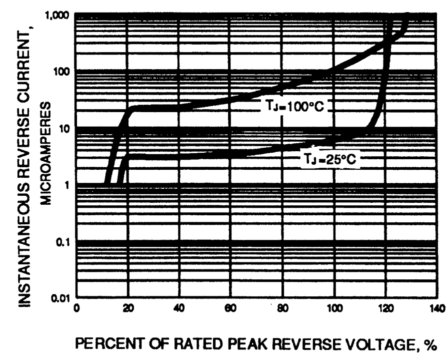


FIG 5 - REVERSE SWITCHING CHARACTERISTICS

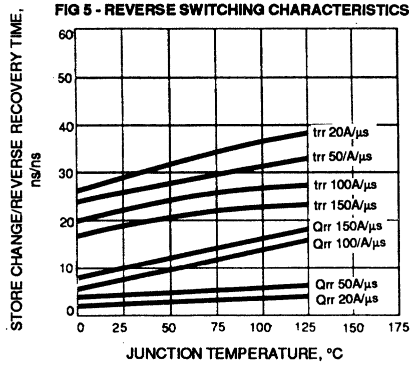
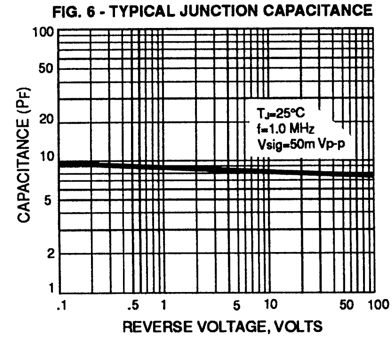


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



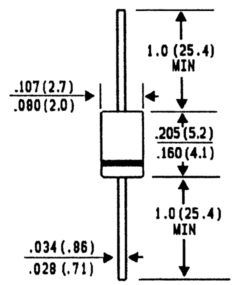
UG1A THRU UG1D

MINIATURE ULTRAFAST PLASTIC RECTIFIER

Voltage - *50 to 200 Volts* **Current** - *1.0 Amperes*

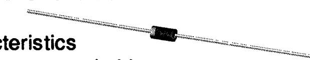
FEATURES

DO-204AL



Dimensions in inches and (millimeters)

- Ideally suited for use in very high frequency switching power supplies, inverters and as free wheeling diodes
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- Ultrafast 15 nanosecond reverse recovery times
- Soft recovery characteristics
- Excellent high temperature switching
- Nitride oxide passivated junction
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*UG1A*	*UG1B*	*UG1C*	*UG1D*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=75°C, Fig. 1	$I_{(AV)}$	1.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	0.95				Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 200.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	15.0				nS
Maximum Reverse Recovery Time T_J=25°C (NOTE 2) T_J=100°C	T_{RR}	25.0 35.0				ns
Maximum Stored Charge T_J=25°C (NOTE 2) T_J=100°C	Q_{RR}	10.0 22.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	15.0				pf
Typical Thermal Resistance (NOTE 4)	RθJA	35.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F =0.5A, I_R =1.0A, recover to 0.25A.
2. T_{RR} andd Q_{RR} measured on LEM tester I_F=1.0A: V_R =30V, di/dt=50A/µs.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths.

FIG. 1 - FORWARD CURRENT DERATING CURVE

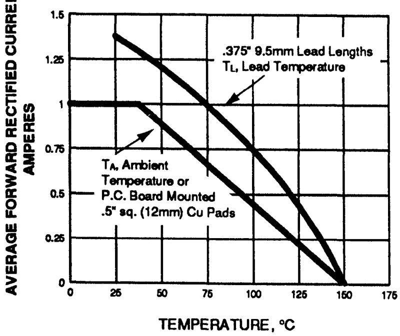


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

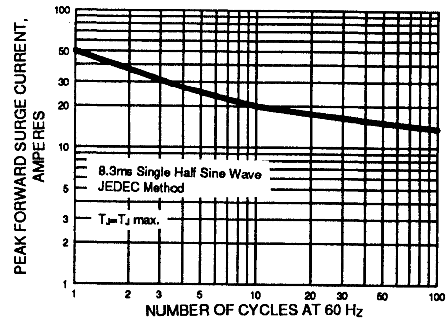


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

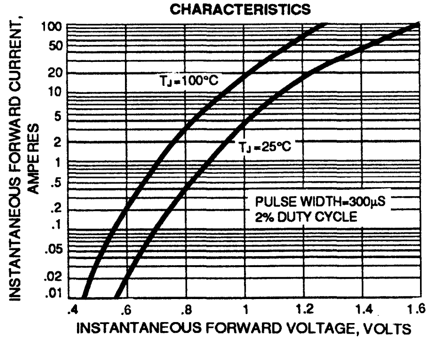


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

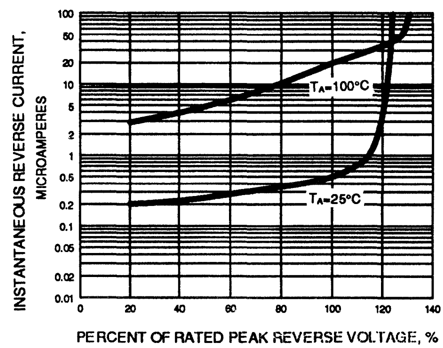


FIG 5 - REVERSE SWITCHING CHARACTERISTICS

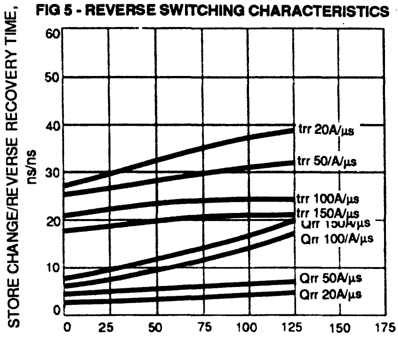
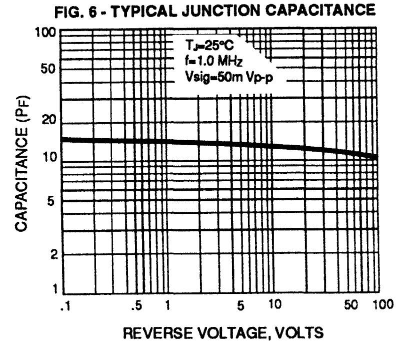


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



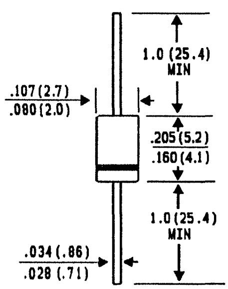
UF4001 THRU UF4007

MINIATURE ULTRAFAST EFFICIENT GLASS PASSIVATED PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.0 Ampere*

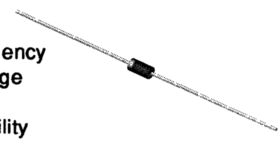
FEATURES

DO-204AL



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Glass passivated chip junctions
- Low cost
- Ultrafast recovery times for high efficiency
- Low Forward Voltage
- Low Leakage
- High Surge Capability
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.012 ounce, 0.3 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	UF 4001	UF 4002	UF 4003	UF 4004	UF 4005	UF 4006	UF 4007	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375" (9.5mm) Lead Length T_A=55°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.0				1.7			Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	10.0 / 50.0							μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	Trr	50.0				75.0			ns
Typical Junction Capacitance (NOTE 2)	C_J	17.0				15.0			pF
Typical Thermal Resistance (NOTE 3)	RΘJA / RΘJA	50.0 / 14.5				60.0 / 15.0			°C/W
Operating Junction and Storage Temperature Range	RΘJL	-55 to +150							°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient, .375", 9.5mm Lead Lengths, P.C. board mounted.

FIG.1 - FORWARD CURRENT DERATING CURVE

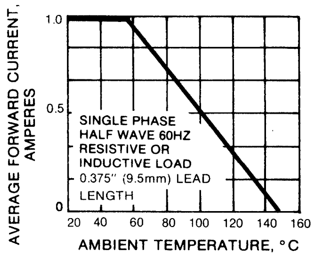


FIG.2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

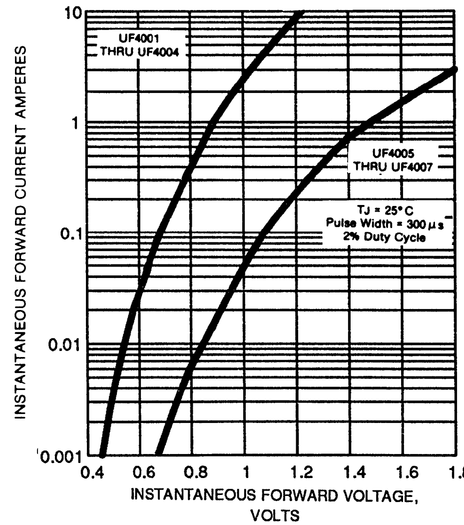


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

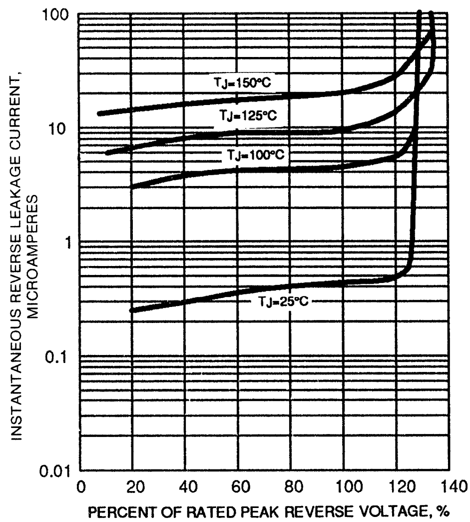


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

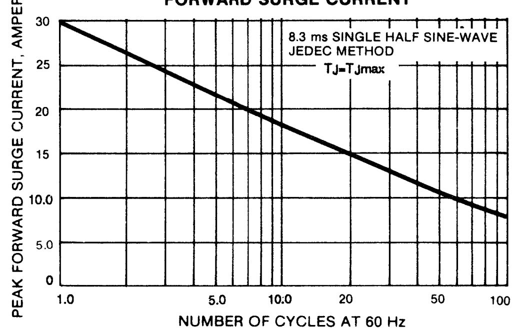


FIG. 6 — TYPICAL JUNCTION CAPACITANCE

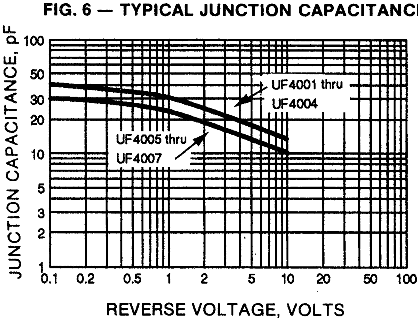
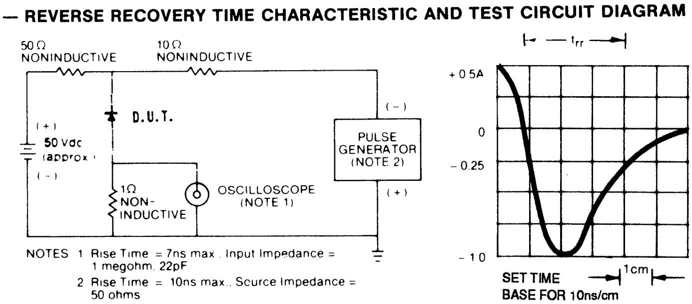


FIG. 5 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



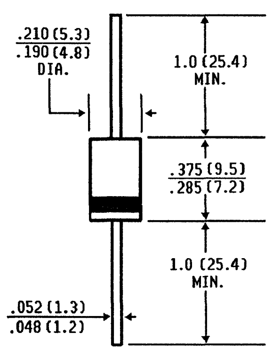
SUF15G AND SUF15J

GLASS PASSIVATED
ULTRA FAST EPITAXIAL RECTIFIER

***Voltage** - 400 and 600 Volts* ***Current** - 1.5 Amperes*

FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Superfast recovery times for high efficiency
- High forward surge capability
- Low Leakage
- Low Power Loss
- High temperature soldering guaranteed: 260°C for 10 seconds at .375" (9.5mm) lead lengths at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded epoxy
Terminals: Plated Axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounces, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*SUF15G*	*SUF15J*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	400	600	Volts
Maximum RMS Voltage	V_{RMS}	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	400	600	Volts
Maximum Average Forward Rectified Current, .375" (9.5 mm) lead lengths at T_A=50°C	$I_{(AV)}$	1.5		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0		Amps
Maximum Instantaneous Forward Voltage at 1.5A	V_F	1.80		Volts
Maximum Peak Reverse Current T_A=25°C at rated Peak Reverse Voltage T_A=100°C	I_R	10.0 100		µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	35.0		nS
Typical Thermal Resistance (NOTE 2)	$R\theta JA$	65.0		°C/W
Operating Junction Temperature Range	T_J	-40 to +150		°C
Storage Temperature Range	T_{STG}	-40 to +150		°C

NOTES:
1. Reverse Recovery Test Condition: I_F=0.5A, I_R=1.0A, I_{RR}=0.25A.
2. Thermal Resistance from Junction to Ambient at.375" (9.5mm) lead length, P.C. board mounted.

FIG. 1 - FORWARD CURRENT DERATING CURVE

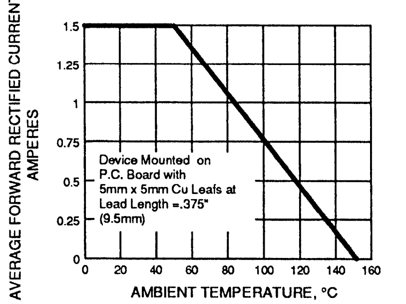


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

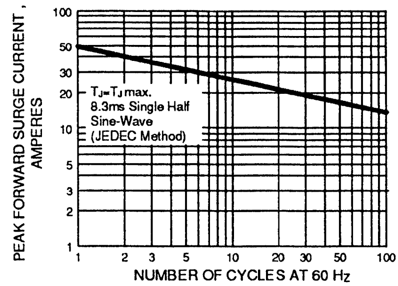


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS

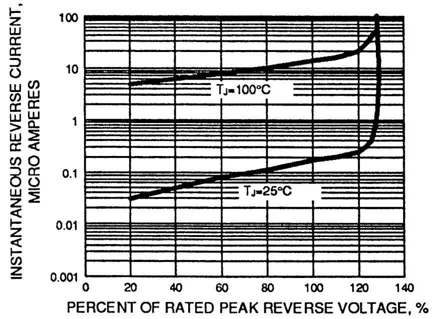


FIG 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

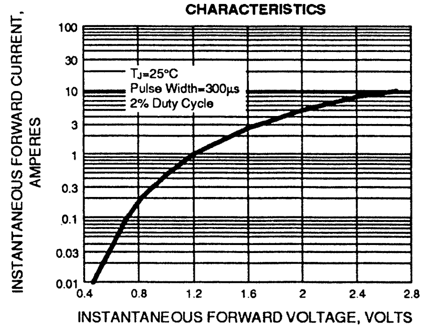


FIG. 5 - TYPICAL TRANSIENT THERMAL IMPEDANCE

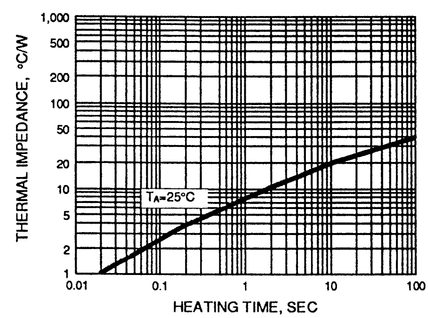
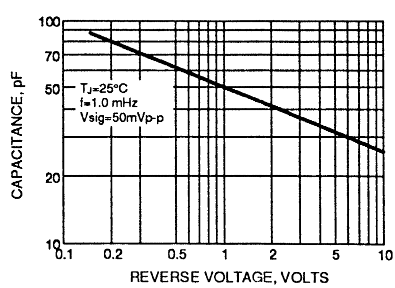


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



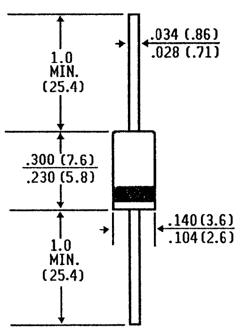
UG2A THRU UG2D

ULTRAFAST PLASTIC RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 2.0 Amperes*

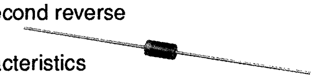
FEATURES

DO-204AC



Dimensions in inches and (millimeters)

- Ideally suited for use in very high frequency switching power supplies, inverters and as free wheeling diodes
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- Ultrafast 15 nanosecond reverse recovery times
- Soft recovery characteristics
- Excellent high temperature switching
- Nitride oxide passivated junction
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: DO-204AC molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UG2A	UG2B	UG2C	UG2D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L =75°C, Fig. 1	$I_{(AV)}$	2.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	80.0				Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	0.95				Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 200.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	15.0				ns
Maximum Reverse Recovery Time T_J= 25°C (NOTE 2) T_J=100°C	T_{RR}	25.0 35.0				ns
Maximum Stored Charge T_J= 25°C (NOTE 2) T_J=100°C	Q_{RR}	10.0 22.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	20.0				pf
Typical Thermal Resistance (NOTE 4)	RΘJA	45.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R =1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: V_R = 30V, di\dt=50 A/μs I_F = 2.0A.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths.

FIG. 1 - FORWARD CURRENT DERATING CURVE

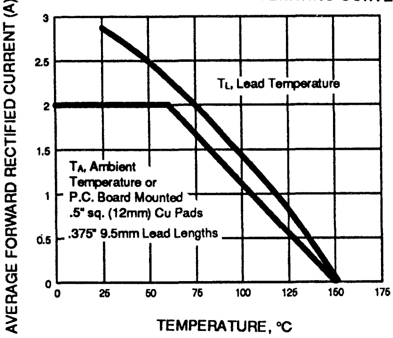


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

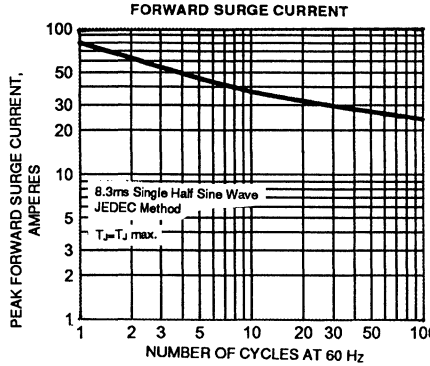


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

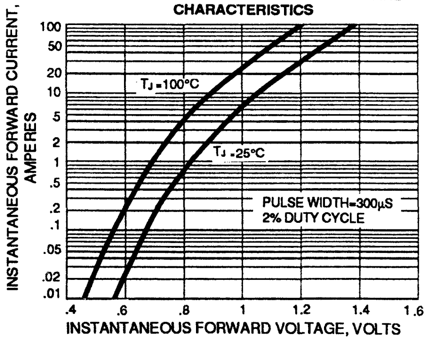


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

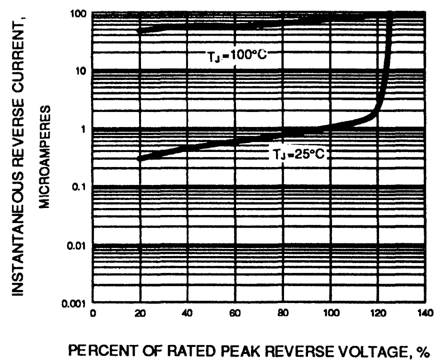


FIG 5 - REVERSE SWITCHING CHARACTERISTICS

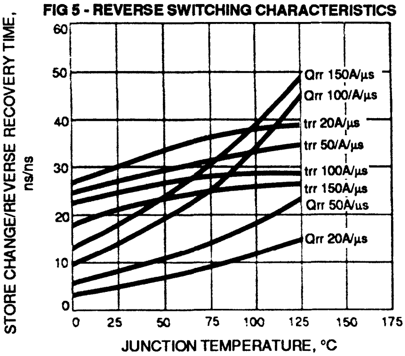
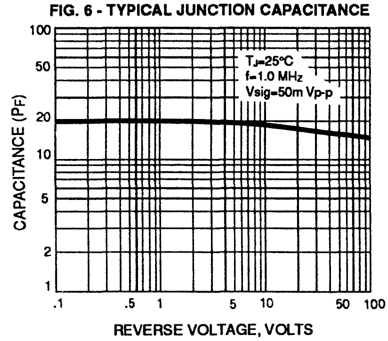


FIG. 6 - TYPICAL JUNCTION CAPACITANCE

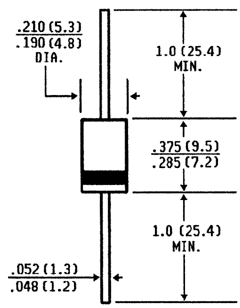


UF5400 THRU UF5408

ULTRAFAST EFFICIENT PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* *__Current__ - 3.0 Amperes*

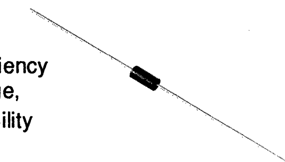
DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low cost
- Ultrafast recovery times for high efficiency
- Low forward voltage, high current capability
- Low leakage
- High surge capability
- High temperature soldering guaranteed: 250°C .375"(9.5mm) lead lengths for 10 seconds at 5 lbs. (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD, molded plastic

Terminals: Plated Axial Leads solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode end

Mounting Position: Any

Weight: 0.04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UF 5400	UF 5401	UF 5402	UF 5403	UF 5404	UF 5405	UF 5406	UF 5407	UF 5408	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
Maximum Average Forward Rectified Current, .375", (9.5 mm) Lead Length at T_A=55°C	$I_{(AV)}$	3.0									Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	150.0									Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.0					1.7				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	10.0 50.0									µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0					75.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	40.0					50.0				pf
Typical Thermal Resistance (NOTE 3)	RΘJA RΘJL	20.0 8.5									°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150									°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measure at 1MHz and applied reverse voltage of 4.0 volts.
3. Thermal Resistance from Junction to Lead, .375"(9.5mm) lead lengths, both leads attached to heatsink.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

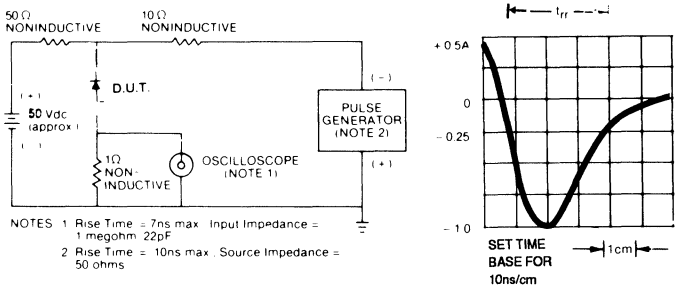


FIG.2 - MAXIMUM FORWARD CURRENT DERATING CURVE

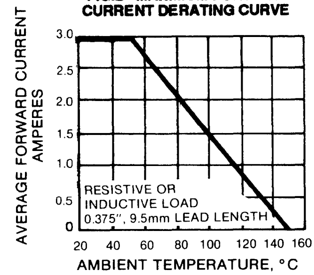


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

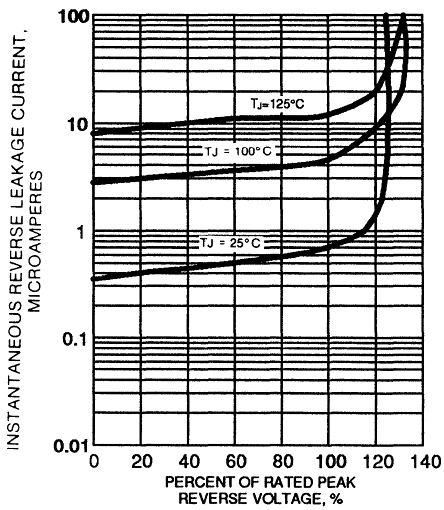


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS

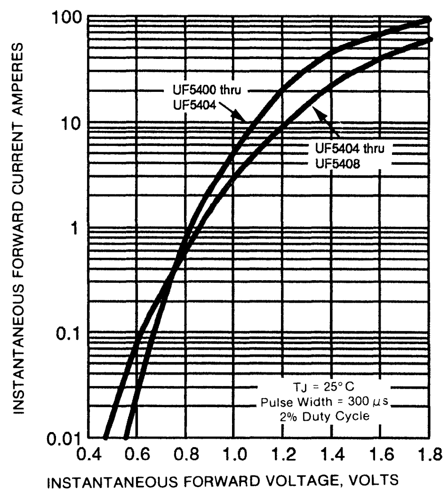


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

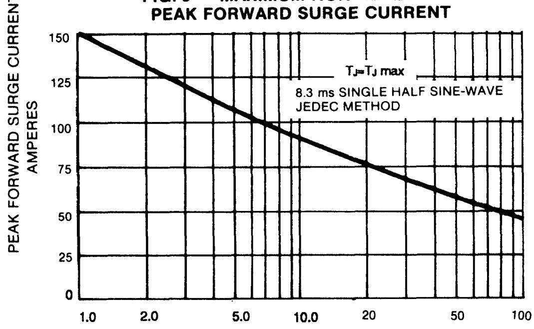
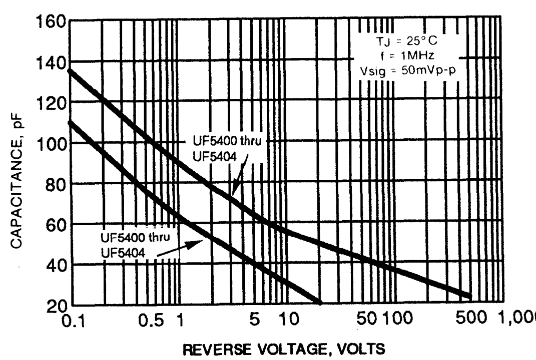


FIG. 6 — TYPICAL JUNCTION CAPACITANCE



• • • • • P • R • E • L • I • M • I • N • A • R • Y • • • • •

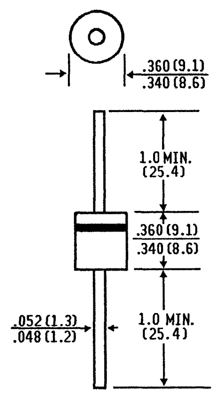
SUF30G AND SUF30J

GLASS PASSIVATED
ULTRA FAST EPITAXIAL RECTIFIER

***Voltage** - 400 and 600 Volts* ***Current** - 3.0 Amperes*

FEATURES

P-600



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Superfast recovery times for high efficiency
- High forward surge capability
- Low Leakage
- Low Power Loss
- High temperature soldering guaranteed: 260°C for 10 seconds at .375" (9.5mm) lead lengths at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Void-free molded epoxy
Terminals: Plated Axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.07 ounces, 2.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	SUF30G	SUF30J	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	400	600	Volts
Maximum RMS Voltage	V_{RMS}	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	400	600	Volts
Maximum Average Forward Rectified Current, .200" (5.0mm) Lead Lengths at T_A=60°C	$I_{(AV)}$	3.0		Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	80.0		Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.80	2.0	Volts
Maximum Peak Reverse Current T_A=25°C at rated Peak Reverse Voltage T_A=100°C	I_R	10.0 100		µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	35.0		nS
Typical Thermal Resistance (NOTE 2)	$R\Theta JA$	25.0		°C/W
Operating Junction Temperature Range	T_J	-40 to +150		°C
Storage Temperature Range	T_{STG}	-40 to +150		°C

NOTES:
1. Reverse Recovery Test Condition: I_F=0.5A, I_R=1.0A, I_{RR}=0.25A.
2. Thermal Resistance from Junction to Ambient at .200" (5.0mm) lead lengths with both leads attached to heat sink.

RATINGS AND CHARACTERISTIC CURVES SUF30G AND SUF30J

FIG 1 - FORWARD CURRENT DERATING CURVE

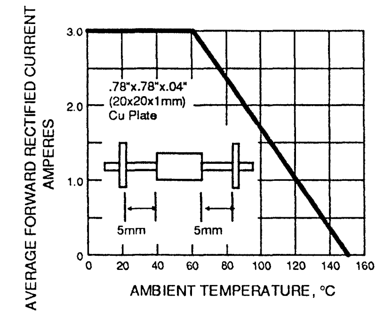


FIG 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

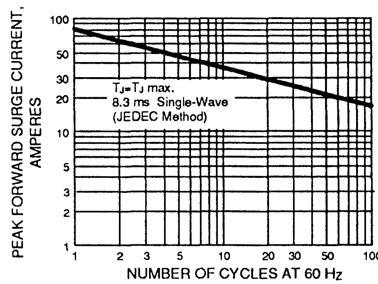


FIG 3 - TYPICAL REVERSE CHARACTERISTICS

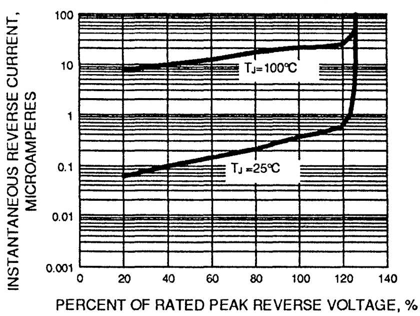


FIG 4 - TYPICAL FORWARD CHARACTERISTICS

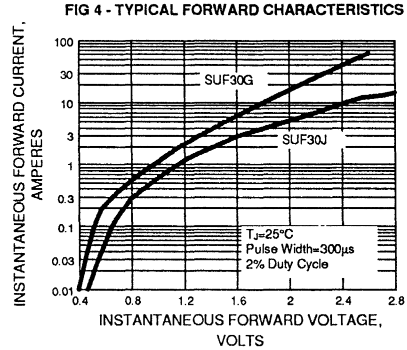


FIG 5 - TRANSIENT THERMAL IMPEDANCE

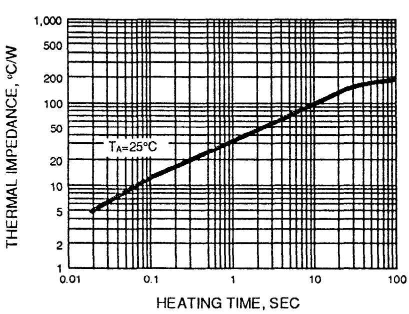
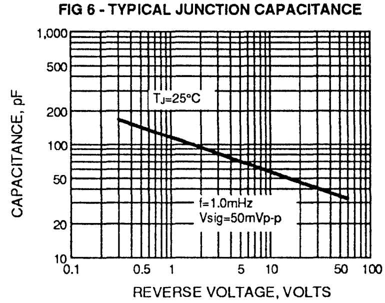


FIG 6 - TYPICAL JUNCTION CAPACITANCE

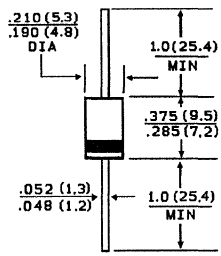


UG4A THRU UG4D

ULTRAFAST PLASTIC RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 4.0 Amperes*

DO-201AD



Dimensions in inches and (millimeters)

FEATURES

- Ideally suited for use in very high frequency switching power supplies, inverters and as free wheeling diodes
- Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- Ultrafast 15 nanosecond reverse recovery times
- Soft recovery characteristics
- Excellent high temperature switching
- Nitride oxide passivated junction
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: DO-201AD molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.045 ounce, 1.2 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*UG4A*	*UG4B*	*UG4C*	*UG4D*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L =75°C	$I_{(AV)}$	4.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Maximum Instantaneous Forward Voltage at 4.0A	V_F	0.95				Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 300.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	TRR	20.0				ns
Maximum Reverse Recovery Time T_J=25°C (NOTE 2) T_J =100°C	T_{RR}	30.0 50.0				ns
Maximum Stored Charge T_J=25°C (NOTE 2) T_J=100°C	Q_{RR}	15.0 30.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	20.0				pf
Typical Thermal Resistance (NOTE 4)	RΘJA	25.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: I_F=4.0A, V_R = 30V, di\dt=50 A/µs
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths.

FIG. 1 - FORWARD CURRENT DERATING CURVE

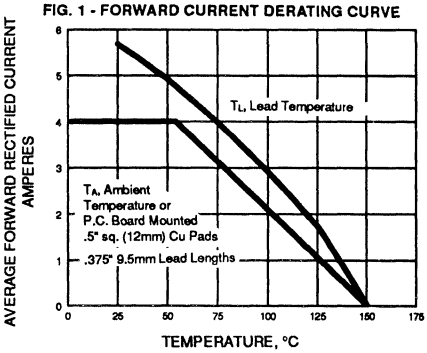


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

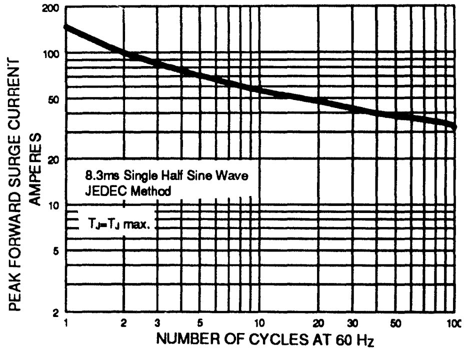


FIG.2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

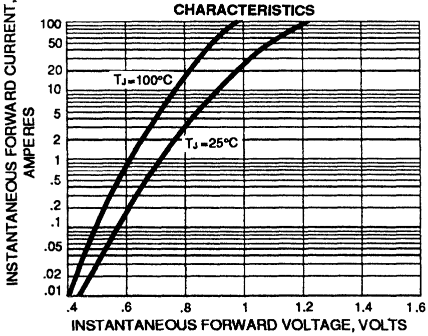


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

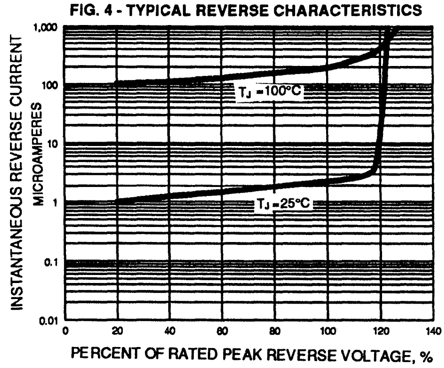


FIG 5 - REVERSE SWITCHING CHARACTERISTICS

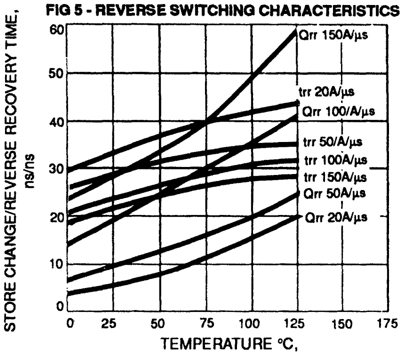
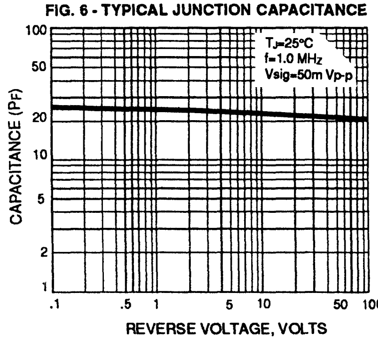


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



MEDIUM CURRENT FAST EFFICIENT RECTIFIERS

6.0 TO 30.0 AMPERES

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PACKAGES

General Instrument

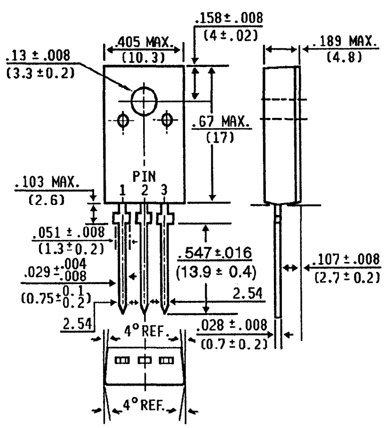
FEPF6AT THRU FEPF6DT

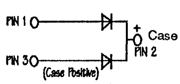
FAST EFFICIENT GLASS PASSIVATED RECTIFIER

Voltage - *50 to 200 Volts* ***Current*** - *6.0 Amperes*

FEATURES

ITO-220CT

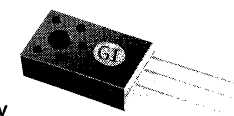




(Standard Polarity)

Dimensions in inches and millimeters

- Dual rectifier construction, positive center-tap
- Isolated Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Superfast recovery times for high efficiency
- Low power loss
- Low forward voltage, high current capability
- For use in low voltage, high frequency inverters, free wheeling and polarity protection applications
- High temperature soldering guaranteed: 250°C, .25", (6.35mm) from case for 10 seconds
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-220 fully overmolded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in.-lb. max.

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.Resistive or inductive load.

	SYMBOLS	*FEPF6AT*	*FEPF6BT*	*FEPF6CT*	*FEPF6DT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_C=100°C	$I_{(AV)}$	6.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=55°C	I_{FSM}	100.0				Amps
Maximum Instantaneous Forward Voltage per leg at 3.0A	V_F	0.975				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0				μA
Maximum Reverse Recovery Time (NOTE 1) per leg T_J=25°C	T_{RR}	35.0				ns
Typical Thermal Resistance (NOTE 2)	RΘJC	4.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

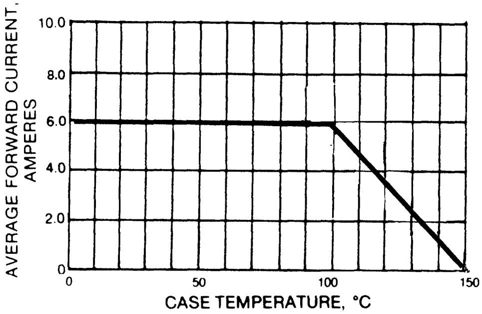


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

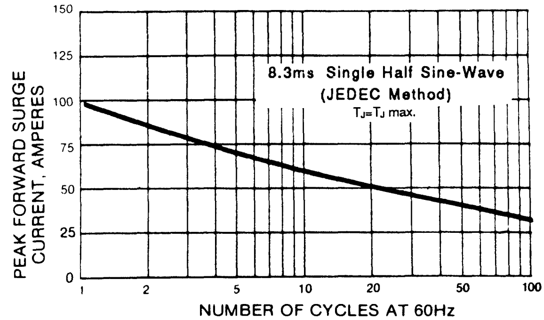


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

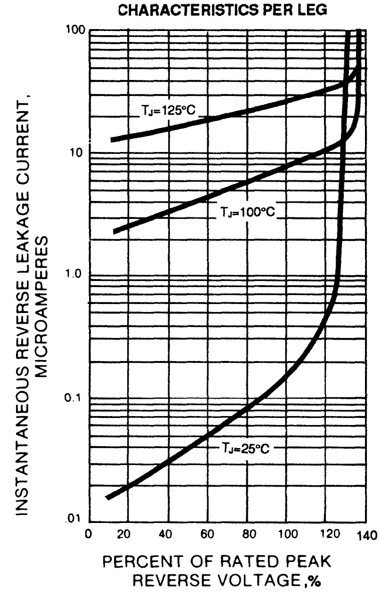


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

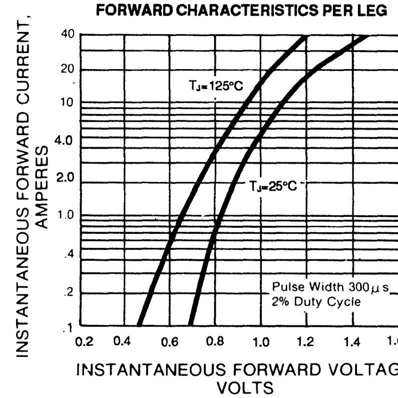
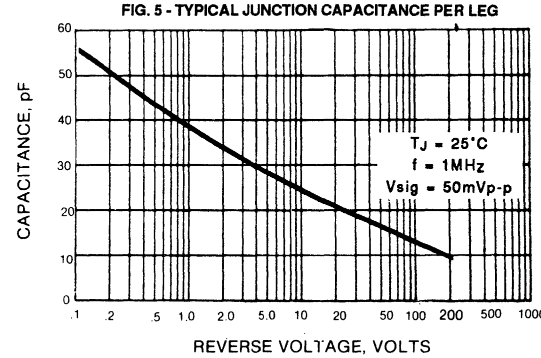


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



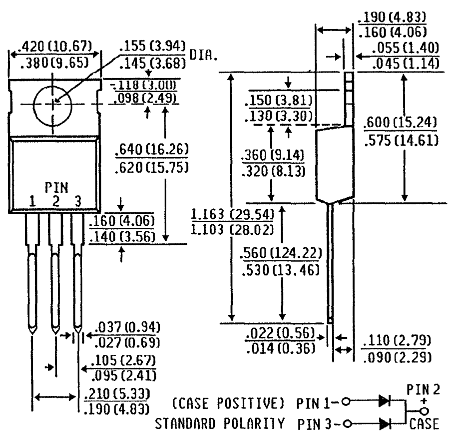
FEP6AT THRU FEP6DT

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 6.0 Amperes*

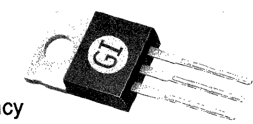
FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- Dual rectifier construction, positive center-tap
- Plastic package has carries Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Superfast recovery times for high efficiency
- Low power loss
- Low forward voltage, high current capability
- For use in low voltage, high frequency inverters, free wheeling and polarity protection applications
- High temperature soldering guaranteed: 250°C, .25", (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in.- lb. max.

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FEP6AT	FEP6BT	FEP6CT	FEP6DT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current T_C=100°C	$I_{(AV)}$	6.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0				Amps
Maximum Instantaneous Forward Voltage per leg at 3.0A	V_F	0.975				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0				μA μA
Maximum Reverse Recovery Time (NOTE 2) per leg T_J=25°C	T_{RR}	35.0				ns.
Typical Thermal Resistance (NOTE 3)	RΘJC	3.6				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{RR}= 25A.
2. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

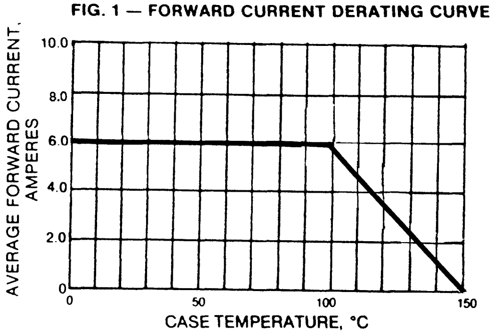


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

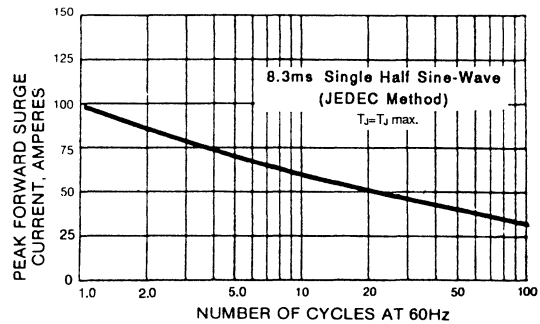


FIG. 3— TYPICAL REVERSE CHARACTERISTICS PER LEG

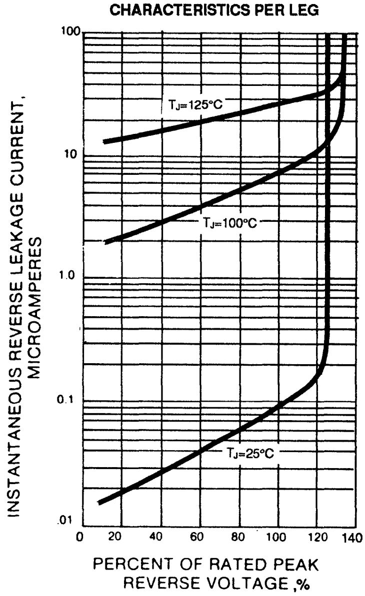


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

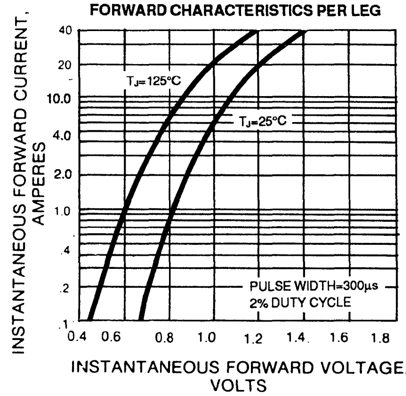
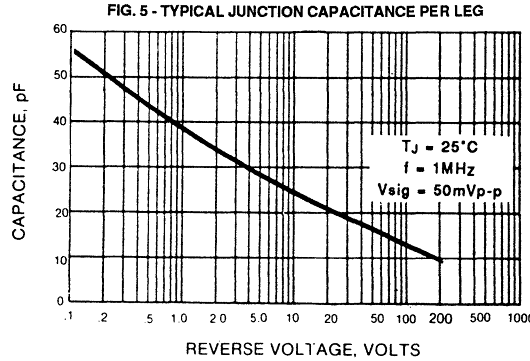


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



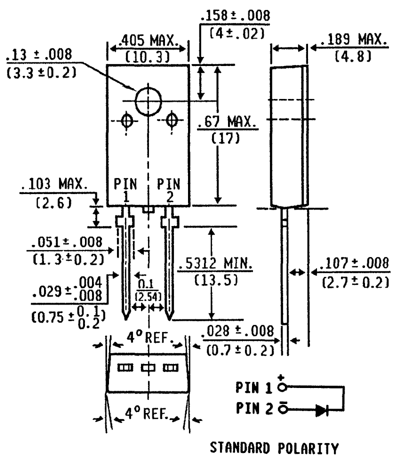
UGF8AT THRU UGF8DT

ULTRAFAST GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 8.0 Amperes*

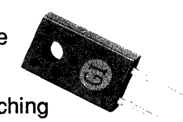
FEATURES

ITO-220



Dimensions in inches and (millimeters)

- Isolated plastic package has Underwriters Laboratories Flammability Classification 94V-O
- Internal insulation resistance 1.5k V_{RMS}
- Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- Ultrafast 20 nanosecond reverse recovery times
- Soft recovery characteristics
- Excellent high temperature switching
- Glass passivated chip junction
- High temperature soldering guaranteed: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: ITO-220 Fully overmolded plastic
Terminals: Plated axial leads, solderable per MIL - STD - 750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.08 ounce, 2.24 gram
Mounting Torque: 5 in. - lbs. max.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UGF8AT	UGF8BT	UGF8CT	UGF8DT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	8.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Maximum Instantaneous Forward Voltage at 8.0A 20A 5.0A,T_A=150°C	V_F	1.00 1.20 0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 300.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	20.0				ns
Maximum Reverse Recovery Time T_J=25°C (NOTE 2) T_J=100°C	T_{RR}	30.0 50.0				ns
Maximum Stored Charge T_J=25°C (NOTE 2) T_J=100°C	Q_{RR}	20.0 45.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	45.0				pf
Typical Thermal Resistance (NOTE 4)	RΘJC	4.5				°C/W
Operating and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester:I_F=8.0A, V_R=30V, di\dt=50 A/µs.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Case.

FIG. 1 - FORWARD CURRENT DERATING CURVE

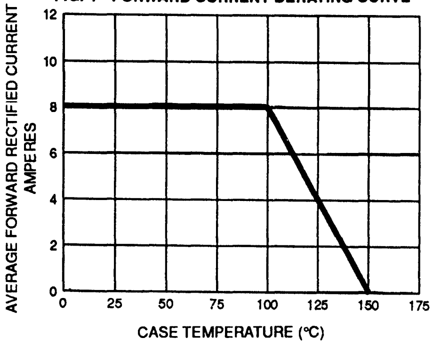


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

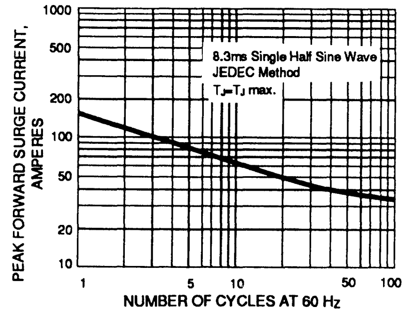


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

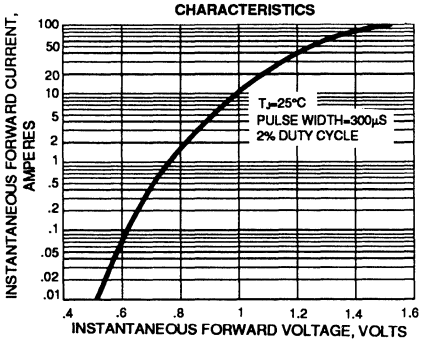


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

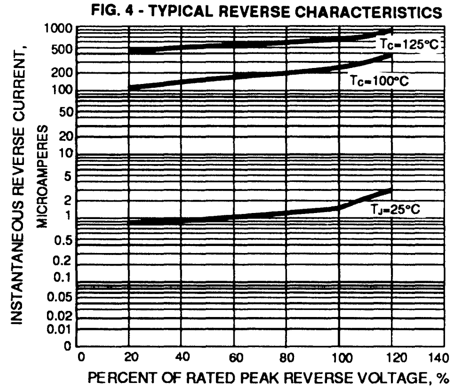


FIG 5 - REVERSE SWITCHING CHARACTERISTICS

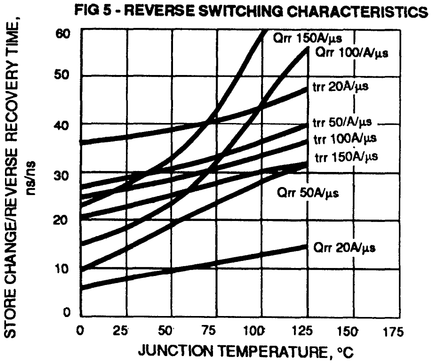
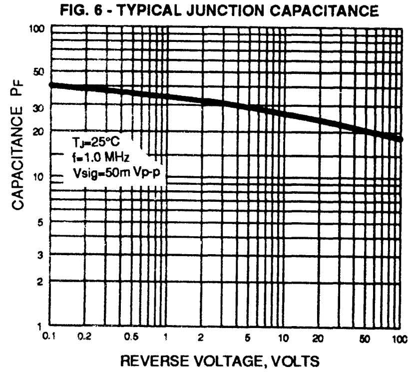


FIG. 6 - TYPICAL JUNCTION CAPACITANCE

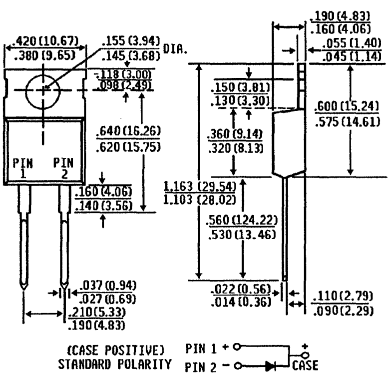


UG8AT THRU UG8DT

ULTRAFAST GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 8.0 Amperes*

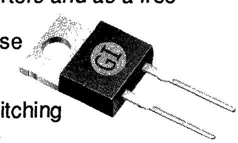
TO-220AC



Dimensions in inches and (millimeters)

FEATURES

- ◆ Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- ◆ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- ◆ Ultrafast 20 nanosecond reverse recovery times
- ◆ Soft recovery characteristics
- ◆ Excellent high temperature switching
- ◆ Glass passivated chip junction
- ◆ High temperature soldering guaranteed: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Weight: 0.08 ounce, 2.24 gram
Mounting Torque: 5 in. - lbs. max.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*UG8AT*	*UG8BT*	*UG8CT*	*UG8DT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	8.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0				Amps
Maximum Instantaneous Forward Voltage at 8.0A 20A 5.0A, T_J=150°C	V_F	1.00 1.20 0.95				 Volts Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 300.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	20.0				ns
Maximum Reverse Recovery Time T_J=25°C (NOTE 2) T_J=100°C	T_{RR}	30.0 50.0				ns
Maximum Stored Charge T_J=25°C (NOTE 2) T_J=100°C	Q_{RR}	20.0 45.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	45.0				pf
Typical Thermal Resistance (NOTE 4)	$R\Theta JC$	4.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: V_R=30V, di\dt=50 A/μs I_F=8.0A.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Case.

FIG. 1 - FORWARD CURRENT DERATING CURVE

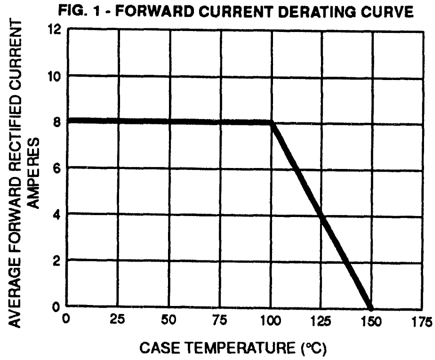


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

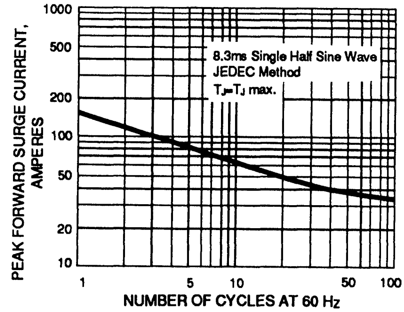


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

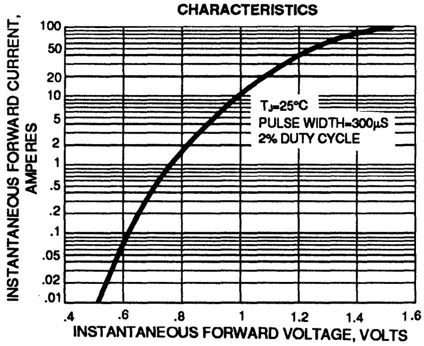


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS

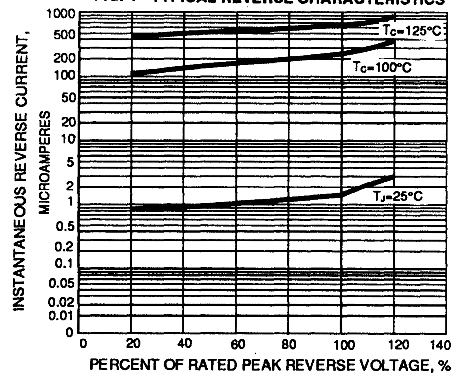


FIG 5 - REVERSE SWITCHING CHARACTERISTICS

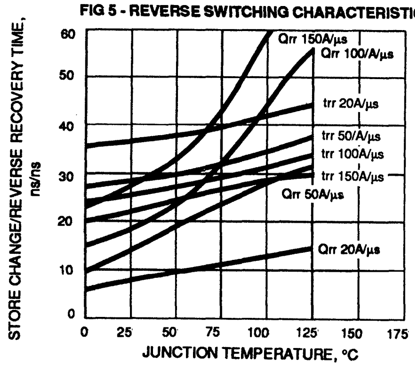
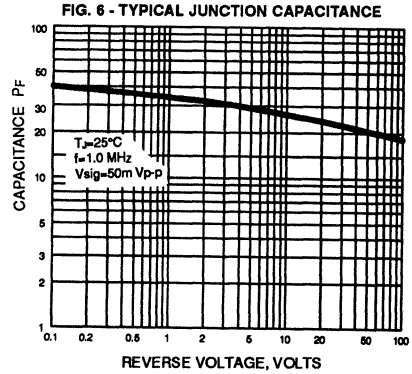


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



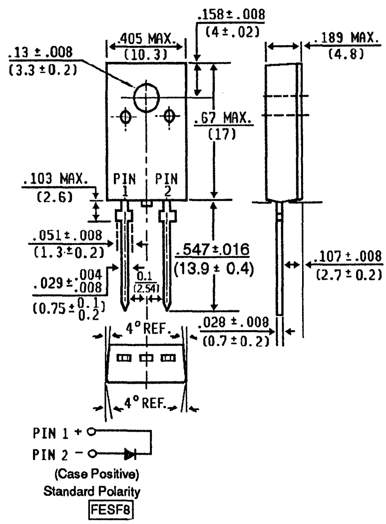
FESF8AT THRU FESF8JT

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

Voltage - *50 to 600 Volts* **Current** - *8.0 Amperes*

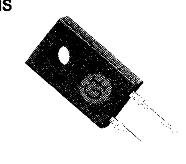
FEATURES

ITO-220



Dimensions in inches and (millimeters)

- Isolated Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low leakage, high voltage
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C, .25", (6.35mm) from case for 10 seconds
- Internal Insulation: 1.5K V_{RMS}



MECHANICAL DATA

Case: ITO-220 fully overmolded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in.- lbs. max.

Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FESF 8AT	FESF 8BT	FESF 8CT	FESF 8DT	FESF 8FT	FESF 8GT	FESF 8HT	FESF 8JT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	8.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0								Amps
Maximum Instantaneous Forward Voltage at 8.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								µA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance (NOTE 1)	C_J	85.0						60.0		pf
Typical Thermal Resistance (NOTE 3)	RΘJC	3.0								°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150								°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case.

FIG. 1 — FORWARD CURRENT DERATING CURVE

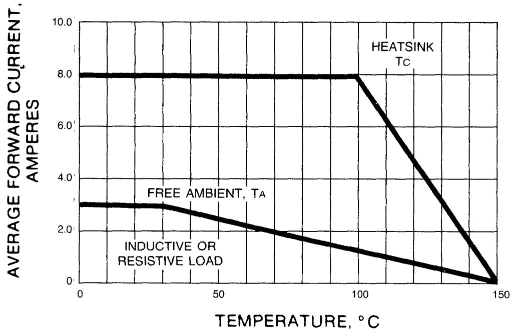


FIG.2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

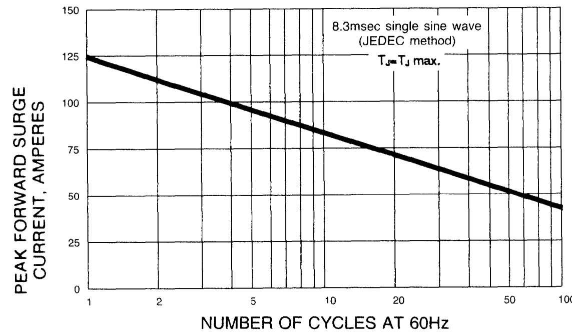


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

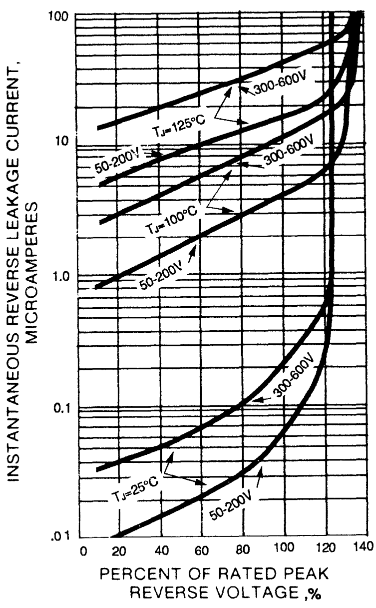


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

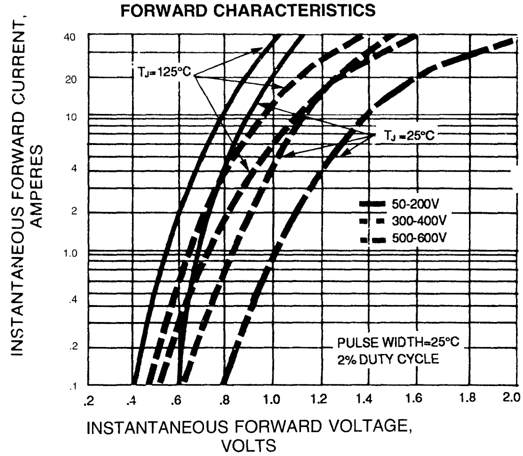
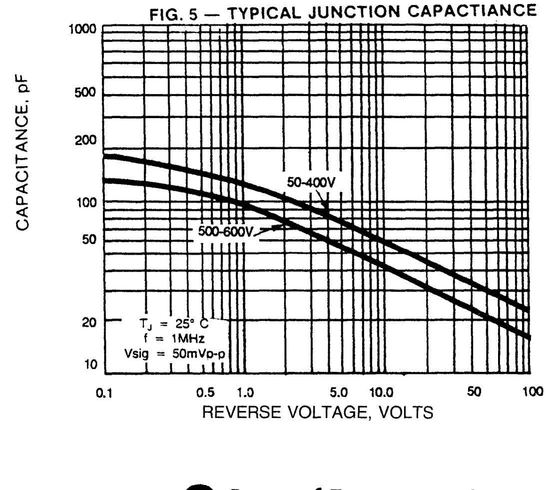


FIG. 5 — TYPICAL JUNCTION CAPACTIANCE



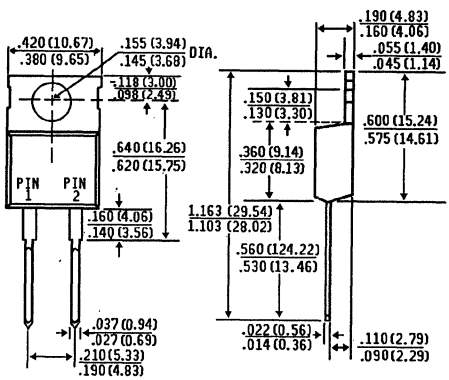
FES8AT THRU FES8JT

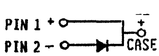
FAST EFFICIENT GLASS PASSIVATED RECTIFIER

Voltage - *50 to 600 Volts* **Current** - *8.0 Amperes*

FEATURES

TO-220AC

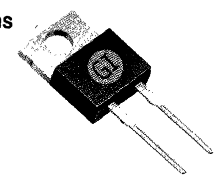




(Case Positive)
Standard Polarity
FES8

Dimensions in inches and millimeters

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low leakage, high voltage
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C, .25", (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AC fully overmolded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in.- lbs. max.

Weight: 0.08 ounce, 2.24 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FES 8AT	FES 8BT	FES 8CT	FES 8DT	FES 8FT	FES 8GT	FES 8HT	FES 8JT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	8.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0								Amps
Maximum Instantaneous Forward Voltage at 8.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								µA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance (NOTE 1)	C_J	85.0						60.0		pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JC}$	3.0								°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150								°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case.

FIG. 1 — FORWARD CURRENT DERATING CURVE

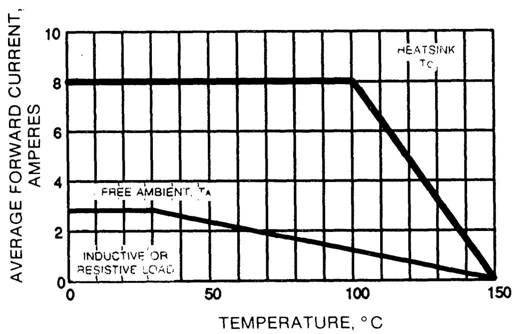


FIG.2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

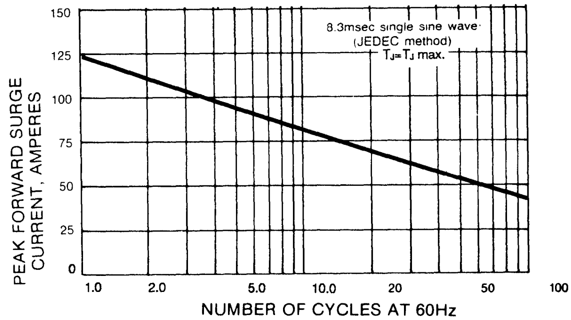


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

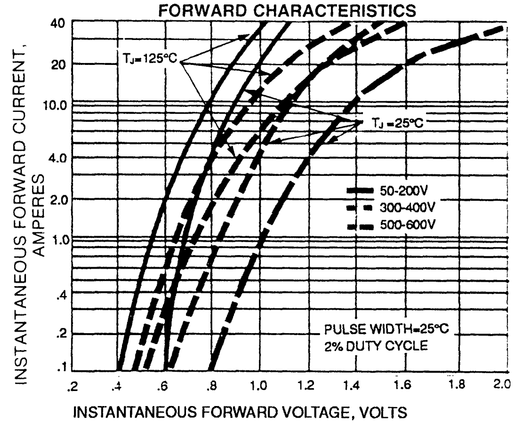


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

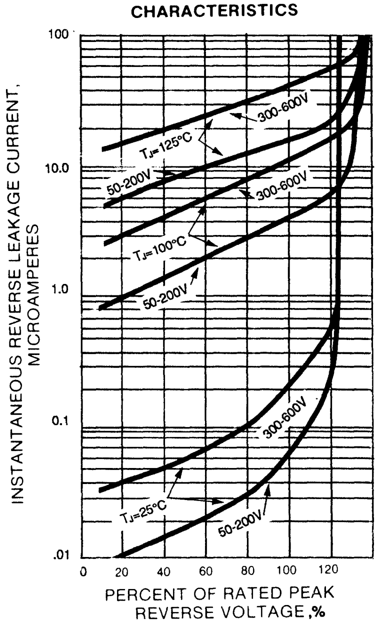
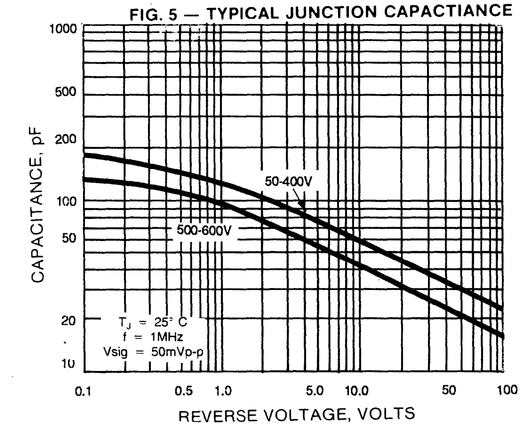


FIG. 5 — TYPICAL JUNCTION CAPACTIANCE

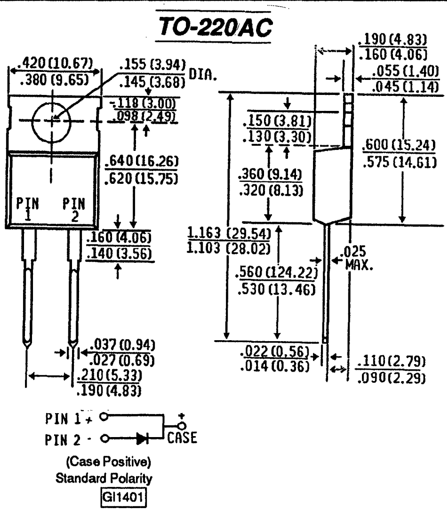


GI1401 THRU GI1404

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

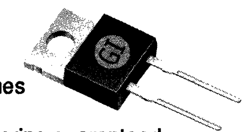
***Voltage** - 50 to 200 Volts* ***Current** - 8.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated cavity-free junction
- Low power loss
- Low leakage
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C,.25", (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lbs. max.

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	GI1401	GI1402	GI1403	GI1404	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	8.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
Maximum Instantaneous Forward Voltage at I_F=4A, T_J=100°C I_F=8A, T_J=100°C I_F=4A, T_J=25°C I_F=8A, T_J=25°C	V_F	0.800 0.895 0.900 0.975				Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	5.0 150.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	35.0				nS
Typical Junction Capacitance (NOTE 2)	C_J	85.0				pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JC}$	2.5				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES:

1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F= 0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case.

FIG.2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

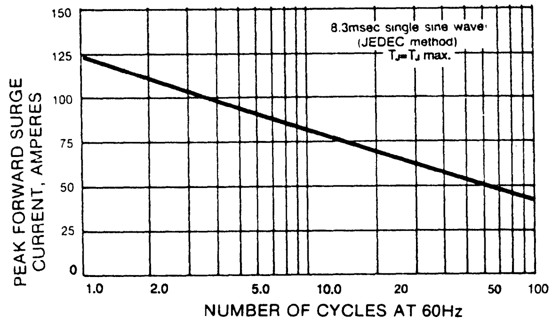


Fig. 1—FORWARD CURRENT DERATING CURVE

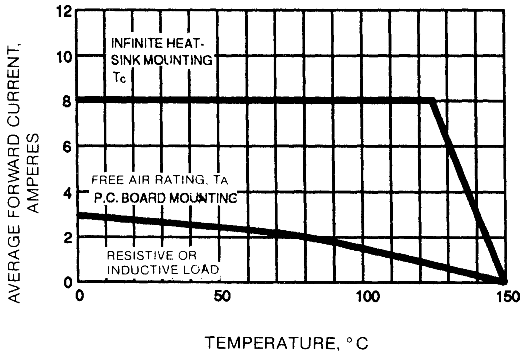


Fig. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

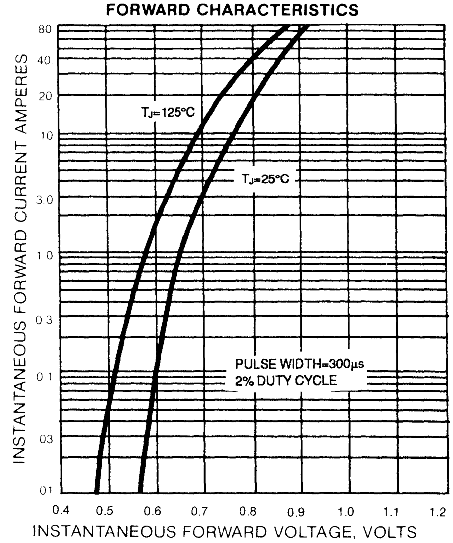


Fig. 3 — TYPICAL REVERSE CHARACTERISTICS

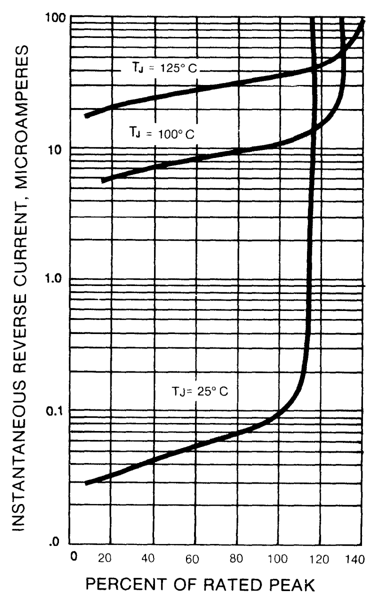
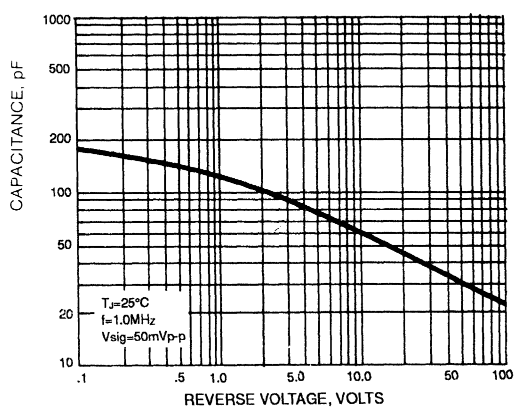


FIG. 5 - TYPICAL JUNCTION CAPACITANCE



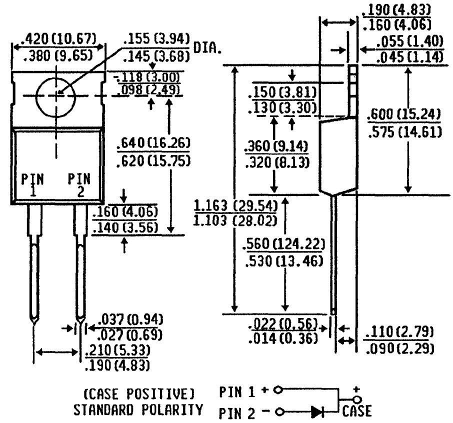
BYW29-50 THRU BYW29-200

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 8.0 Amperes*

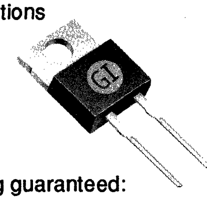
FEATURES

TO-220AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low leakage
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C, (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic

Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lbs. max.

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*BYW29-50*	*BYW29-100*	*BYW29-150*	*BYW29-200*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C= 125°C	$I_{(AV)}$	8.0				Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed T_J=150°C	I_{FSM}	100.0				Amps
Maximum Instantaneous Forward Voltage I_F=20A, T_J=25°C I_F=8A, T_J=150°C	V_F	1.3 0.8				Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0				µA
Maximum Reverse Recovery Time (NOTE 2)	T_{RR}	25.0				ns
Typical Junction Capacitance (NOTE 1)	C_J	45.0				pf
Maximum Thermal Resistance (NOTE 3)	$R_{\theta JC}$	3.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

NOTES:

1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=1A to V_R=30V, with di/dt=100A/µs.
3. Thermal Resistance from Junction to Case.

FIG. 1 — FORWARD CURRENT DERATING CURVE

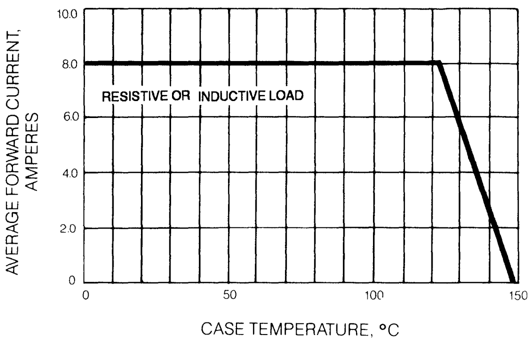


FIG. 2 — TYPICAL REVERSE CHARACTERISTICS

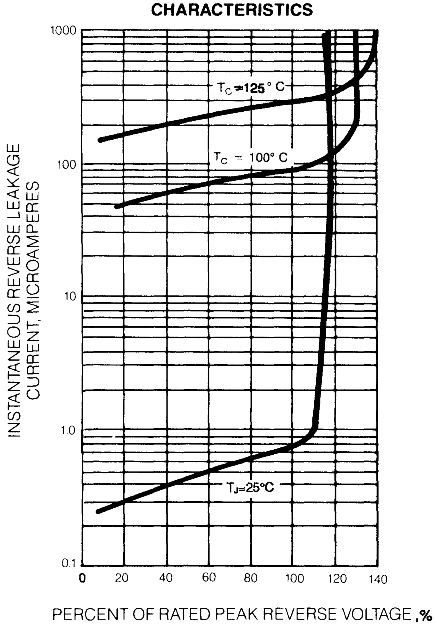


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

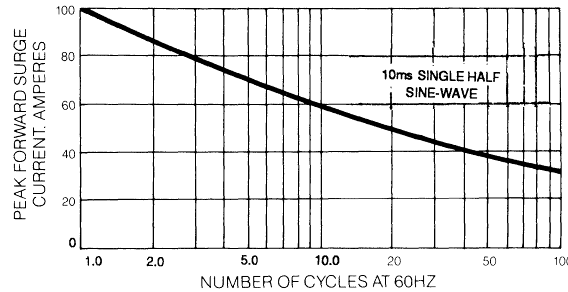


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

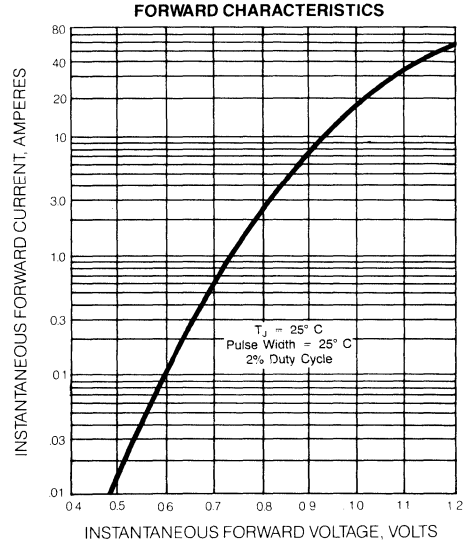
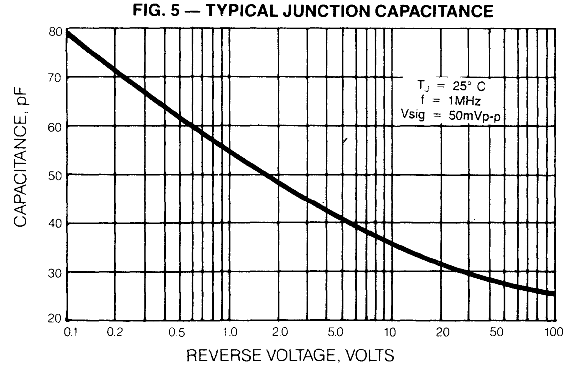


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

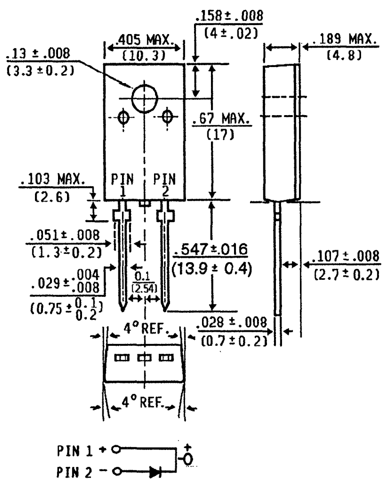


FESF16AT THRU FESF16JT

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

Voltage - *50 to 600 Volts* **Current** - *16.0 Amperes*

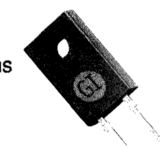
ITO-220



(Case Positive)
Standard Polarity
FESF16

Dimensions in inches and (millimeters)

FEATURES



- Isolated plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low forward voltage, high current capability
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C, .25",(6.35mm) from case for 10 seconds
- Internal Insulation: 1.5k V_{RMS}

MECHANICAL DATA

Case: JEDEC ITO-220 Fully overmolded plastic

Terminals: Plated Lead solderable per MIL-STD-750 Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lb. max.

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25ÉC ambient temperature unless otherwise specified.
Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	FESF 16AT	FESF 16BT	FESF 16CT	FESF 16DT	FESF 16FT	FESF 16GT	FESF 16HT	FESF 16JT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	16.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0								Amps
Maximum Instantaneous Forward Voltage at 16A	V_F	0.975				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								μA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance (NOTE 1)	C_J	175.0						145.0		pf
Typical Thermal Resistance (NOTE 3)	RΘJC	1.7								°C/W
Operating and Storage Temperature Range	$T_J T_{STG}$	-55 to +150								°C

NOTES:

1. Measured at 1 MHZ and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: IF=0.5A, IR=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case.

FIG. 2 — **MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT**

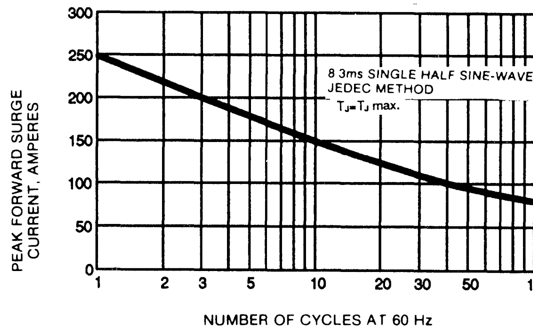


Fig. 1 — FORWARD CURRENT DERATING CURVE

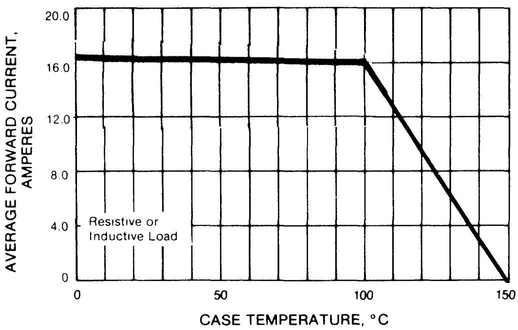


Fig. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

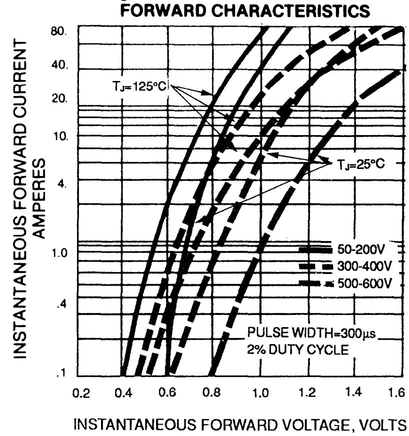


FIG. 3 — **TYPICAL REVERSE CHARACTERTISTICS**

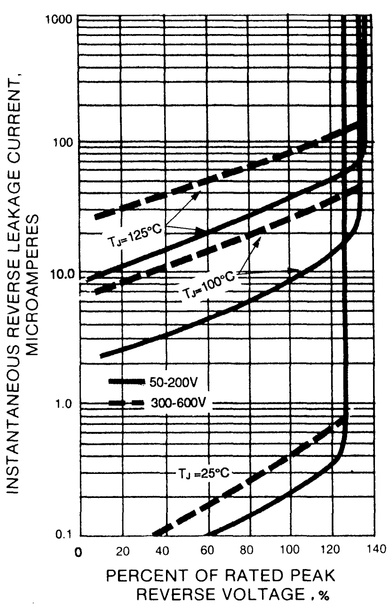
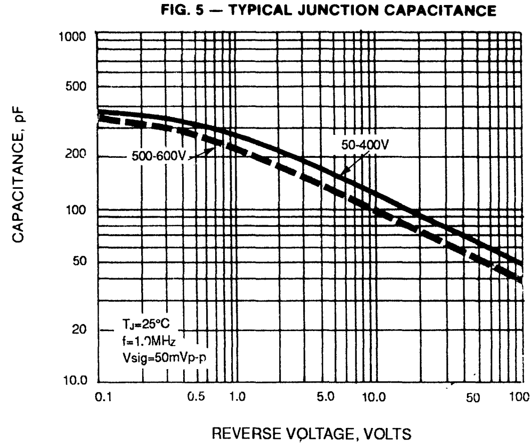


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



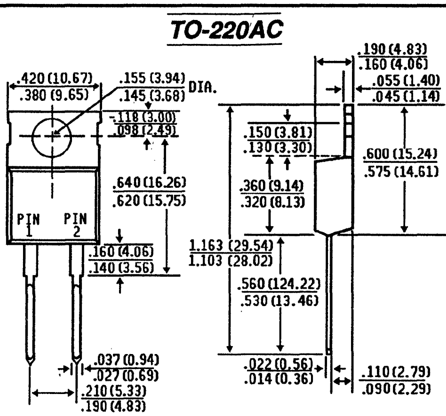
FES16AT THRU FES16JT

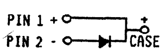
FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 16.0 Amperes*

FEATURES

TO-220AC

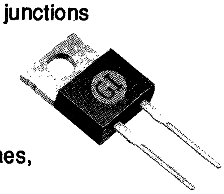




(Case Positive)
Standard Polarity
FES16

Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low forward voltage, high current capability
- High surge capability
- Superfast recovery times, for high efficiency
- High temperature soldering guaranteed: 250°C, .25", (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FES 16AT	FES 16BT	FES 16CT	FES 16DT	FES 16FT	FES 16GT	FES 16HT	FES 16JT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	16.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0								Amps
Maximum Instantaneous Forward Voltage at 16A	V_F	0.975				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								µA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance (NOTE 1)	C_J	175.0						145.0		pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JC}$	1.5								°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +175								°C

NOTES:

1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case.

Fig. 1—FORWARD CURRENT DERATING CURVE

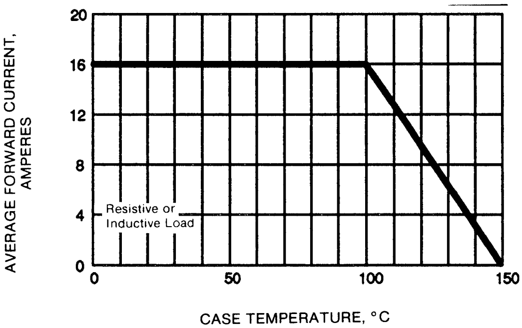


FIG. 2 — MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

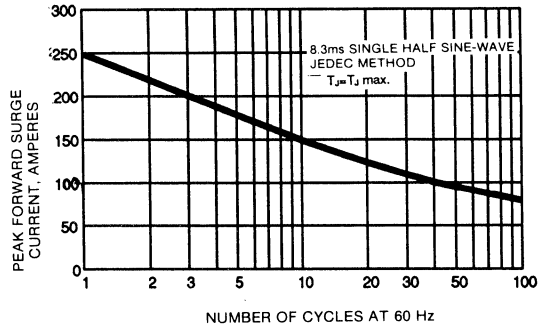


FIG. 3 —TYPICAL REVERSE CHARACTERTISTICS

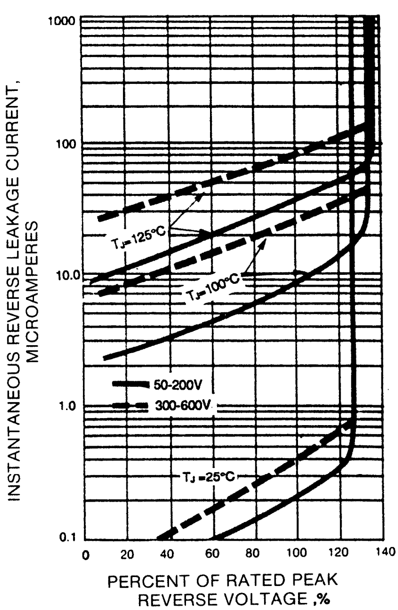


Fig. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

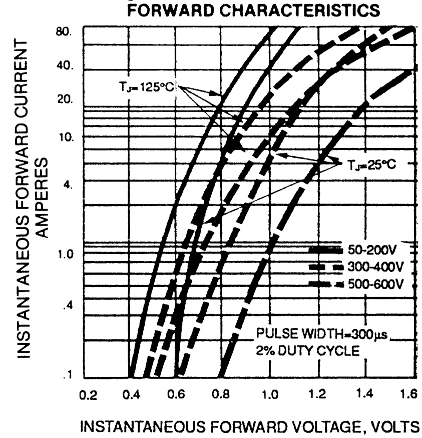
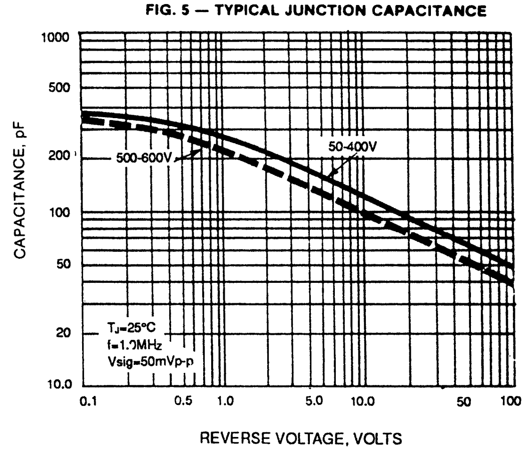


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

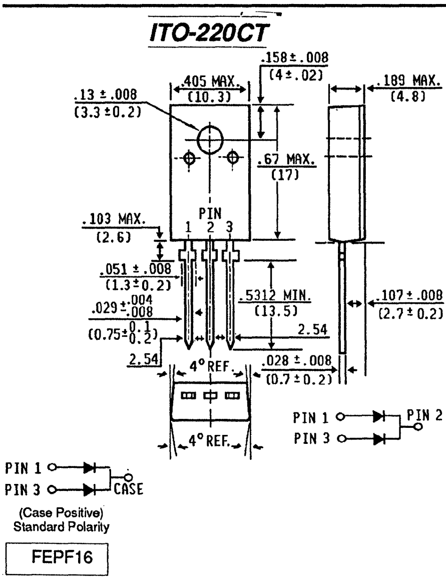


FEPF16AT THRU FEPF16JT

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

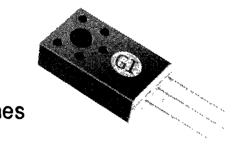
***Voltage** - 50 to 600 Volts* ***Current** - 16 .0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- Dual rectifier construction, positive centertap
- Isolated plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low forward voltage, high current capability
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C,.25", (6.35mm) from case for 10 seconds
- Internal Insulation: 1.5K V_{RMS}



MECHANICAL DATA

Case: ITO-220 fully overmolded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lbs. max.

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*FEPF 16AT*	*FEPF 16BT*	*FEPF 16CT*	*FEPF 16DT*	*FEPF 16FT*	*FEPF 16GT*	*FEPF 16HT*	*FEPF 16JT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	16.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0								Amps
Maximum Instantaneous Forward Voltage at 8.0A per leg	V_F	0.95				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								µA
Maximum Reverse Recovery Time (NOTE 2) per leg T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance per leg (NOTE 1)	C_J	85.0						60.0		pf
Typical Thermal Resistance (NOTE 3)	$R\theta JC$	2.2								°C/W
Operating and Storage Temperature Range Temperature Range	T_J, T_{STG}	-55 to +156								°C

NOTES:

1. Measured at 1 MHZ and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: IF=0.5A, IR=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

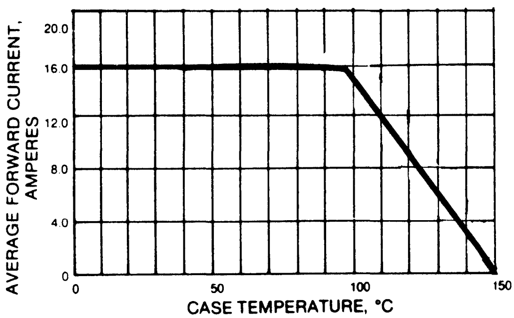


FIG. 3 TYPICAL REVERSE CHARACTERISTICS

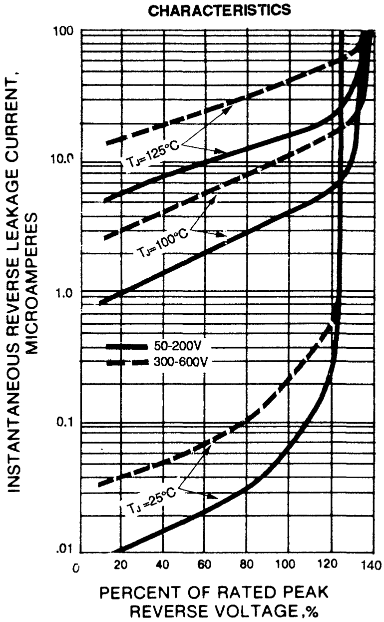


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

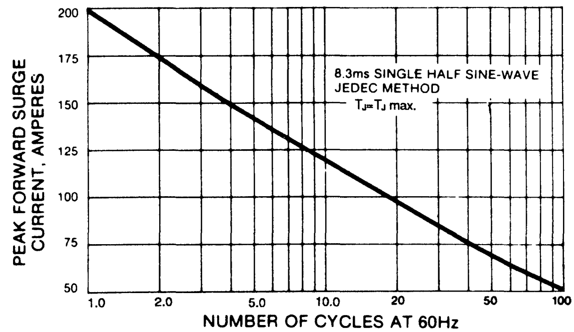


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

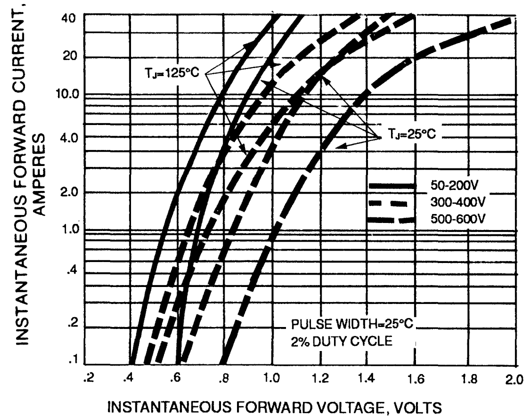
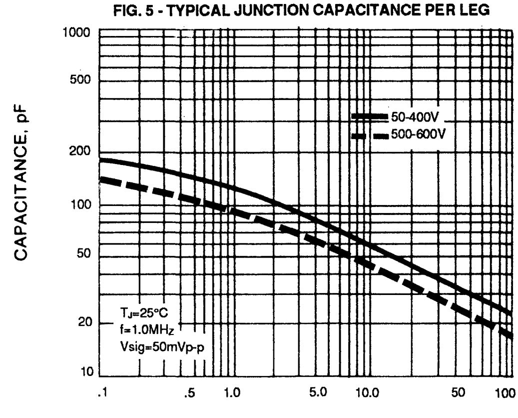


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

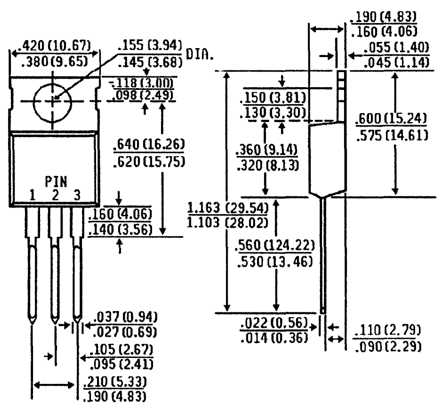


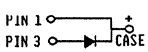
FEP16AT THRU FEP16JT

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 16.0 Amperes*

TO-220AB





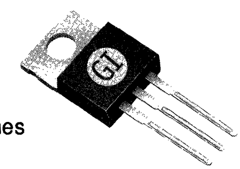
(Case Positive)

FEP16

Dimensions in inches and (millimeters)

FEATURES

- Dual rectifier construciton, positive centertap
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low forward voltage, high current capability
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C,.25", (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220-AB molded plastic

Terminals: Plated Leads solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lbs max

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FEP 16AT	FEP 16BT	FEP 16CT	FEP 16DT	FEP 16FT	FEP 16GT	FEP 16HT	FEP 16JT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	16.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0								Amps
Maximum Instantaneous Forward Voltage per leg at 8.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								μA
Maximum Reverse Recovery Time (NOTE 2) per leg T_J= 25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance per leg (NOTE 1)	C_J	85.0						60.0		pf
Maximum Thermal Resistance (NOTE 3)	$R_{\theta JC}$	3.0								°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150								°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

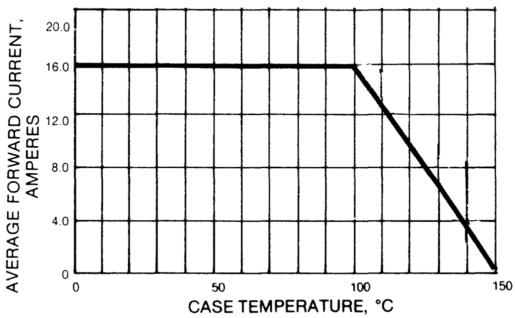


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

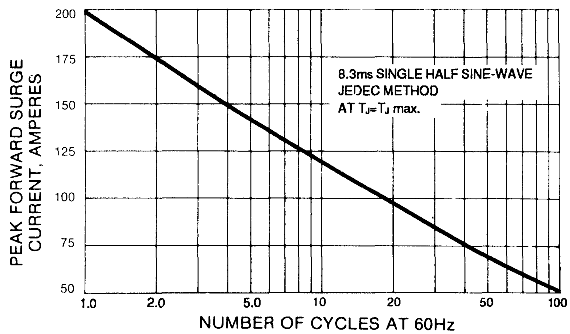


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

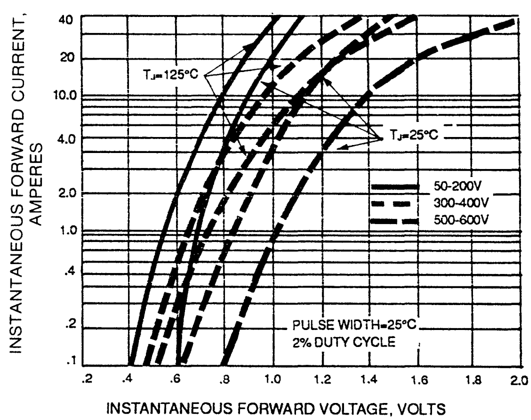


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

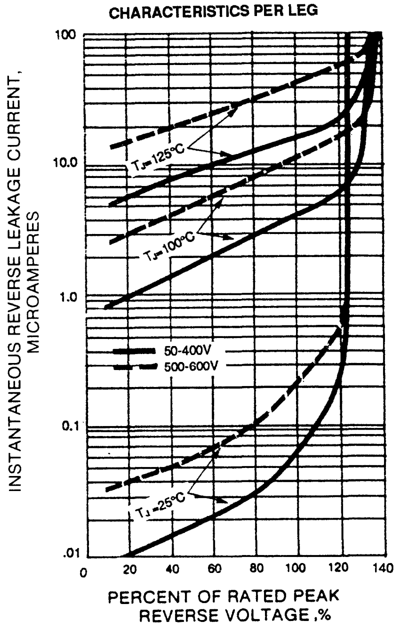
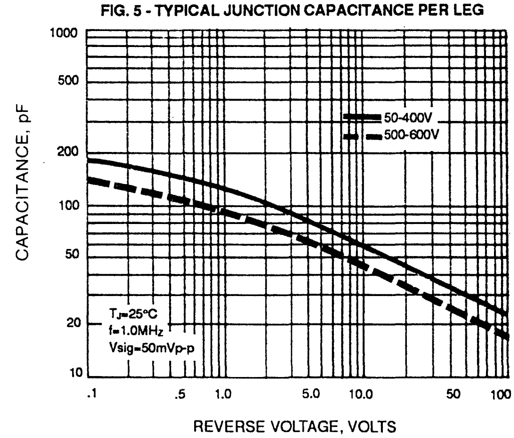


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

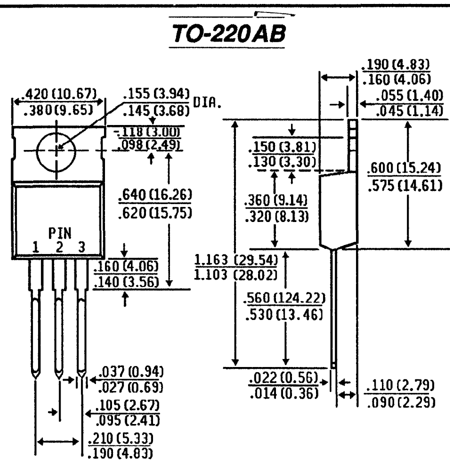


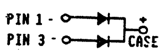
GI2401 THRU GI2404

GLASS PASSIVATED FAST EFFICIENT RECTIFIER

***Voltage** - 50 to 200 Volts* *__Current__ - 16.0 Amperes*

TO-220AB





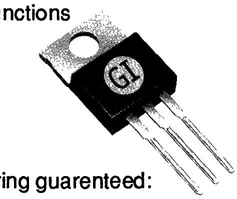
(Case Positive)
STANDARD POLARITY

GI2401

Dimensions in inches and millimeters

FEATURES

- Dual rectifier construction, positive centertap
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guarenteed: 250°C, .25",(6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220-AB molded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lbs max

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GI2401	GI2402	GI2403	GI2404	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=125°C	$I_{(AV)}$	16.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
Maximum Instantaneous Forward Voltage per leg I_F=4A, T_J=100°C / I_F=8A, T_J=100°C / I_F=4A, T_J=25°C / I_F=8A, T_J=25°C	V_F	0.800 / 0.895 / 0.900 / 0.975				Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	5.0 / 150.0			5.0 / 500.0	μA
Maximum Reverse Recovery Time per leg (NOTE 2)	T_{RR}	35.0				ns
Typical Junction Capacitance per leg (NOTE 1)	C_J	85.0				pf
Maximum Thermal Resistance (NOTE 3)	RΘJC	1.75				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150				°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case per leg.

Fig. 1—FORWARD CURRENT DERATING CURVE

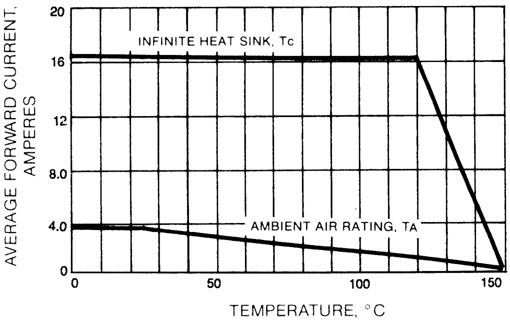


FIG.2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

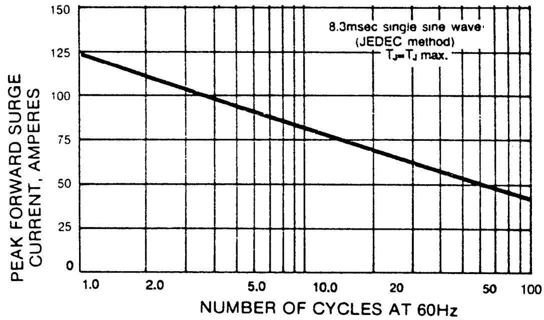


Fig. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

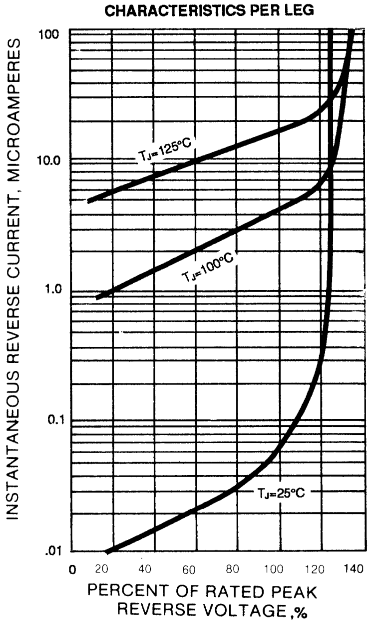


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

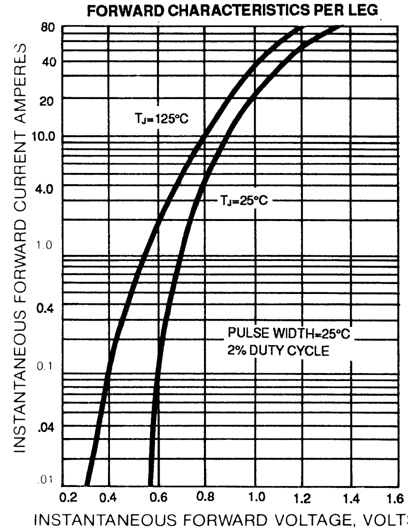
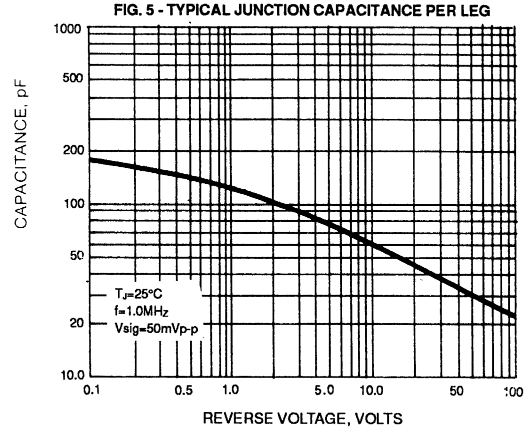


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG

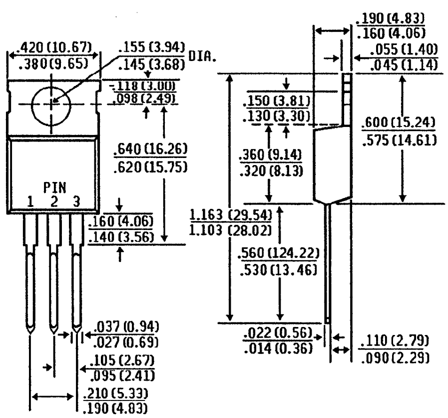


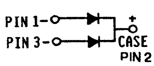
BYV32-50 THRU BYV32-200

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 150 Volts* ***Current** - 18.0 Amperes*

TO-220AB





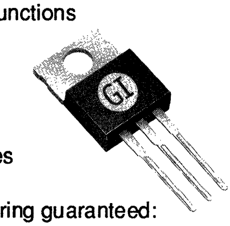
(Standard Polarity)

BYV32-50

Dimensions in inches and (millimeters)

FEATURES

- Dual rectifier construction, positive centertap
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Low power loss
- Low forward voltage, high current capability
- High surge capability
- Superfast recovery times for high efficiency
- High temperature soldering guaranteed: 250°C, .25" (6.35mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 5 in. - lbs. max

Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	BYV32-50	BYV32-100	BYV32-150	BYV32-200	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=120°C	$I_{(AV)}$	18.0				Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed T_J=150C	I_{FSM}	150.0				Amps
Maximum Instantaneous Forward Voltage per leg at I_F=20A, I_F=5.0A, T_J=100°C	V_F	1.15 0.85				Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 600.0				μA
Maximum Reverse Recovery Time per leg (NOTE 2) T_J=25°C	T_{RR}	35.0				ns
Typical Junction Capacitance (NOTE 1)	C_J	45.0				pf
Maximum Thermal Resistance per leg (NOTE 3)	RΘJC	3.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150				°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=1.0A to V_R=30V, with di/dt=100A/μs.
3. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

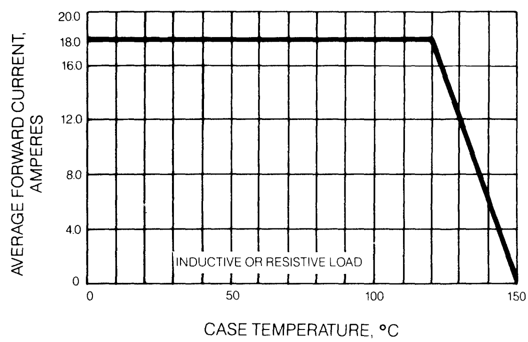


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

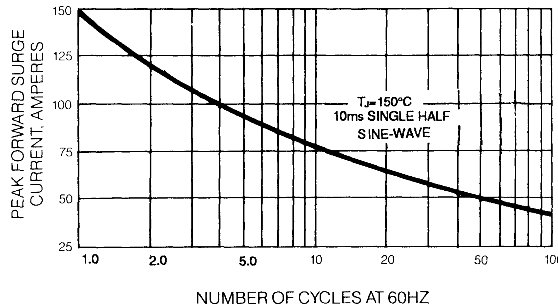


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

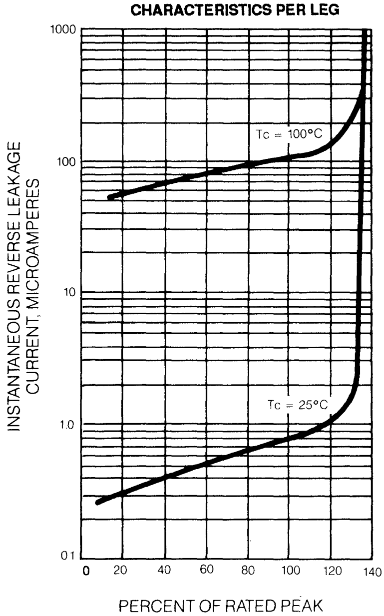


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

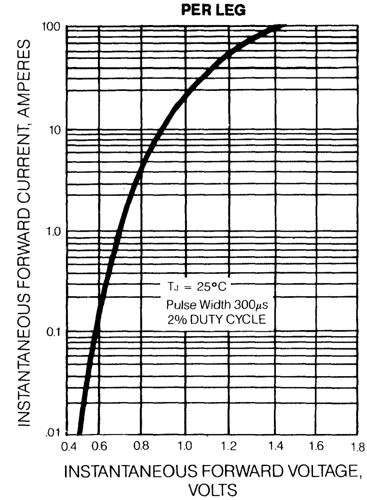
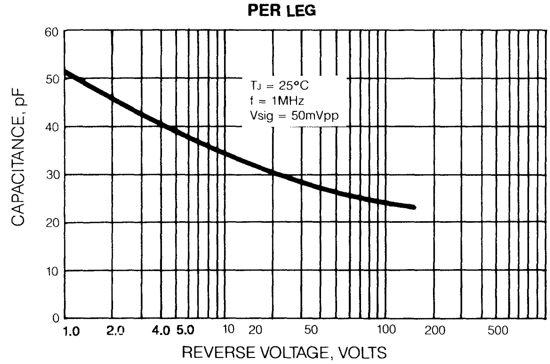


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER LEG



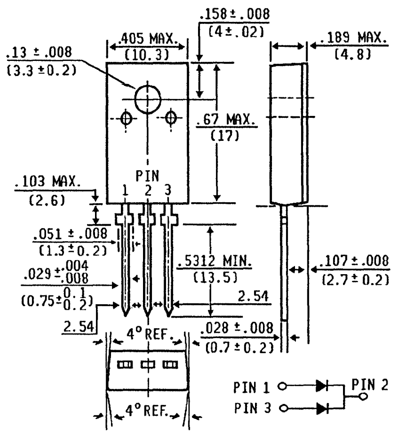
UGF18ACT THRU UGF18DCT

ULTRAFAST RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 18.0 Amperes*

FEATURES

ITO-220CT



(Standard Polarity)

Dimensions in inches and (millimeters)

- Isolated plastic package has Underwriters Laboratories Flammability Classification 94V-O
- Internal insulation resistance 1.5k V_{RMS}
- Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- Ultrafast 25 nanosecond reverse recovery times
- Soft recovery characteristics
- Excellent high temperature switching
- Glass passivated chip junctions
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: ITO-220CT Fully overmolded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UGF18ACT	UGF18BCT	UGF18CCT	UGF18DCT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	18.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0				Amps
Maximum Instantaneous Forward Voltage per leg at: 9.0A / 20A / 5.0A, T_J=100°C	V_F	1.10 / 1.20 / 0.95				Volts
Maximum DC Reverse Current T_A=25°C / at Rated DC Blocking Voltage per leg T_A=100°C	I_R	10.0 / 300.0				µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	20.0				nS
Maximum Reverse Recovery Time T_J=25°C / (NOTE 2) T_J=100°C	T_{RR}	30.0 / 50.0				ns
Maximum Stored Charge T_J=25°C / (NOTE 2) T_J=100°C	Q_{RR}	20.0 / 45.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	30.0				pf
Typical Thermal Resistance (NOTE 4)	RΘJC	4.5				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to +150				°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: I_F=9.0A, V_R=30V, di\dt=50 A/µs
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Case per element.

FIG. 1 - FORWARD CURRENT DERATING CURVE

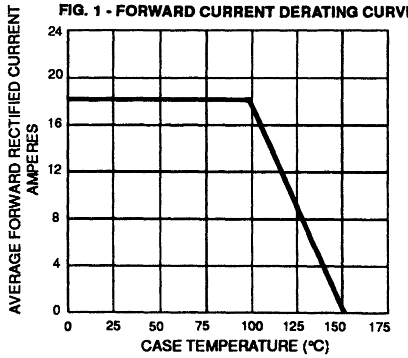


FIG. 2- MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

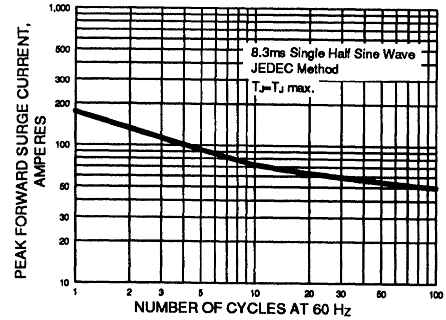


FIG. 3- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

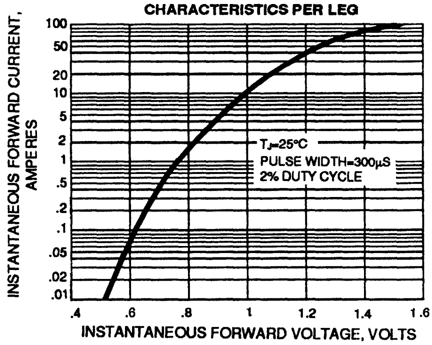


FIG.4- TYPICAL REVERSE CHARACTERISTICS PER LEG

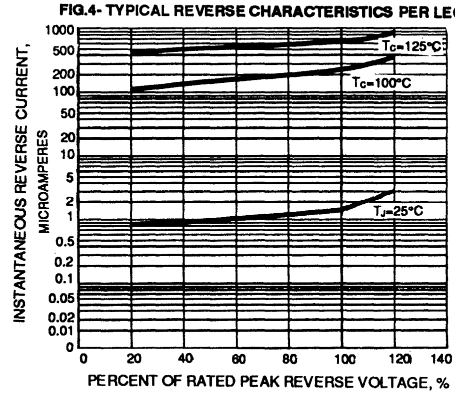


FIG 5 - REVERSE SWITCHING CHARACTERISTICS PER LEG

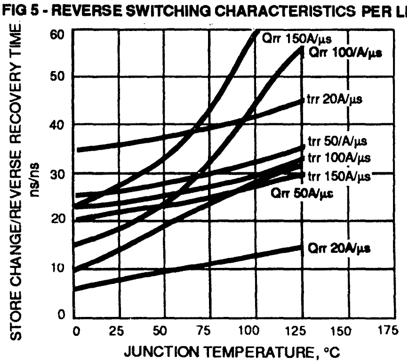
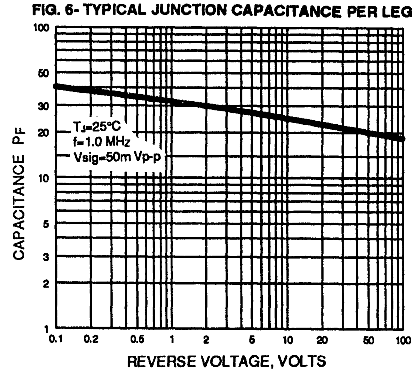


FIG. 6- TYPICAL JUNCTION CAPACITANCE PER LEG



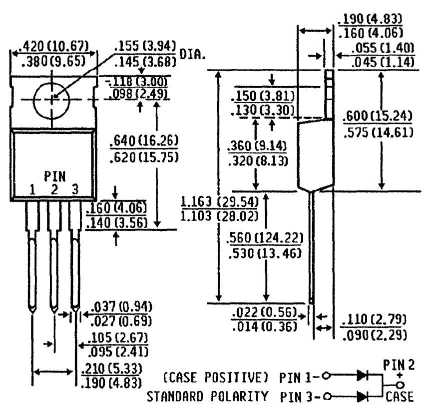
UG18ACT THRU UG18DCT

ULTRAFAST RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 18.0 Amperes*

FEATURES

TO-220AB



Dimensions in inches and (millimeters)

- ◆ Plastic package has Underwriters Laboratories Flammability Classification 94V-O
- ◆ Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- ◆ Ultrafast 25 nanosecond reverse recovery times
- ◆ Soft recovery characteristics
- ◆ Excellent high temperature switching
- ◆ Glass passivated glass junctions
- ◆ High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC TO-220AB molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 5 in. - lbs. max.
Weight: 0.08 ounce, 2.24 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UG18ACT	UG18BCT	UG18CCT	UG18DCT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=105°C	$I_{(AV)}$	18.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method) per leg	I_{FSM}	175.0				Amps
Maximum Instantaneous Forward Voltage per leg at: 9.0A 20A 5.0A, T_J=100°C	V_F	1.10 1.20 0.95				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage per leg T_A=100°C	I_R	10.0 300.0				µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	20.0				ns
Maximum Reverse Recovery Time T_J=25°C (NOTE 2) T_J=100°C	T_{RR}	30.0 50.0				ns
Maximum Stored Charge T_J=25°C (NOTE 2) T_J=100°C	Q_{RR}	20.0 45.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	30.0				pf
Typical Thermal Resistance (NOTE 4)	RθJC	4.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester :I_F=9.0A V_R=30V, di\dt=50 A/µs
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Case per element.

FIG. 1 - FORWARD CURRENT DERATING CURVE

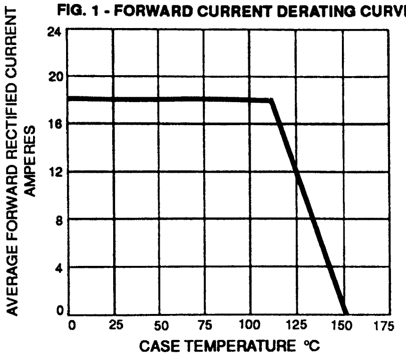


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

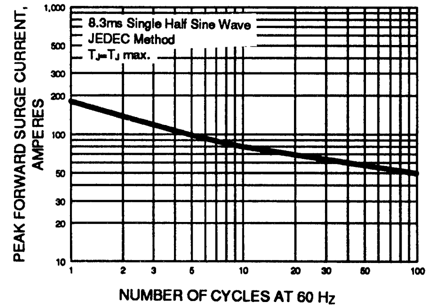


FIG. 3 - TYPICAL FORWARD CHARACTERISTICS PER LEG

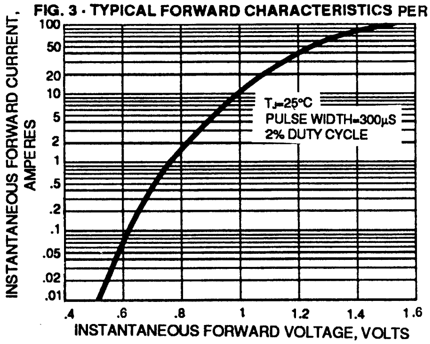


FIG. 4 - TYPICAL REVERSE CHARACTERISTICS PER LEG

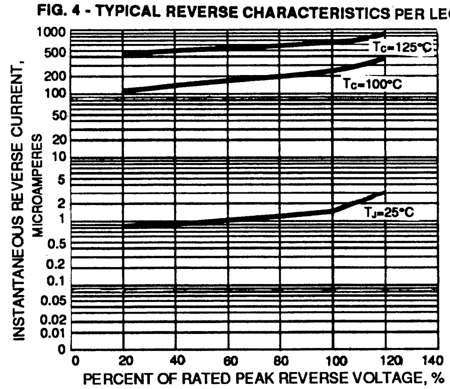


FIG 5 - REVERSE SWITCHING CHARACTERISTICS PER LEG

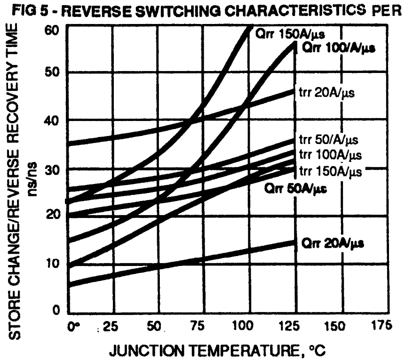
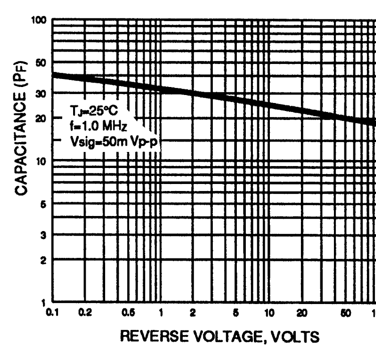


FIG. 6 - TYPICAL JUNCTION CAPACITANCE PER LEG

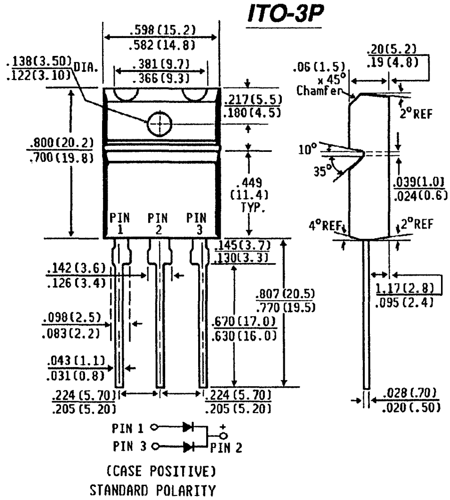


UGF30APT THRU UGF30DPT

ULTRAFAST RECTIFIER

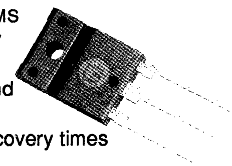
***Voltage** - 50 to 200 Volts* ***Current** - 30 Amperes*

ITO-3P



Dimensions in inches and (millimeters)

FEATURES



- Isolated Plastic material used carries Underwriters Laboratory Flammability Classification 94V-0
- Internal Insulation: 1.5k V_{RMS}
- Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- Ultrafast 30 nanosecond recovery times
- Low leakage current
- Glass passivated junction
- Soft recovery characteristics
- Excellent high temperature switching
- High temperature soldering guaranteed: 250 °C/10 seconds at terminals

MECHANICAL DATA

Case: ITO-3P Fully overmolded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in.-lb. max.
Weight: 0.037 ounce, 1.04 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*UGF30APT*	*UGF30BPT*	*UGF30CPT*	*UGF30DPT*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=120°C	$I_{(AV)}$	30.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0				Amps
Maximum Instantaneous Forward Voltage per leg at: 15A / 30A / 10A, T_J=100°C	V_F	1.0 / 1.15 / .85				Volts
Maximum DC Reverse Current T_A=25°C / at Rated DC Blocking Voltage per leg T_A=100°C	I_R	15.0 / 800.0				μA
Maximum Reverse Recovery Time Per Leg (NOTE 1)	T_{RR}	20.0				ns
Maximum Reverse Recovery Time T_J=25°C / Per Leg (NOTE 2) T_J=100°C	T_{RR}	35.0 / 50.0				ns
Maximum Stored Charge T_J=25°C / Per Leg (NOTE 2) T_J=100°C	Q_{RR}	22.0 / 50.0				nC
Typical Junction Capacitance Per Leg (NOTE 3)	C_J	75.0				pf
Typical Thermal Resistance (NOTE 4)	$R_{\Theta JC}$	1.5				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. T_{RR} andd Q_{RR} measured on LEM tester: V_R=30V, di\dt=50 A/μs I_F = 15.0A
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to Case per element.

FIG. 1 - FORWARD CURRENT DERATING CURVE

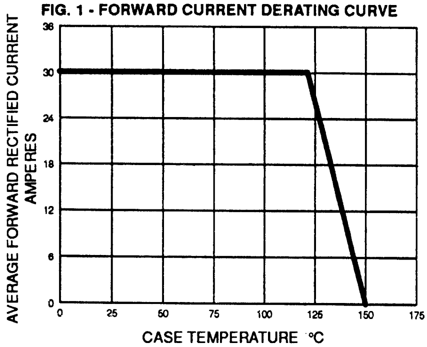


FIG. 2- MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

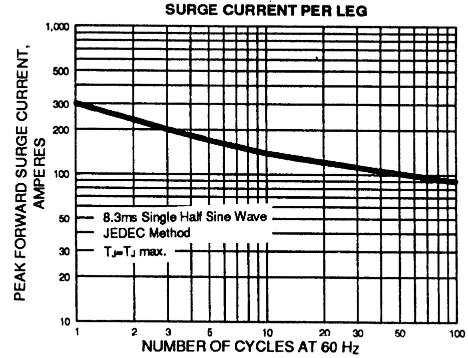


FIG. 3- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

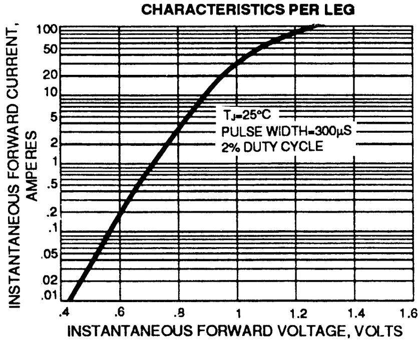


FIG.4- TYPICAL REVERSE CHARACTERISTICS PER LEG

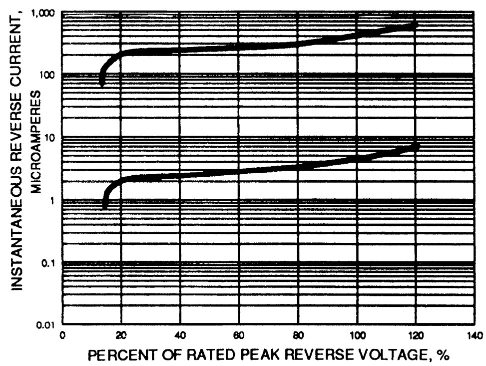


FIG 5 - REVERSE SWITCHING CHARACTERISTICS PER LEG

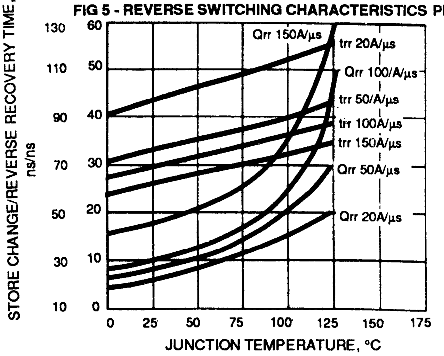
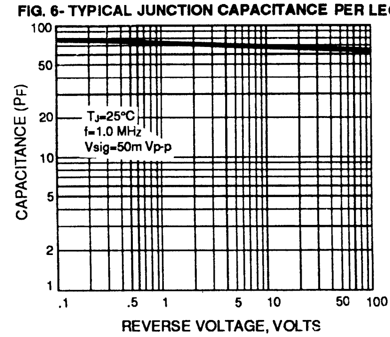


FIG. 6- TYPICAL JUNCTION CAPACITANCE PER LEG



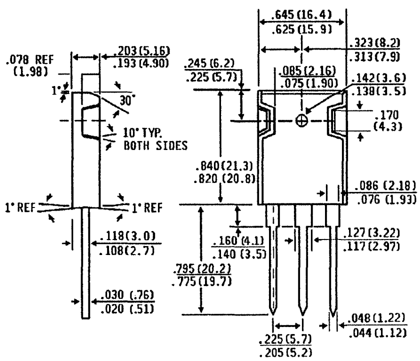
UG30APT THRU UG30DPT

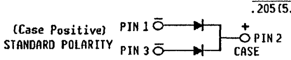
ULTRAFAST RECTIFIER

***Voltage** - 50 to 200 Volts* ***Current** - 30.0 Amperes*

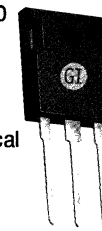
FEATURES

TO- 247AD





Dimensions in inches and (millimeters)



- Plastic material used carries Underwriters Laboratory Flammability Classification 94V-0
- Ideally suited for use in very high frequency switching power supplies, inverters and as a free wheeling diodes
- Ultrafast 15 nanosecond recovery typical
- Low leakage current
- Glass passivated chip junctions
- Soft recovery characteristics
- Excellent with temperature switching
- High temperature soldering guaranteed: 250 °C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC TO-247-AD molded plastic
Terminals: Lead solderable per MIL-STD-202, Method 208
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in.-lb.max.
Weight : .2 ounce, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	UG30APT	UG30BPT	UG30CPT	UG30DPT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_C=120°C	$I_{(AV)}$	30.0				Amps
Peak Forward Surge Current 8.3 ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0				Amps
Maximum Instantaneous Forward Voltage per leg at 15A 30A 10A T_J=100°C	V_F	1.0 1.15 0.85				Volts
Maximum DC Reverse Current at T_A =25°C Rated DC Blocking Voltage per leg T_A =100°C	I_R	5.0 800.0				µA
Maximum Reverse Recovery Time Per Leg (NOTE 1)	T_{RR}	20.0				ns
Maximum Reverse Recovery Time T_J= 25°C Per Leg (NOTE 2) T_J=100°C	T_{RR}	35.0 50.0				ns
Maximum Stored Charge T_J=25°C Per Leg (NOTE 2) T_J=100°C	Q_{RR}	22.0 50.0				nC
Typical Junction Capacitance Per Leg (NOTE 3)	C_J	150.0				pf
Typical Thermal Resistance (NOTE 4)	RΘJC	1.0				°C/W
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-55 to 150				°C

NOTES: 1. Reverse Recovery Test Conditions: I_F =0.5A, I_R = 1.0A, recover to 0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: I_F=15.0A, V_R=30V, di\dt=50 A\µs
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
4. Thermal Resistance from Junction to case per element.

FIG. 1 - FORWARD CURRENT DERATING CURVE

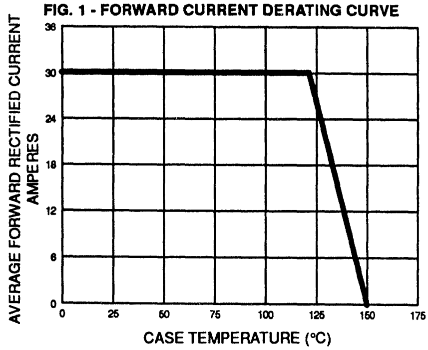


FIG. 2- MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

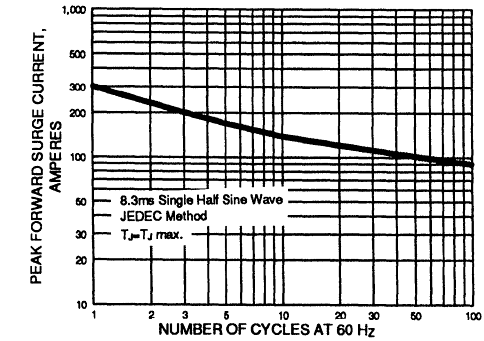


FIG. 3- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

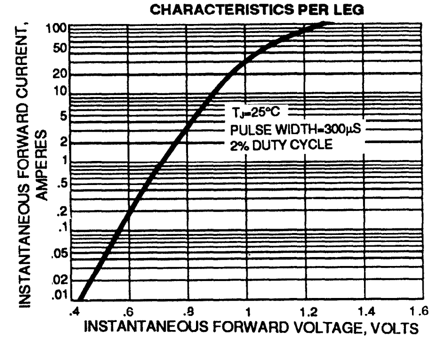


FIG.4- TYPICAL REVERSE CHARACTERISTICS PER LEG

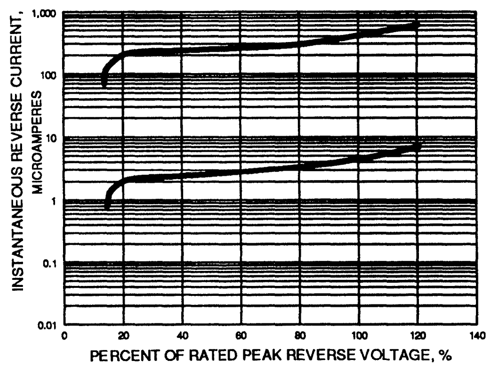


FIG 5 - REVERSE SWITCHING CHARACTERISTICS PER LEG

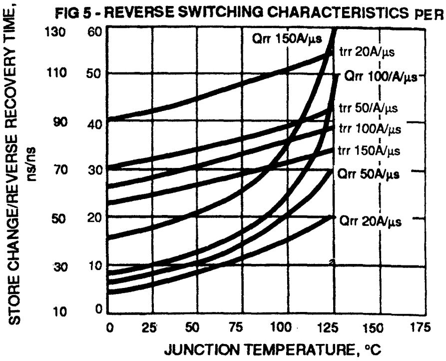
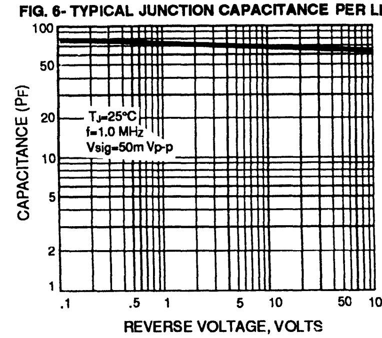


FIG. 6- TYPICAL JUNCTION CAPACITANCE PER LEG



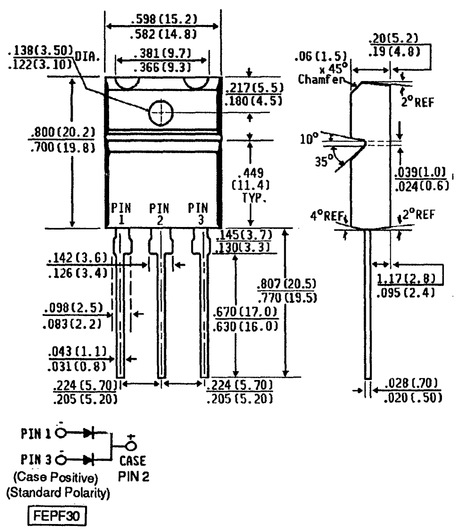
FEPF30AP THRU FEPF30JP

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 30.0 Amperes*

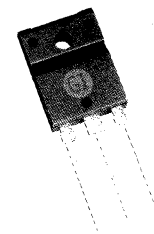
FEATURES

ITO-3P



Dimensions in inches and (millimeters)

- Dual rectifier construction, positive centertap
- Isolated Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- Glass passivated chip junctions
- Superfast recovery times,high voltage
- Low forward voltage, high current capability
- Low thermal resistance
- Low power loss, high efficiency
- High temperature soldering guaranteed: 250°C, .17", (4.3mm) from case for 10 seconds
- Internal Insulation: 1.5k V_{RMS}



MECHANICAL DATA

Case: ITO-3P Fully overmolded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any
Mounting Torque: 10 in.-lb. max.
Weight: 0.47 ounce, 13.2 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	FEPF 30AP	FEPF 30BP	FEPF 30CP	FEPF 30DP	FEPF 30FP	FEPF 30GP	FEPF 30HP	FEPF 30JP	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	30.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0								Amps
Maximum Instantaneous Forward Voltage at 15.0A per leg	V_F	0.95				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 500.0								µA
Maximum Reverse Recovery Time (NOTE 2) per leg T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance per leg (NOTE 1)	C_J	175.0						145.0		pf
Thermal Resistance (NOTE 3)	$R_{\Theta JC}$	2.0								°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150								°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

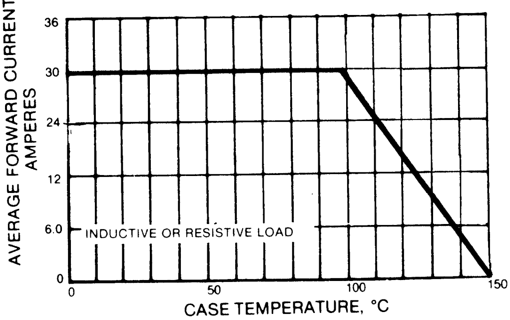


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

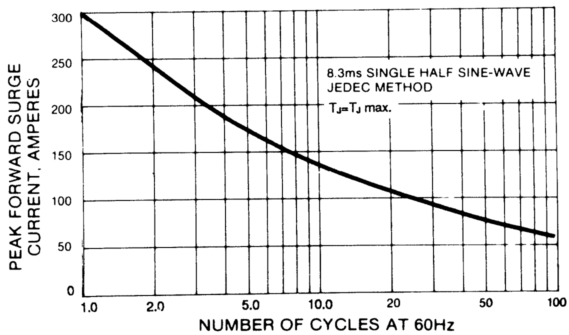


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

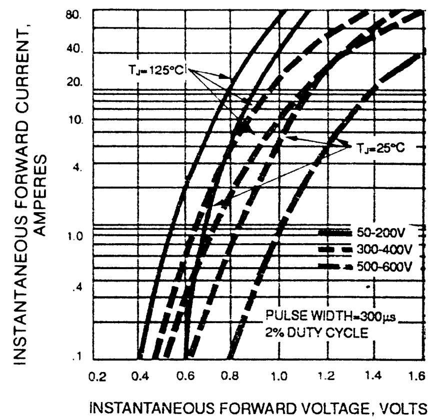


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

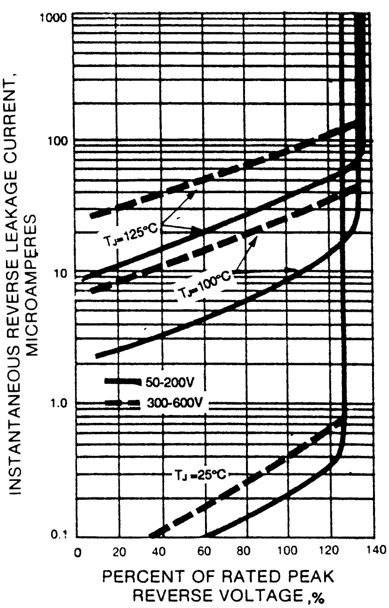
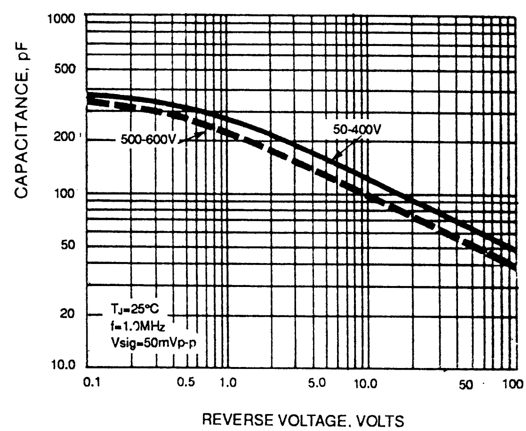


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



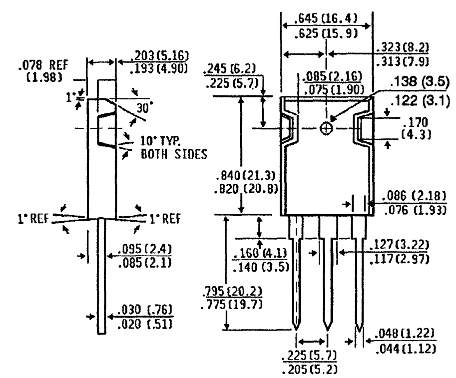
General Instrument

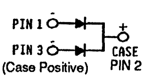
FEP30AP THRU FEP30JP

FAST EFFICIENT GLASS PASSIVATED RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 30.0 Amperes*

TO-247AD





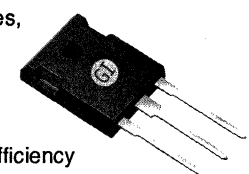
(Case Positive) (Standard Polarity)

FEP30

Dimensions in inches and (millimeters)

FEATURES

- Dual rectifier constructlon, positive centertap
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junctions
- Superfast recovery times, high voltage
- Low forward voltage, high current capability
- Low thermal resistance
- Low power loss, high efficiency
- High temperature soldering guaranteed: 250°C,.17", (4.3mm) from case for 10 seconds



MECHANICAL DATA

Case: JEDEC TO-247-AD molded plastic

Terminals: Plated Leads solderable per MIL-STD-750, Method 2026

Polarity: As marked

Mounting Position: Any

Mounting Torque: 10 in. - lbs. max

Weight: 0.2 ounce, 5.6 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	FEP 30AP	FEP 30BP	FEP 30CP	FEP 30DP	FEP 30FP	FEP 30GP	FEP 30HP	FEP 30JP	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	30.0								Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0								Amps
Maximum Instantaneous Forward Voltage per leg at 15.0A	V_F	0.95				1.3		1.5		Volts
Maximum DC Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C= 100°C	I_R	10.0 500.0								μA
Maximum Reverse Recovery Time (NOTE 2) per leg T_J=25°C	T_{RR}	35.0				50.0				ns
Typical Junction Capacitance per leg (NOTE 1)	C_J	175.0						145.0		pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JC}$	1.0								°C/W
Operating and Storage Temperature Range Temperature Range	$T_J T_{STG}$	-55 to +150								°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Case per leg.

FIG. 1 — FORWARD CURRENT DERATING CURVE

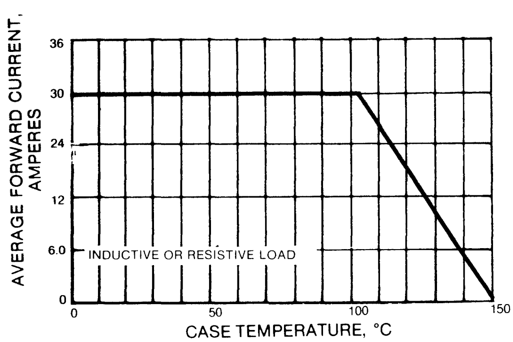


FIG. 2 —MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER LEG

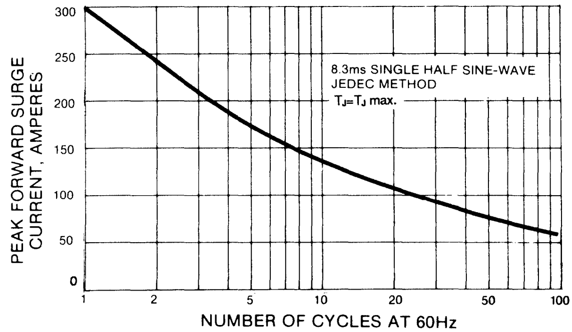


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER LEG

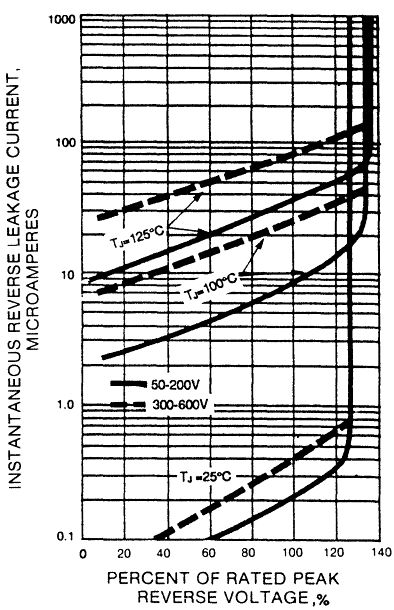


FIG. 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER LEG

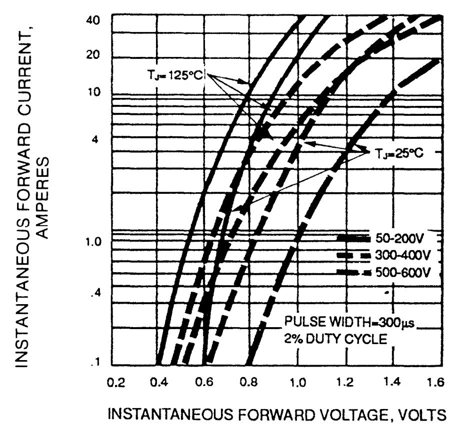
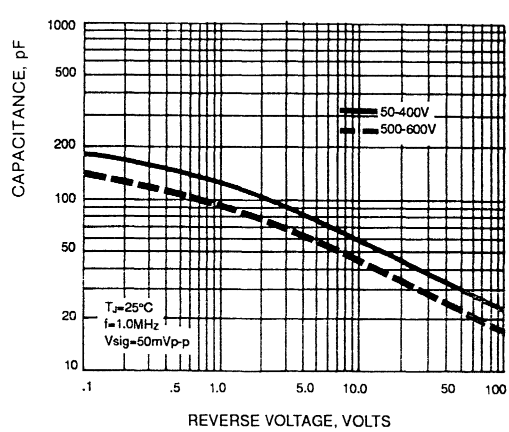


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER LEG



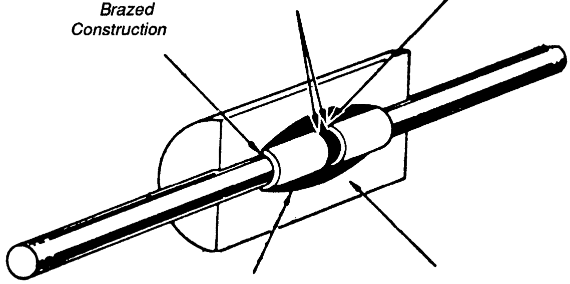
GI General Instrument

SUPERECTIFIERS

0.25 TO 3.0 AMPERES
50 VOLTS TO 4000 VOLTS

General Instrument

SUPERECTIFIER
.25 to 3.0 Amperes 50 Volts to 4000 Volts



Introduction

No other .25 to 3.0 Ampere rectifiers of any kind - plastic, glass, or metal - can match (or even approach) **SUPERECTIFIER**'s combination of features...the result of General Instrument's unique glass-plastic construction:

- *Brazed at greater than 600°C at both leads and die-eliminates all soft solders*
- *Exclusive UL recognized flame-retardant epoxy molding compound rated 94V-0, the highest available*
- *Patented glass passivation*
- *Reliability proved equal to military requirements*
- *Hermetically sealed construction*
- *Cost effective construction at plastic prices*

General Instrument's **SUPERECTIFIER** is exactly that...a super rectifier. There is nothing else in the world like it.

In cell construction, most other rectifiers rated up to 3.0 Amperes are soft soldered or are only pressure contacted and silastic passivated. **SUPERECTIFIER** uses a patented brazed construction and glass passivation to seal its junction hermetically.

In device encapsulation, again **SUPERECTIFIER** is the only one that won't go up in flames. It is one of the few rectifiers using an exclusive flame-RETARDANT molding compound, rated UL94V-0, the highest rating available. Other plastic rectifiers use flame-ENHANCING compounds. Here again, **SUPERECTIFIER**'s superiority is manifest. With this construction it exceeds environmental standards of MIL-S-19500.

In summary, **SUPERECTIFIER** is the world's only rectifier with totally brazed construction, with a patented glass passivated junction, and with flame-retardant molding encapsulation.

FAMILIES OF GENERAL INSTRUMENT SUPERECTIFIER

Glass Passivated Junction Plastic Rectifiers 0.25 to 1.5 AMPERES

Types:
1N3611GP thru 1N3614GP
1N4001GP thru 1N4007GP
1N4245PG thru 1N4249GP
1N5059GP thru 1N5062GP
1N5391GP thru 1N5399GP
GI250-1 thru GI250-2
GP02-20 thru GP02-40
GP08A thru GP08J
GP10A thru GP10Y
GP15A thru GP15M

Features:
- *High Temperature Metallurgically Bonded*
- *Plastic Package has Underwriters Laboratory Classification 94V-0*
- *Glass Passivated Junction overmolded in epoxy packages for easy handling*
- *Io rated current operation at 55 °C Ambient Temperature with no Thermal Runaway*
- *Capable of meeting Environmental Standards of MIL-S-19500*
- *High Temperature Soldering Guaranteed 350°C/10 Second/.375", 9.5mm Lead Length at 5lbs. 2.25kg Tension*
- *Tin Plated Axial Leads, Solderable per MIL-STD-202 Methqd 208*

Glass Passivated Junction Plastic Rectifiers 2.0 to 3.0 AMPERES

Types:
1N5624GP thru 1N5627GP
GP20A thru GP20J
GP25A thru GP25M
GP30A thru GP30M

Features:
- *High Temperature Metallurgically Bonded*
- *Plastic Package has Underwriters Laboratory Classification 94V-0*
- *Glass Passivated Junction overmolded in epoxy packages for easy handling*
- *Io rated current operation at 55 C Ambient Temperature with no Thermal Runaway*
- *Typical less than 0.1 μ A*
- *Capable of meeting Environmental Standards of MIL-S-19500*
- *Tin Plated Axial Leads, Solderable per MIL-STD-202 Method 208*
- *High Temperature Soldering Guaranteed 350 °C/10 Second/.375", (9.5mm) Lead Length at 5 lbs (2.25kg) Tension*

Fast Recovery Glass Passivated Junction Plastic Rectifiers 0.50 to 3.0 AMPERES

Types:
1N4942GP thru 1N4948GP
RGP02-12E thru RGP02-20E
RGP10Athru RGP10M
RGP15A thru RGP15M
RGP20Athru RGP20J
RGP25A thru RGP25M
RGP30A thru RGP30M
BA157GP thru BA159GP

Features:
- *High Temperature Metallurgically Bonded*
- *Fast switching for High Rectification Efficiency to 100kHz*
- *Plastic Package has Underwriters Laboratory Classification 94V-0*
- *Capable of meeting Environmental Standards of MIL-S-19500*
- *Includes all Advantages of the* **SUPERECTIFIER** *Design*
- *Tin Plated Axial Leads, Solderable per MIL-STD-202 Method 208*
- *High Temperature Soldering Guaranteed: 350 °C/10 Second/.375", (9.5mm) Lead Length at 5 lbs. (2.25kg)Tension*

QUICK GUIDE TO SUPERECTIFIERS

TYPE	RGP02* -12E thru -20E	GP02 -20 thru -40	GP1250 -1 thru -4	TYPE	BA157GP* thru BY159GP*	GP08A thru GP08J	GP10A thru GP10M	1N3611GP thru 1N3614GP& 1N3957GP	1N4001GP thru 1N4007GP	1N4245GP thru 1N4249GP	1N4933GP* thru 1N4937GP*
CASE	DO-204AL	DO-204AL	DO-204AL	CASE	DO-204AL	DO-204AL	DO-204AL	DO-204AL	DO-204AL	DO-204AL	DO-204AL
Io(A)	0.5	0.25	0.25	Io(A)	0.5	0.8	1.0	1.0	1.0	1.0	1.0
@TA(C°)	55	55	75	@TA(°C)	55	55	55	100	75	55	75
VR=1000(V)			G1250-1	VR= 50(V)		GP08A	GP10A		1N4001GP		1N4933GP
VR=1200(V)	RG02-12E			VR=100(V)		GP08B	GP10B		1N4002GP		1N4934GP
VR=1400(V)	RG02-14E			VR=200(V)		GP08D	GP10D	1N3611GP	1N4003GP	1N4245GP	1N4935GP
VR=1600(V)	RG02-16E			VR-300(V)		GP08G					
VR=1800(V)	RG02-18E			VR=400(V)	BA157GP		GP10G	1N3612GP	1N4004GP	1N4246GP	1N4936GP
VR=2000(V)	RG02-20E	GP02-20	G1250-2	VR= 500(V)		GP08J					
VR=2500(V)		GP02-25		VR= 600(V)	BA158GP		GP10J	1N3613GP	1N4005GP	1N4247GP	1N4937GP
VR=3000(V)		GP02-30	G1250-3	VR- 800(V)	BA159DGP		GP10K	1N3614GP	1N4006GP	1N4248GP	
VR=3500(V)		GP02-35		VR=1000(V)	BA159GP		GP10M	1N3957GP	1N4007GP	1N4249GP	
VR=4000(V)		GP02-40	G1250-4	V_R=>1000V			GP10N-Y				
SURGE(A)	20	15	15		20	25	30	30	30	25	30
VF(V)	1.8	3.0	3.5		1.3	1.3	1.1	1.1	1.1	1.2	1.2

*FAST RECOVERY

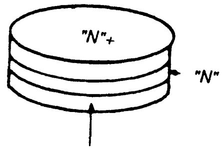
QUICK GUIDE TO SUPERECTIFIERS

*TYPE	1N4383GP thru 1N4586GP	1N5059GP thru 1N5062GP	AGP15-200 thru AGP15-800	GP15A thru GP15M	1N5391GP thru 1N5399GP	RGP15A* thru RGP15M*	GP20A thru GP20J	RGP20A thru RGP20J*	RGP25A thru RGP25M*	1N5624GP thru 1N5627GP	GP30A thru GP30M	RGP30A* thru RGP30*
*CASE	DO-204AC	DO-204AC	DO-204AC	DO-204AC	DO-204AC	DO-204AC			DO201AD	DO201AD	DO201AD	DO201AD
Io(A)	1.0	1.0	1.5	1.5	1.5	1.5	2.0	2.0	2.5	3.0	3.0	3.0
@TA(C°)	55	55	55	55	55	55	55	55	55	70	55	55
VR= 50(V)				GP15A	1N5391GP	RGP15A	GP20A	RGP20A	RGP25A		GP30A	RGP30A
VR= 100(V)				GP15B	1N5392GP	RGP15B	GP20B	RGP20B	RGP25B		GP30B	RGP30B
VR= 200(V)	1N4383GP	1N5059GP	AGP15-200	GP15D	1N5393GP	RGP15D	GP20D	RGP20D	RGP25D	1N5624GP	GP30D	RGP30D
VR= 300(V)					1N5394GP							
VR= 400(V)	1N4384GP	1N5060GP	AGP15-400	GP15G	1N5395GP	RGP15G	GP20G	RGP20G	RGP25G	1N5625GP	GP30G	RGP30G
VR= 500(V)					1N5396GP							
VR= 600(V)	1N4385GP	1N5061GP	AGP15-600	GP15J	1N5397GP	RGP15J	GP20J	RGP20J	RGP25J	1N5626GP	GP30J	RGP30J
VR= 800(V)	1N4585GP	1N5062GP	AGP15-800	GP15K	1N5398GP	RGP15K			RGP25K	1N5627GP	GP30K	RGP30K
VR=1000(V)	1N4586GP	1N5399GP		GP15M		RGP15M			RGP25M		GP30M	RGP30M
*												
SURGE(A)	50	50	50	50	50	50	65	65	65	100	125	125
VF(V)	V_F=1.0	1.2	V_F=1.1	1.1	1.4	1.3	1.1	1.3	1.3	1.0	1.1	1.3

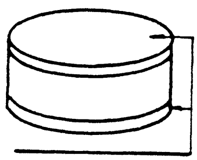
*FAST RECOVERY

GLASS RECTIFIER PROCESS

Diffused Slice

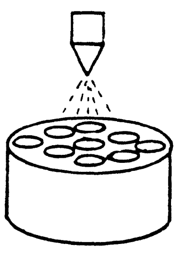


1-Diffuse a PN junction into a slice of silicon.



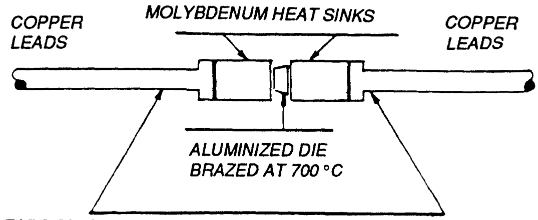
EVAPORATED ALUMINUM

2-Evaporate aluminum on both sides of the slice to make metallurgical contact.



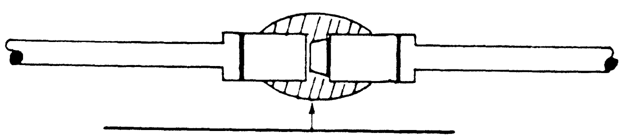
SAND BLASTED ROUND DICE

3-Sandblast the slice to produce a round beveled die.



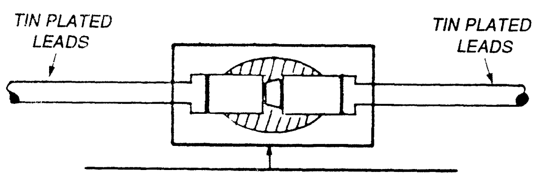
LEADS BRAZED TO MOLYBDENUM HEATSINKS

4. Braze the die between two molybdenum heat sinks to which leads have been attached at approximately 700°C.



GLASS BODY AND PASSIVATION

5-Clean the assembly by chemically etching, washing and drying.
6-Apply glass in the form of a frit to the die and molybdenum assembly.
7-Melt the glass by heating in an oven to approximately 600 °C.



OVERMOLDED FLAME-RETARDANT EPOXY

8-Overmold glass passivated construction with UL recognized flame-retardant 94V-0 classification epoxy.
9-Perform finishing operations such as lead tinning, electrical testing and marking.

Package Design

The small size of the superectifier with its capability up to 3 Amperes permits packing densities in electronic assemblies and equipment, while increasing reliability. Only high temperature brazing operations are used to withstand the 600°C required to melt and fuse the glass. This technique eliminates solder construction and tremendously enhances mechanical strength and temperature cycling capability, increasing operating and storage temperature range while reducing thermal resistance.

Reliability

Specified reliability data on Superectifier devices are available from the General Instrument Semiconductor Components Reliability Department. The basic design of the superectifier devices and the strict positive controls over materials and manufacturing processes provide assurance of failure-free performance under the most severe conditions. Processing facilities have been geared to follow the procedural requirements of Military Standard 750 and are capable of withstanding environmental extremes in excess of MIL-S-19500. Assurance of production uniformity and reliability is provided by a test technique called "Operational Load Line Testing", which has proven product reliability with over 1 Billion Superectifiers now in use.

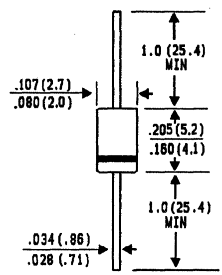
GP02-20 THRU GP02-40

MINIATURE HIGH VOLTAGE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 2000 to 4000 Volts* ***Current** - 0.25 Amperes*

PATENTED*

DO-204AL



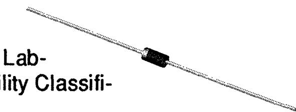
Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375",(9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.012 ounce, .3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GP02 -20	GP02 -25	GPO2 -30	GPO2 -35	GPO2 -40	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	2000	2500	3000	3500	4000	Volts
Maximum RMS Voltage	V_{RMS}	1400	1750	2100	2450	2800	Volts
Maximum DC Blocking Voltage	V_{DC}	2000	2500	3000	3500	4000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	0.25					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=55°C	I_{FSM}	15.0					Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	3.0					Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0					µA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.0					µs
Typical Junction Capacitance (NOTE 1)	C_J	3.0					pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	130.0					°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175					°C

NOTES:

1. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, I_{rr}=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

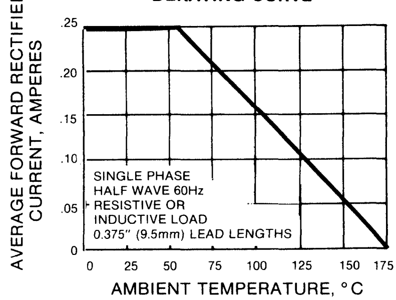


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

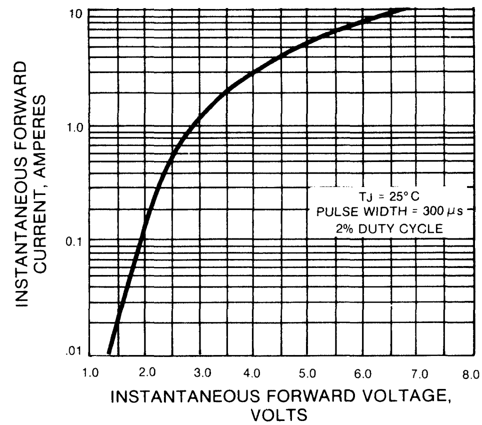


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

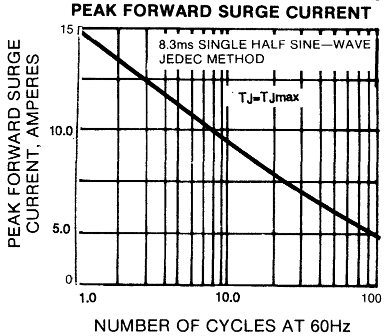


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

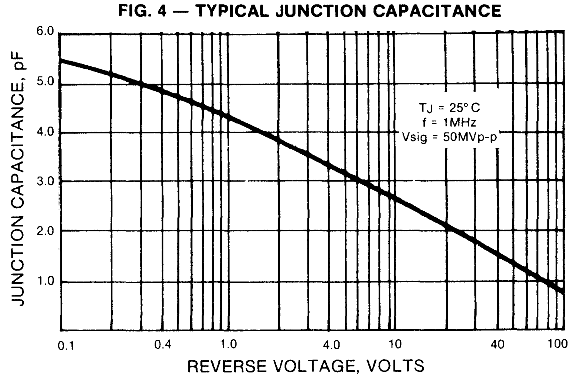


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

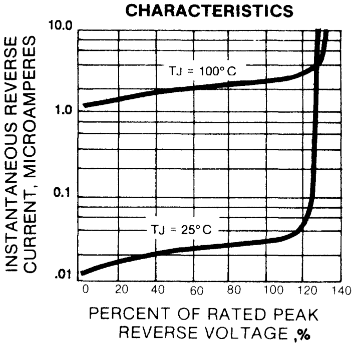
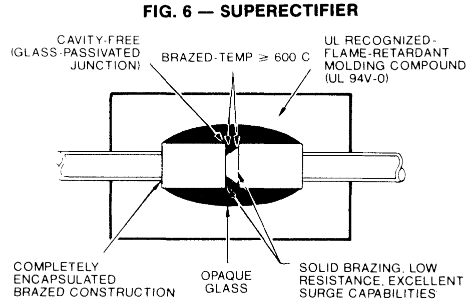


FIG. 6 — SUPERECTIFIER



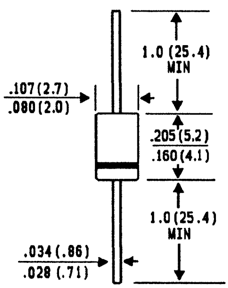
GI250-1 THRU GI250-4

MINIATURE HIGH VOLTAGE GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 1000 to 4000 Volts* ***Current** - 0.25 Amperes*

PATENTED*

DO-204AL



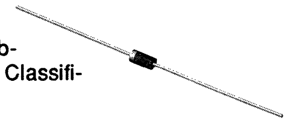
Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Glass passivated cavity-free junction
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.012 ounce, .3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GI250-1	GI250-2	GI250-3	GI250-4	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1000	2000	3000	4000	Volts
Maximum RMS Voltage	V_{RMS}	700	1400	2100	2800	Volts
Maximum DC Blocking Voltage	V_{DC}	1000	2000	3000	4000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$	0.25				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load at T_A=75°C (JEDEC Method)	I_{FSM}	15.0				Amps
Maximum Instantaneous Forward Voltage at 0.25A	V_F	3.5				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0				µA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.0				µs
Typical Junction Capacitance (NOTE 1)	C_J	3.0				pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	130.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175				°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

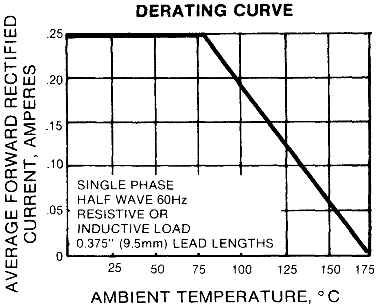


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

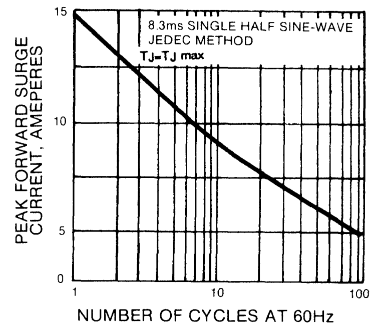


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

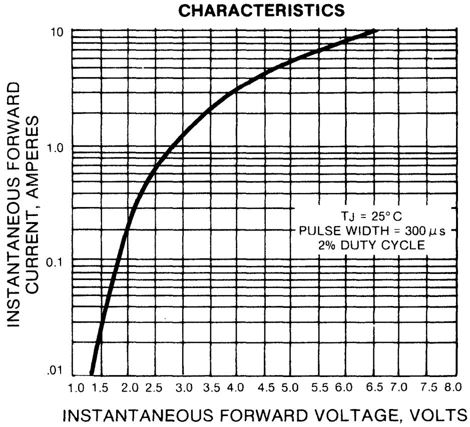


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

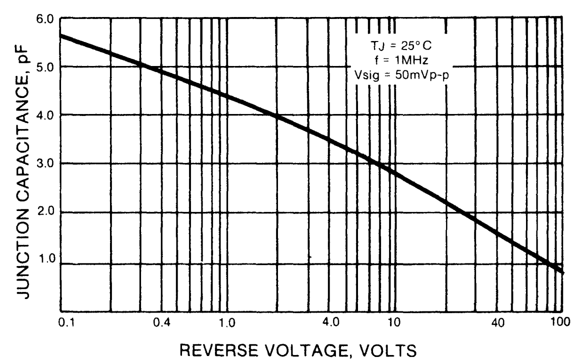


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

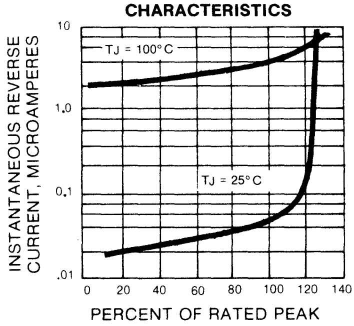
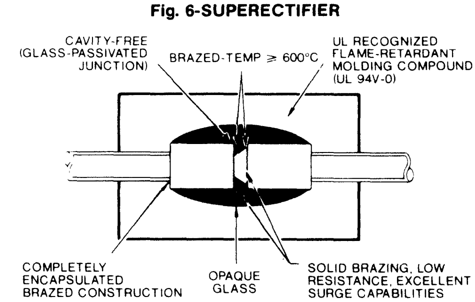


Fig. 6-SUPERECTIFIER



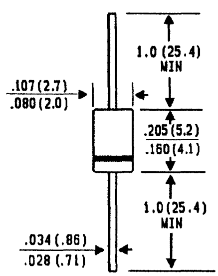
GP08A THRU GP08J

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 0.8 Amperes*

PATENTED*

DO-204AL

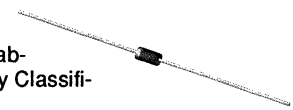


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- ◆ High temperature metallurgically bonded constructed rectifiers
- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ◆ Glass passivated cavity-free junction
- ◆ 0.8 Ampere operation at T_A= 55°C with no thermal runaway
- ◆ Typical I_R less than 0.1μ A
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, .3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GP08A	GP08B	GP08D	GP08G	GP08J	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A =55°C	$I_{(AV)}$			0 .8			Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=55°C	I_{FSM}			25.0			Amps
Maximum Instantaneous Forward Voltage at 0.8A	V_F			1.3			Volts
Maximum Full Load Reverse Current Full Cycle Average 375" (9.5mm)Lead Lengths at T_A=55°C	$I_{R(AV)}$			30.0			μA
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R			5.0 50.0			μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}			2.0			μs
Typical Junction Capacitance (NOTE 2)	C_J			8.0			pf
Typical Thermal Resistance (NOTE 3)	RθJA			45.0			°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}			-65 to +175			°C

NOTES:
1. Measure on I_F =0.5A, I_R =1.0A, Irr =.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

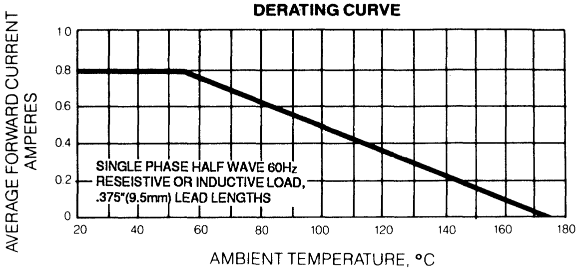


FIG. 2 TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

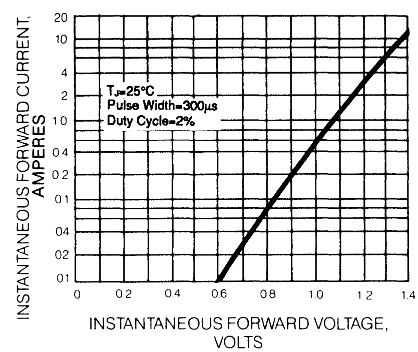


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

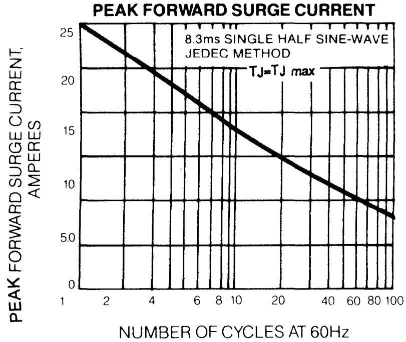


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

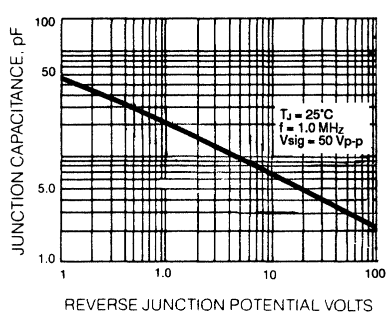


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

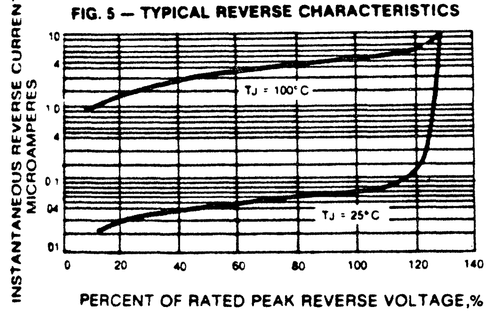
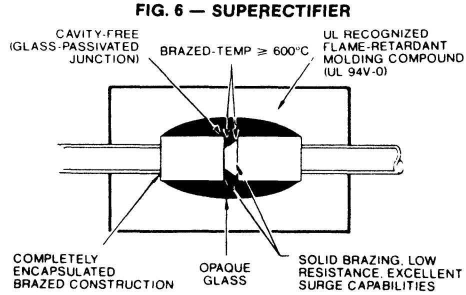


FIG. 6 — SUPERECTIFIER



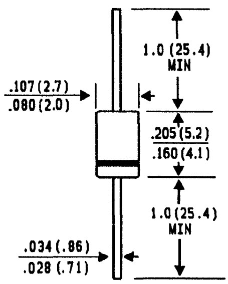
1N3611GP THRU 1N3614GP AND 1N3957GP

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.0 Ampere*

*

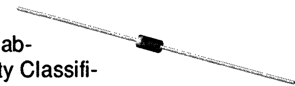
DO-204AL



Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, .3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N 3611GP	1N 3612GP	1N 3613GP	1N 3614GP	1N 3957GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Amps
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$			1.0			Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			30.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.0			Volts
* Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R			1.0 300.0			μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}			2.0			μs
Typical Junction Capacitance (NOTE 2)	C_J			10.0			pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$			45.0			°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}			-65 to +175			°C

NOTES:
1. Reverse Recovery Test Conditions : I_F=0.5A, I_R = 1.0A, Irr =.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

* JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

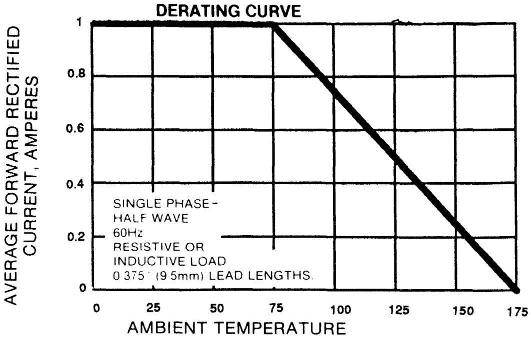


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

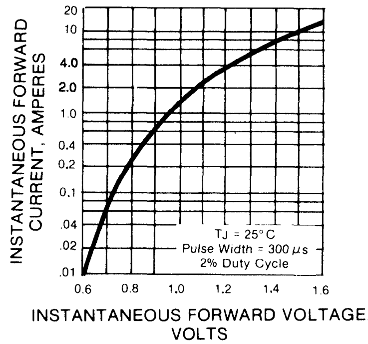


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

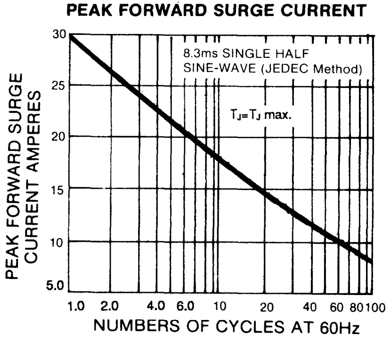


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

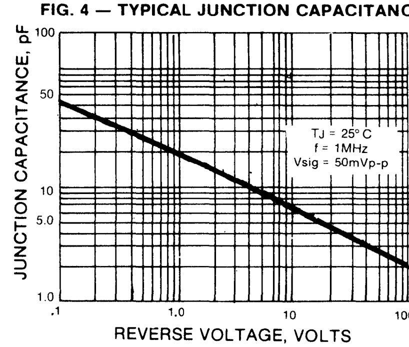


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

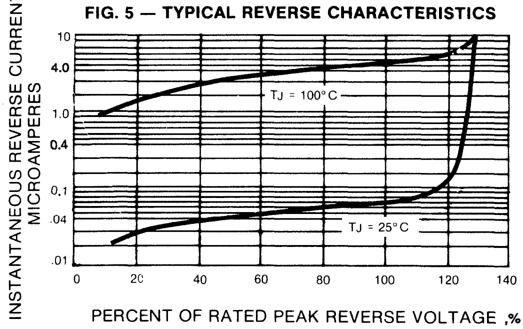
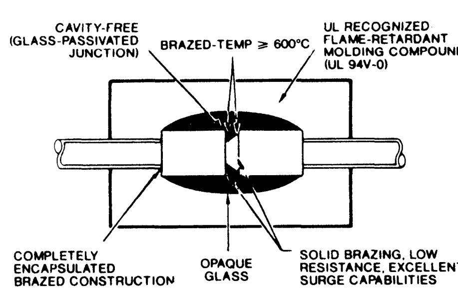


FIG. 6 — SUPERECTIFIER



1N4001GP THRU 1N4007GP

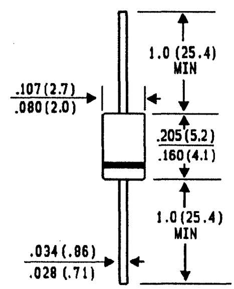
MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** -1.0 Ampere*

FEATURES

PATENTED*

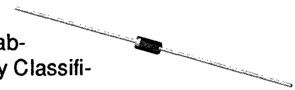
DO-204AL



Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER ®



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A= 75°C with no thermal runaway
- Typical I_R less than 0.1 μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Axial leads, solderable per MIL-STD-202, Method 208
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N 4001GP	1N 4002GP	1N 4003GP	1N 4004GP	1N 4005GP	1N 4006GP	1N 4007GP	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
*Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$	1.0							Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.1							Volts
*Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A= 75°C	$I_{R(AV)}$	30.0							μA
*Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0							μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}	2.0							μS
Typical Junction Capacitance (NOTE 2)	C_J	8.0							pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	45.0							°C/W
*Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr= 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
* JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

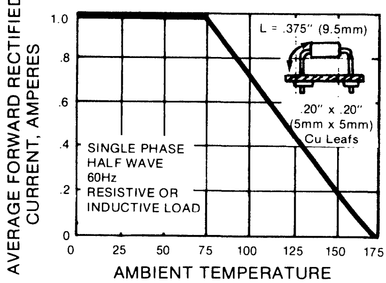


FIG. 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

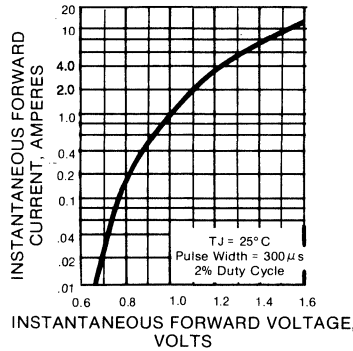


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

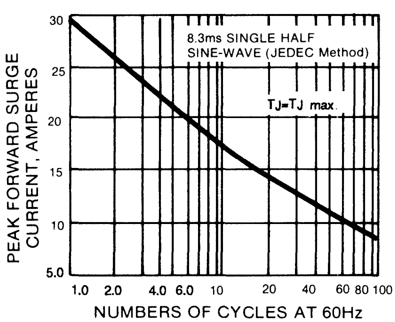


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

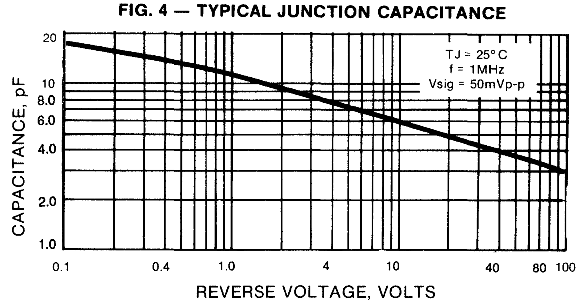


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

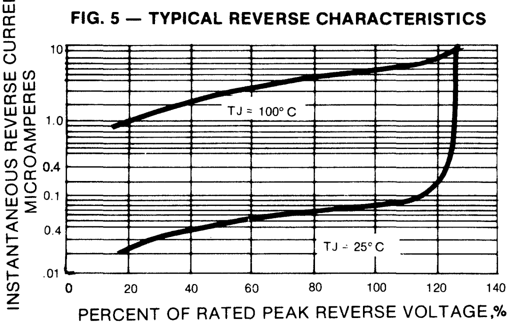
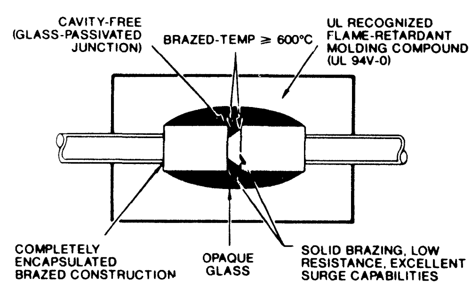


FIG. 6 — SUPERECTIFIER



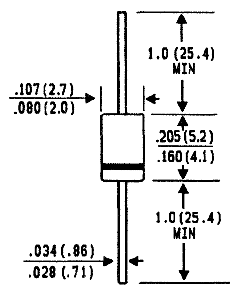
1N4245GP THRU 1N4249GP

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

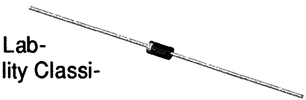
DO-204AL



Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

FEATURES



- ◆ High temperature metallurgically bonded constructed rectifiers
- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- ◆ Glass passivated cavity-free junction
- ◆ 1.0 Ampere operation at T_A=55°C with no thermal runaway
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, .3 gram

SUPERECTIFIER ®

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N 4245GP	1N 4246GP	1N 4247GP	1N 4248GP	1N 4249GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$			1.0			Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			25.0			Amps
* Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.2			Volts
* Maximum Full Load Reverse Current Full Cycle Average .375" (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$			50.0			µA
* Maximum Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=125°C	I_R			1.0 / 25.0			µA
Typical Junction Capacitance (NOTE 1)	C_J			8.0			pf
Typical Thermal Resistance (NOTE 2)	RθJA			45.0			°C/W
* Operating Junction Temperature Range	T_J			-65 to +160			°C
* Storage Temperature Range	T_{STG}			-65 to +175			°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
* JEDEC registered values

FIG.1 — FORWARD CURRENT DERATING CURVE

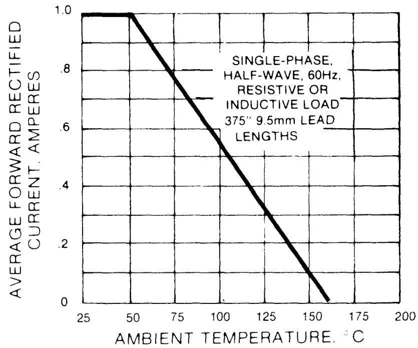


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

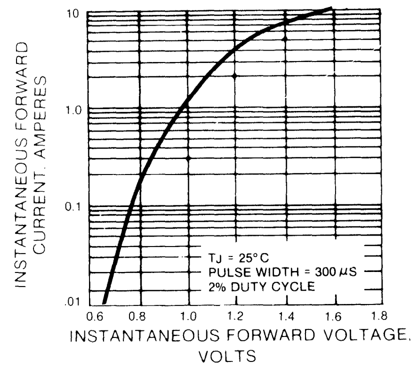


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

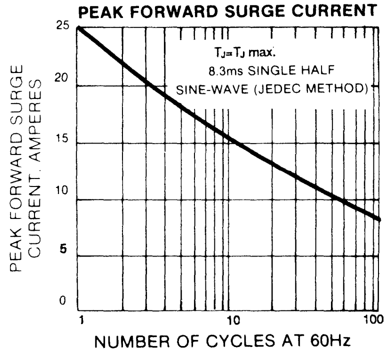


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

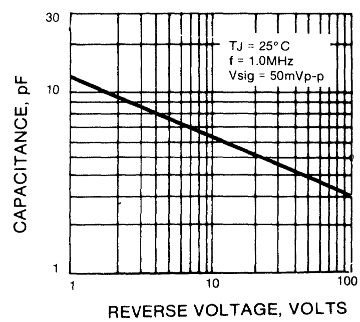


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

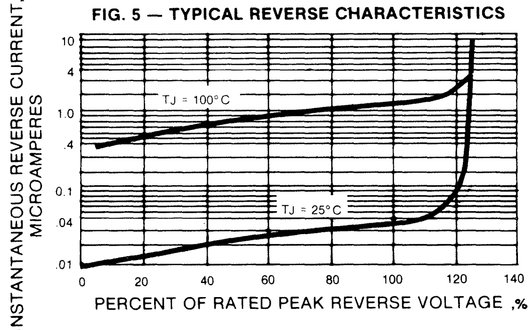
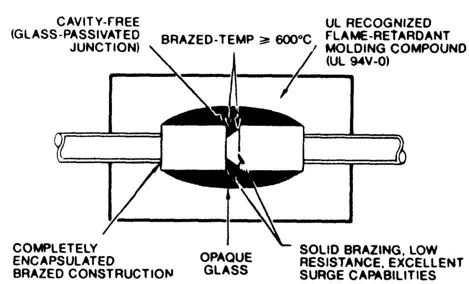


FIG. 6 — SUPERECTIFIER



GP10A THRU GP10Y

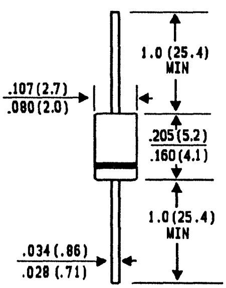
MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 1600 Volts* ***Current** - 1.0 Ampere*

FEATURES

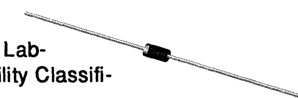
PATENTED*

DO-204AL



Dimensions in inches and (millimeters)

**Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, .3 gram

SUPERECTIFIER®

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave 60Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	A B D G J K M N Q T V W Y	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50 to 1600 Volts, See Fig 5.	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths (see fig. 1)	$I_{(AV)}$	1.0	Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0 | 25.0	Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.1 | 1.2 | 1.3	Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{R(AV)}$	30.0	μA
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0	μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}	2.0	μS
Typical Junction Capacitance (NOTE 2)	C_J	8.0 | 7.0 | 5.0	pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	45.0	°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175 | -65 to +150	°C

NOTES:
1. Reverse Recovery Test Condition: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

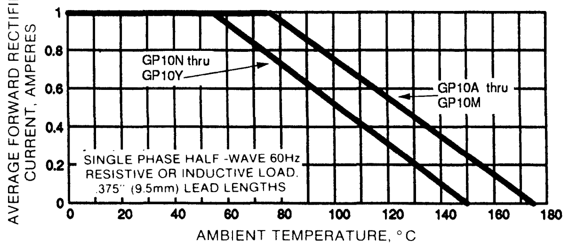


FIG. 2 - MAXIMUM NON-REPETITVE PEAK FORWARD SURGE CURRENT

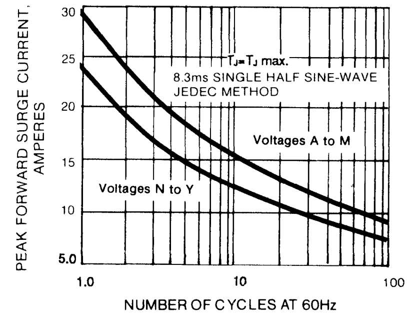


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

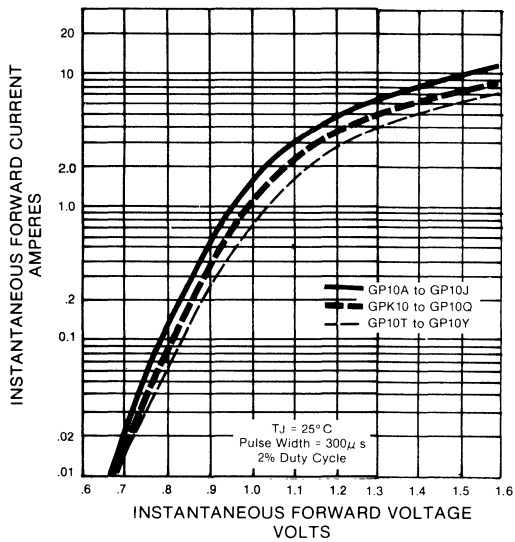


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

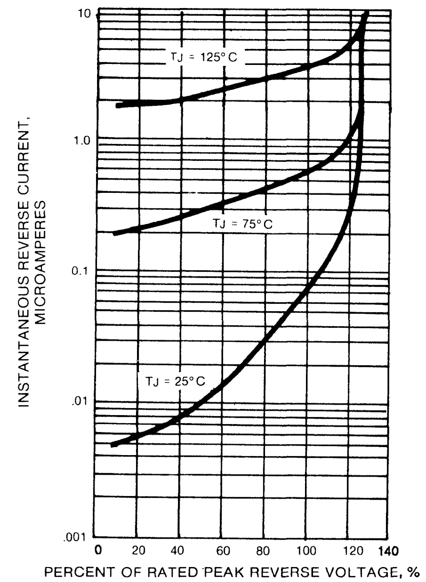
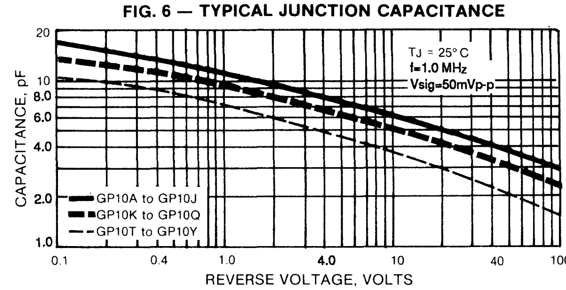


Fig. 5 —MAXIMUM RECURRENT PEAK REVERSE VOLTAGE

GP10A - 50V
GP10B - 100V
GP10D - 200V
GP10G - 400V
GP10J - 600V
GP10K - 800V
GP10M - 1000V
GP10N - 1100V
GP10Q - 1200V
GP10T - 1300V
GP10V - 1400V
GP10W - 1500V
GP10Y - 1600V

FIG. 6 — TYPICAL JUNCTION CAPACITANCE



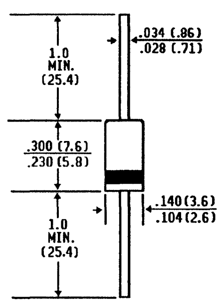
1N4383GP THRU 1N4385GP
1N4585GP AND 1N4586GP

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AC

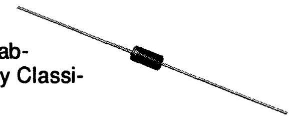


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER ®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=100°C with no thermal runaway
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce,0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Single half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N 4383GP	1N 4384GP	1N 4385GP	1N 4585GP	1N 4586GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=100°C	$I_{(AV)}$			1.0			Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=100°C	I_{FSM}			50.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.0			Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R			5.0 250.0			μA
* Typical Reverse Recovery Time (NOTE 2)	T_{RR}			2.0			μS
Maximum Full Load Reverse Current Full Cycle Average at .375"(9.5mm) Lead Lengths T_A=100°C	$I_{R(AV)}$	275	250	225	200	200	μA
Typical Junction Capacitance (NOTE 1)	C_J			15.0			pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$			25.0			°C/W
* Operating Junction and Storage Temperature Range	T_J, T_{STG}			-65 to +175			°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}= 0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
* JEDEC registered values

FIG. 1 - FORWARD CURRENT DERATING CURVE

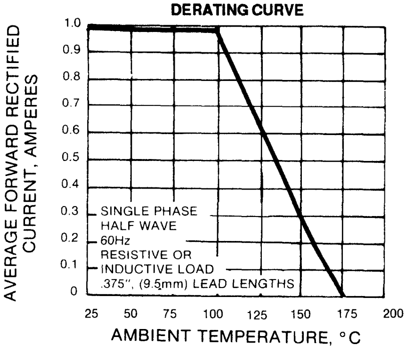


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

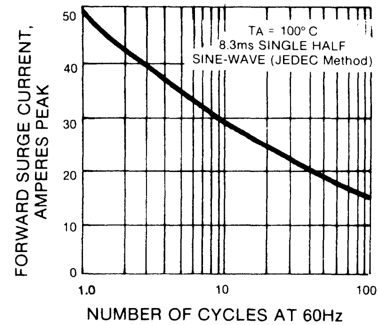


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

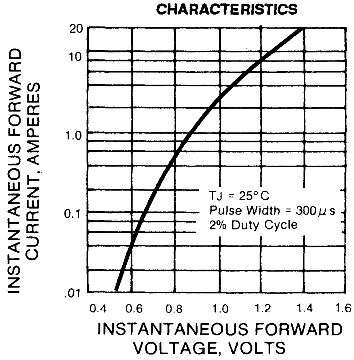


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

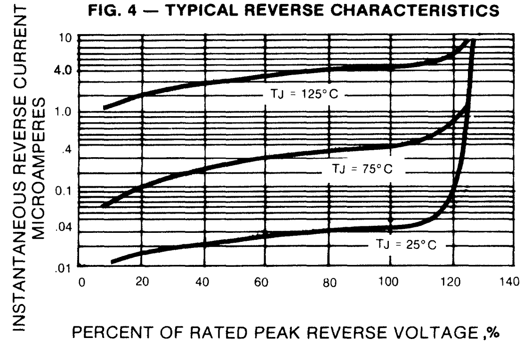


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

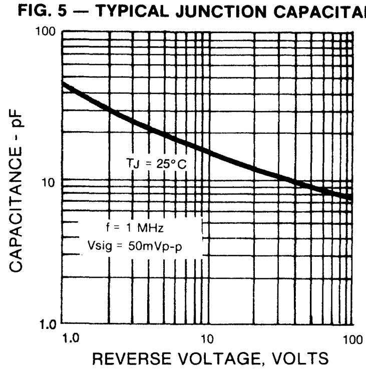
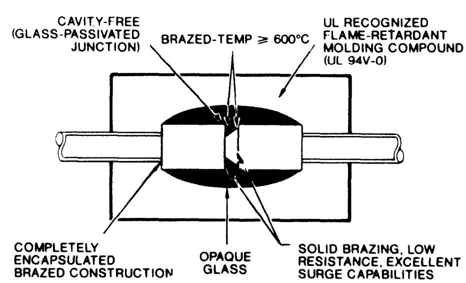


FIG. 6 — SUPERECTIFIER



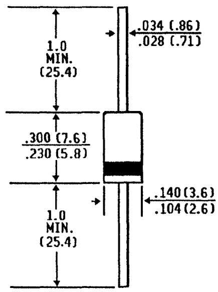
1N5059GP THRU 1N5062GP

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 200 to 800 Volts*   ***Current** - 1.0 Ampere*

PATENTED*

DO-204AC

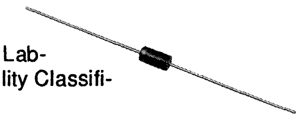


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER ®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N5059GP	1N5060GP	1N5061GP	1N5062GP	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$	1.0				Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
*Maximum Instantaneous Forward Voltage at 1.0A T_A=75°C	V_F	1.2				Volts
*Maximum Full Load Reverse Current, Full Cycle Average, .375" (9.5mm) Lead Lengths at T_A=25°C T_A=75°C	$I_{R(AV)}$	5.0 150.0				μA
*Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=175°C	I_R	5.0 300.0				μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}	2.0				μs
Typical Junction Capacitance (NOTE 2)	C_J	15.0				pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	25.0				°C/W
*Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

* JEDEC Registered Value

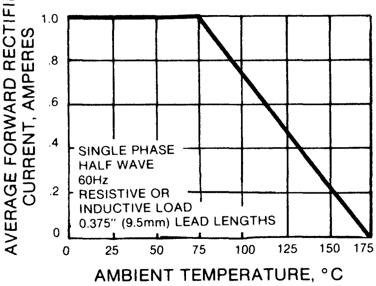


FIG. 1 — FORWARD CURRENT DERATING CURVE

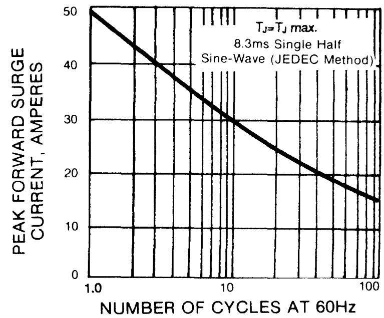


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

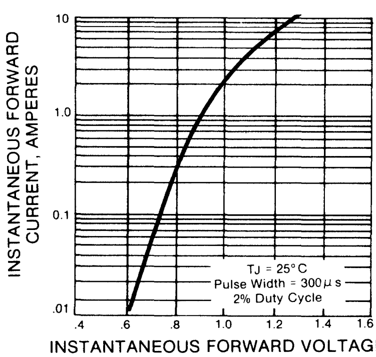


FIG. 3 — TYPICAL INSTANTANEOUS FOWARD CHARACTERISTICS

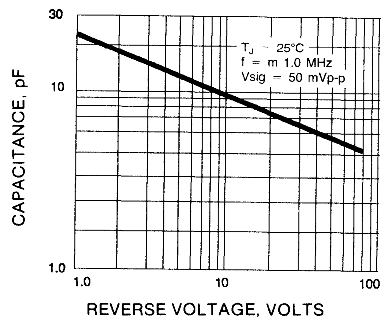


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

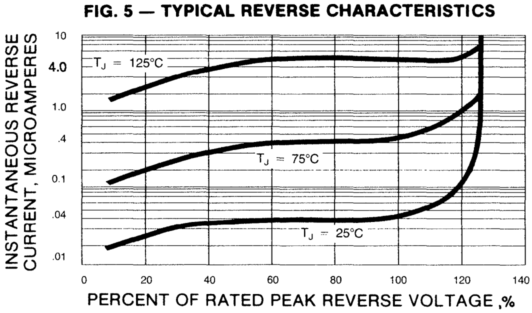


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

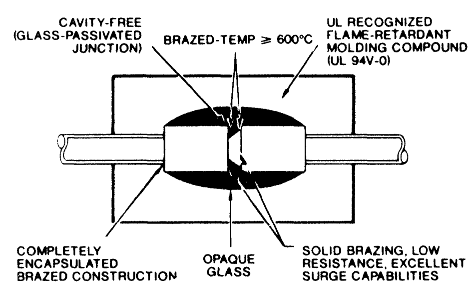


FIG. 6 — SUPERECTIFIER

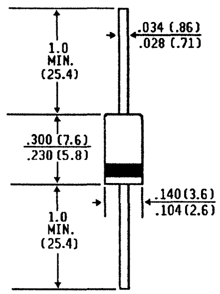
1N5391GP THRU 1N5399GP

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.5 Amperes*

PATENTED*

DO-204AC

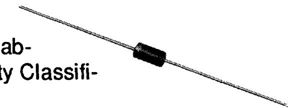


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER ®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.5 Ampere operation at T_A=70°C with no thermal runaway
- Typical I_R less than 0.1 µA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce,0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Single phase, half wave 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N53 91GP	1N53 92GP	1N53 93GP	1N53 94GP	1N53 95GP	1N53 96GP	1N53 97GP	1N53 98GP	1N53 99GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
* Maximum RMS Voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_L=70°C	$I_{(AV)}$	1.5									Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0									Amps
* Maximum Instantaneous Forward Voltage at 1.5A,T_A=70°C	V_F	1.4									Volts
* Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R	5.0 300.0									µA
* Maximum Full Load Reverse Current Full Cycle Average, 375", (9.5mm) Lead Length atT_A=70°C	$I_{R(AV)}$	300.0									µA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.0									µS
Typical Junction Capacitance (NOTE 1)	C_J	15.0									pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$	30.0									°C/W
* Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175									°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Reverse Recovery Test Condition: I_F=0.5A, I_R=1.0A, Irr=0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

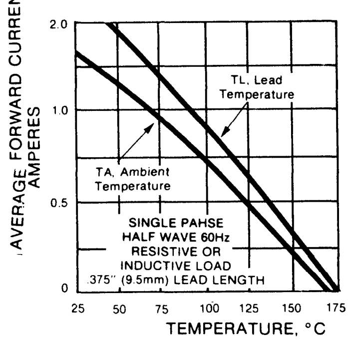


FIG. 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

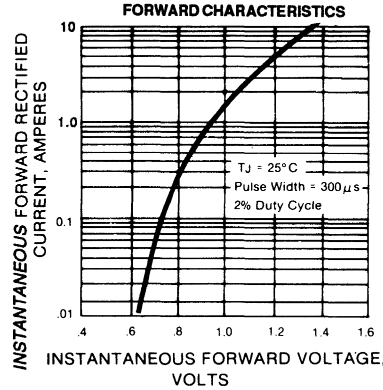


FIG. 3 — PEAK FORWARD SURGE CURRENT

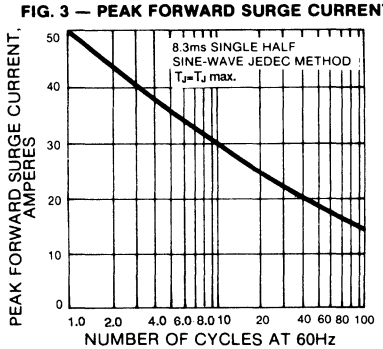


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

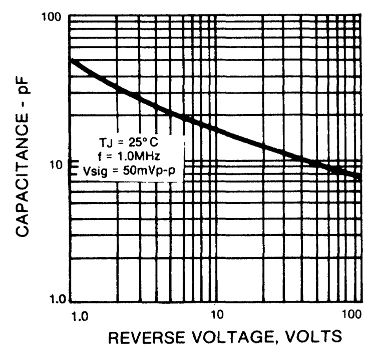


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

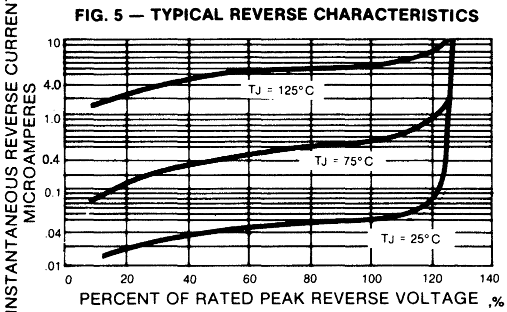
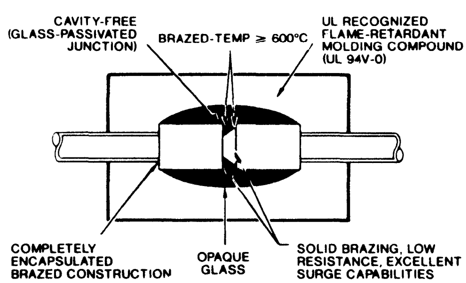


FIG. 6 — SUPERECTIFIER



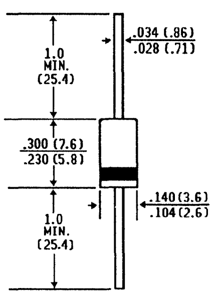
GP15A THRU GP15M

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.5 Amperes*

PATENTED*

DO-204AC

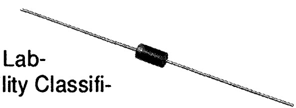


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*GP 15A*	*GP 15B*	*GP 15D*	*GP 15G*	*GP 15J*	*GP 15K*	*GP 15M*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1.5							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum Instantaneous Forward Voltage at 1.5A	V_F	1.1							Volts
Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=150°C	I_R	5.0 / 200.0							μA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.0							μS
Typical Junction Capacitance (NOTE 1)	C_J	15.0							pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$	25.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Reverse Recovery Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

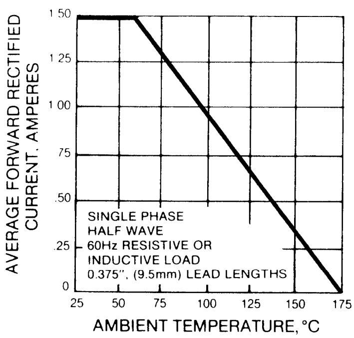


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

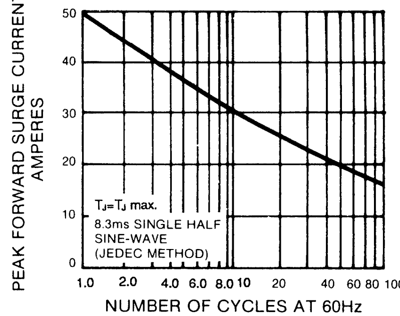


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

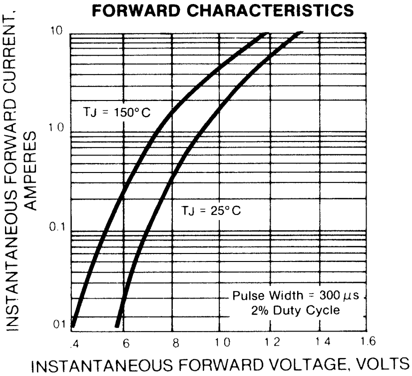


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

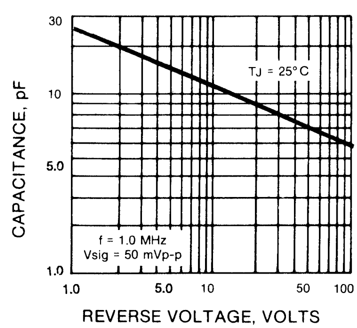


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

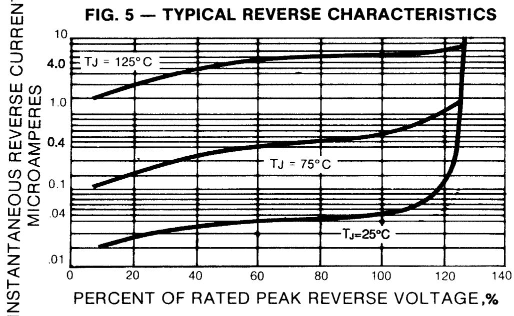
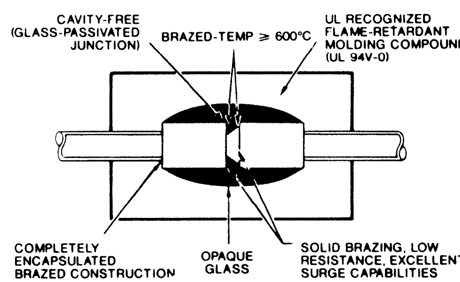


FIG. 6 — SUPERECTIFIER



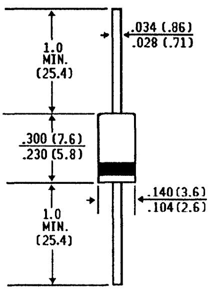
AGP15-200 THRU AGP15-800

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC CONTROLLED AVALANCHE RECTIFIER

***Voltage* - 200 to 800 Volts *Current* - 1.5 Amperes**

PATENTED*

DO-204AC



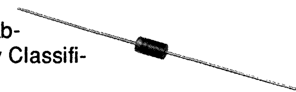
Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Controlled Avalanche characteristic combined with the ability to dissipate reverse power
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Glass passivated cavity-free junction
- 1.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any ***Weight:*** 0.0154 ounce,.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	AGP15-200	AGP15-400	AGP15-600	AGP15-800	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	Volts
Minimum Avalanche Breakdown Voltage at 100 μ A	V_{BR}	240	450	675	880	Volts
Maximum Avalanche Breakdown Voltage at 100 μ A	V_{BR}	500	750	1000	1200	Volts
Maximum Peak Power Dissipation in the Avalanche Region 20 μs Pulse	P_{RM}	500.0				Watts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1 .5				Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
Maximum Instantaneous Forward Voltage at 1.5A	V_F	1.1				Volts
Maximum Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R	5.0 200.0				μA
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Length at T_A=55°C	$I_{R(AV)}$	100.0				μA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.0				μS
Typical Junction Capacitance (NOTE 1)	C_J	15.0				pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$	25.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175				°C

NOTES: 1. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F= 0.5A, I_R= 1.0A, recover to 0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

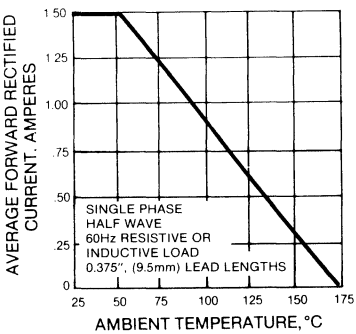


FIG. 2 — TYPICAL INSTANTEOUS FORWARD CHARACTERISTICS

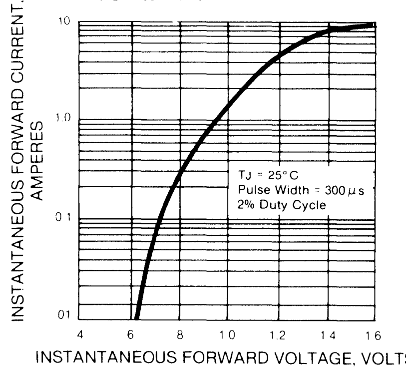


FIG. 3 — MAXIMUM NON-REPETITVE PEAK FORWARD SURGE CURRENT

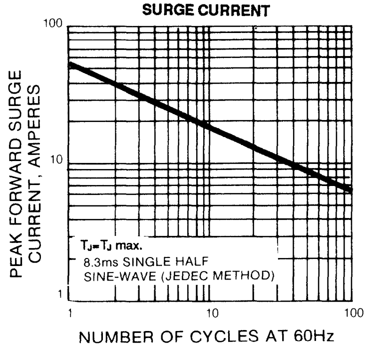


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

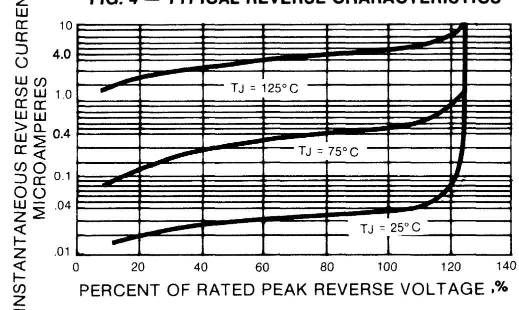


FIG. 5—MAXIMUM NON-REPETITIVE REVERSE AVALANCHE POWER DISSIPATION

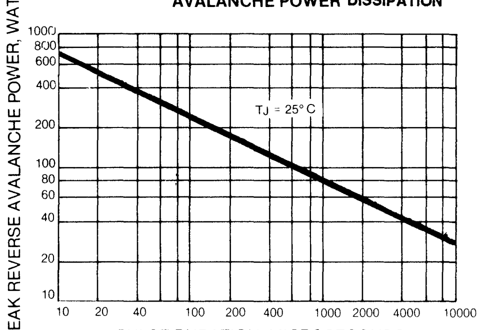
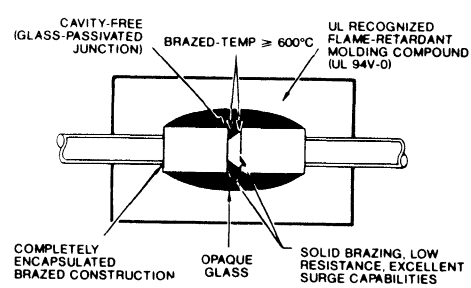


FIG. 6 — SUPERECTIFIER

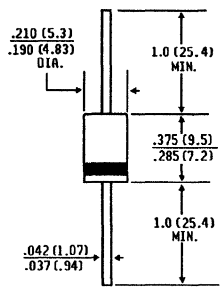


GP20A THRU GP20J

GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 2.0 Amperes*

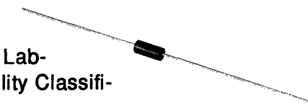
PATENTED*



Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 2.0 Ampere operation at T_A= 55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Band denotes cathode
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

SUPERECTIFIER®

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified 60 Hz.
Resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	GP 20A	GP 20B	GP 20D	GP 20G	GP 20J	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	2.0					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	65.0					Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	1.2		1.1			Volts
Maximum Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R	5.0					μA
Maximum Full Load Reverse Current, Full Cycle Average, 375" (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$	100.0					μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}	2.5					μs
Typical Junction Capacitance (NOTE 2)	C_J	40.0					pf
Typical Thermal Resistance (NOTE 3)	RθJA	16.0					°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175					°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions : I_F=0.5A, I_R= 1.0A, Irr=0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

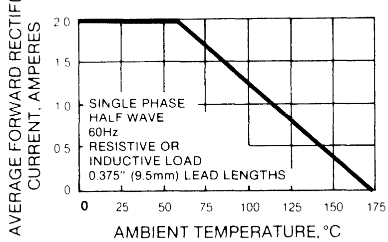


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

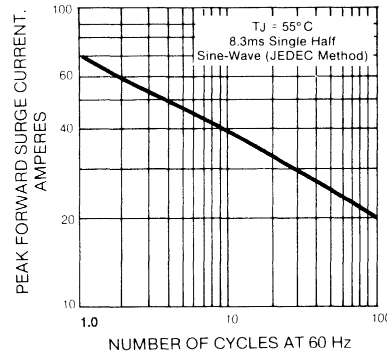


FIG. 3 — TYPICAL JUNCTION CAPACITANCE

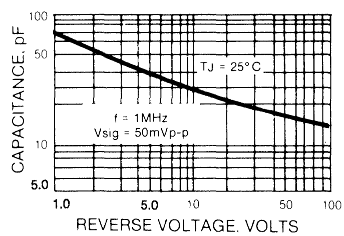


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

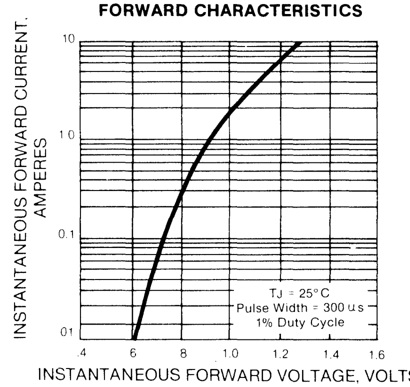


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

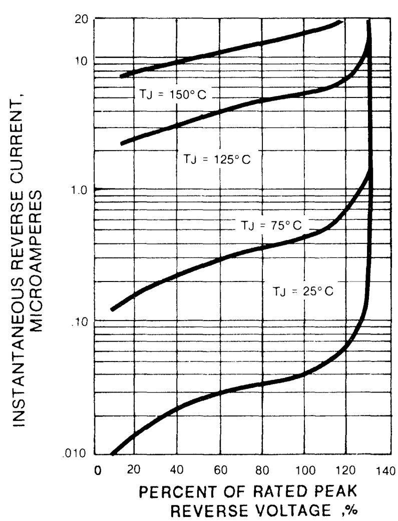
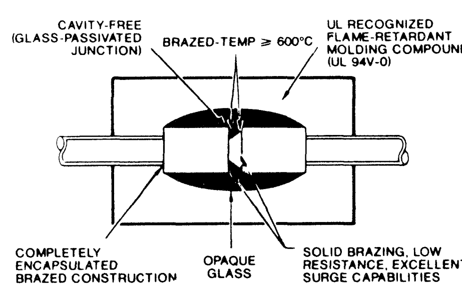


FIG. 6 — SUPERECTIFIER



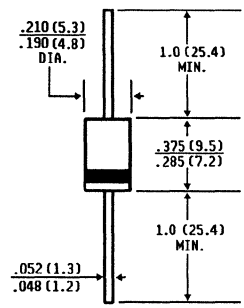
1N5624GP THRU 1N5627GP

GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

Voltage *- 200 to 800 Volts* ***Current*** *- 3.0 Amperes*

PATENTED*

DO-201AD

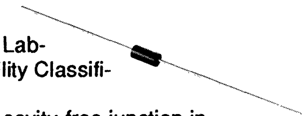


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction in D0-201AD package
- 3.0 Ampere operation at T_A=70°C with no thermal runaway
- Typical I_R less than 0.1 µA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounce, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N5624GP	1N5625GP	1N5626GP	1N5627GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	Volts
* Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	Volts
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=70°C	$I_{(AV)}$	3.0				Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
* Maximum Instantaneous Forward Voltage at 3.0A T_A=25°C	V_F	1.0				Volts
T_A=70°C		0.95				
Maximum Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R	5.0				µA
T_A=150°C		300.0		200.0		
Maximum Full Load Reverse Current, Full Cycle Average,.375" (9.5mm) Lead Length at T_A=70°C	$I_{R(AV)}$	200.0				µA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	3.0				µS
Typical Junction Capacitance (NOTE 1)	C_J	40.0				pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$	15.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175				°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Reverse Recovery Test Conditions: I_F = 0.5A, I_R =1.0A, recover to 0.25A.

FIG. 1 — FORWARD CURRENT DERATING CURVE

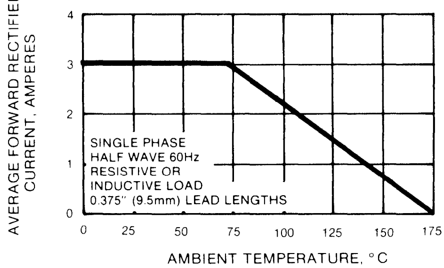


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

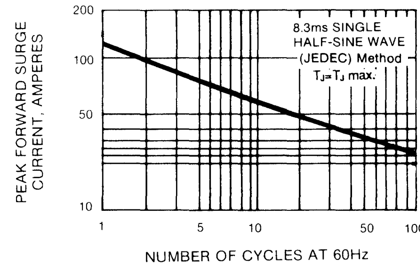


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

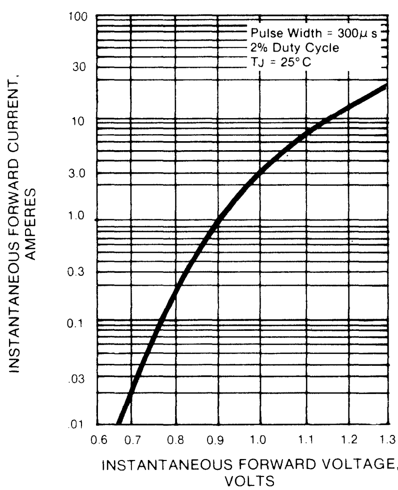


FIG. 4—TYPICAL JUNCTION CAPACITANCE

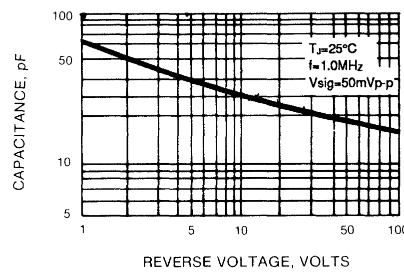


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

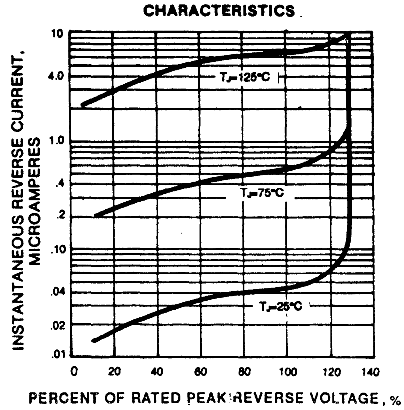
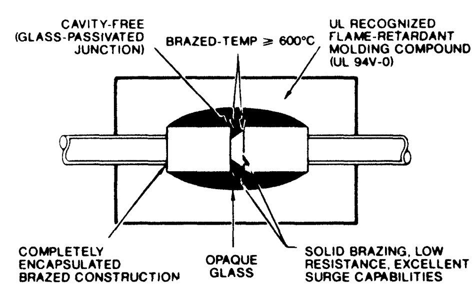


FIG. 6 — SUPERECTIFIER



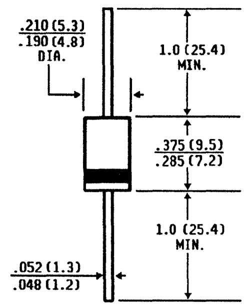
GP30A THRU GP30M

GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 3.0 Amperes*

PATENTED*

DO-201AD

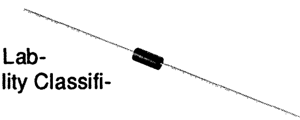


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction in D0-201AD package
- 3.0 Ampere operation at T_A= 55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounce, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz,resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GP 30A	GP 30B	GP 30D	GP 30G	GP 30J	GP 30K	GP 30M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0							Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.2		1.1					Volts
Maximum Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R	5.0 100.0							µA
Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$	100.0							µA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	3.0							µS
Typical Junction Capacitance (NOTE 1)	C_J	40.0							pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$	15.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

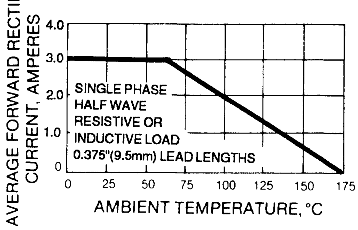


FIG. 2 - MAXIMUM NON-REPETITVE PEAK FORWARD SURGE CURRENT

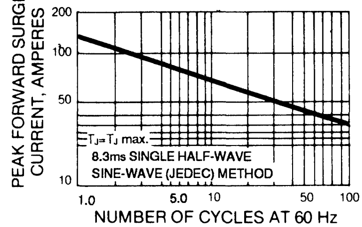


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

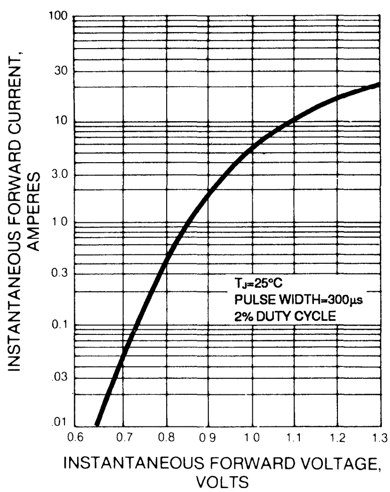


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

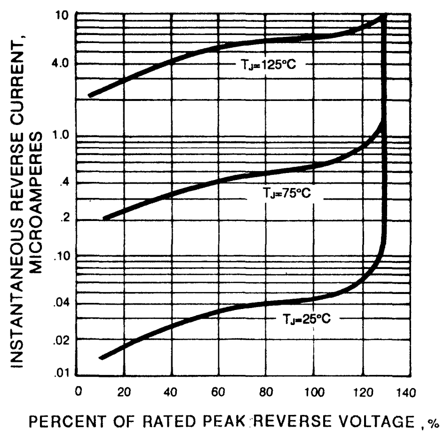


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

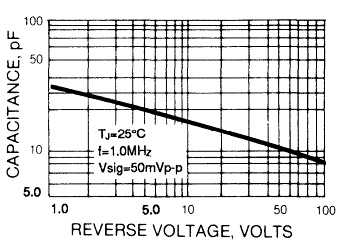
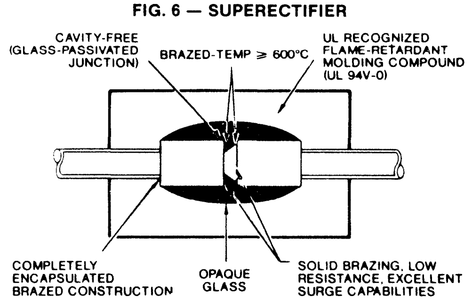


FIG. 6 — SUPERECTIFIER



FAST-RECOVERY SUPERECTIFIERS

0.5 AMPERES THRU 3.0 AMPERES
50 VOLTS TO 2000 VOLTS

General Instrument

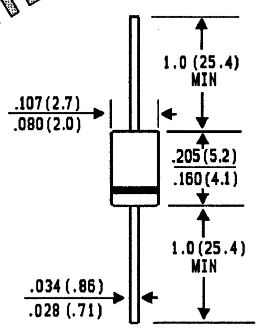
RGP02-12E THRU RGP02-20E

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 1200 to 2000 Volts* ***Current** - 0.5 Amperes*

PATENTED*

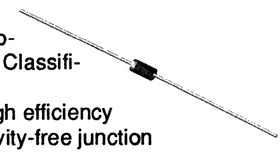
DO-204AL



Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- For use in high frequency rectifier circuits
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 0.5 Ampere operation at T_A= 55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375" (9.5mm) lead length at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD- 750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, .3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	RGP02 -12E	RGP02 -14E	RGPO2 -16E	RGPO2 -18E	RGPO2 -20E	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1200	1400	1600	1800	2000	Volts
Maximum RMS Voltage	V_{RMS}	840	980	1120	1260	1400	Volts
Maximum DC Blocking Voltage	V_{DC}	1200	1400	1600	1800	2000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	0 .5					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	20.0					Amps
Maximum Instantaneous Forward Voltage at 0.1A	V_F	1.8					Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0					μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	300.0					nS
Typical Junction Capacitance (NOTE 2)	C_J	5.0					pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	50.0					°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175					°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr =.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

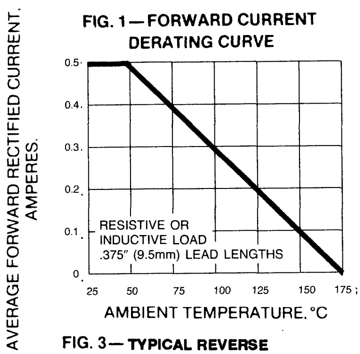


FIG. 2—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

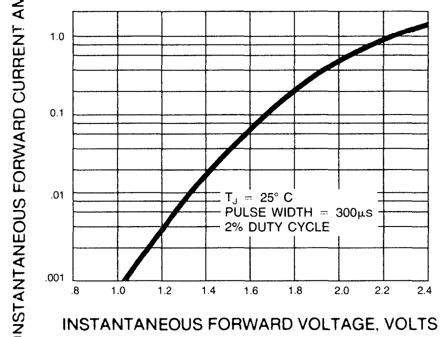


FIG. 3—TYPICAL REVERSE CHARACTERISTICS

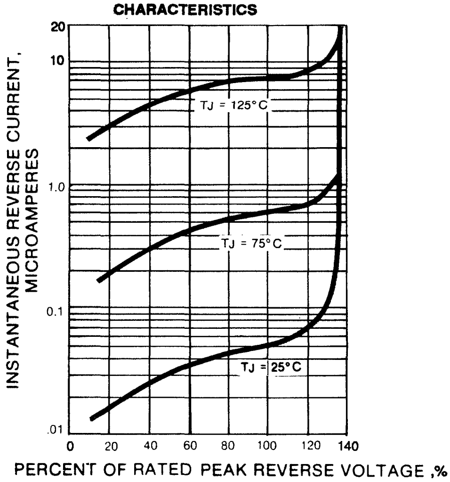


FIG. 4 —MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

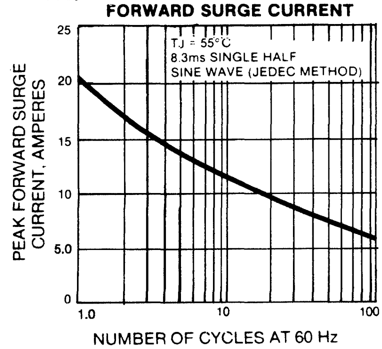


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

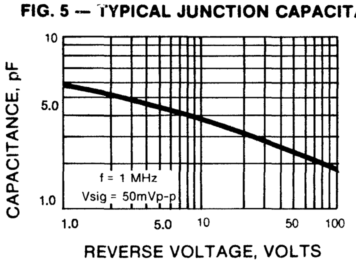
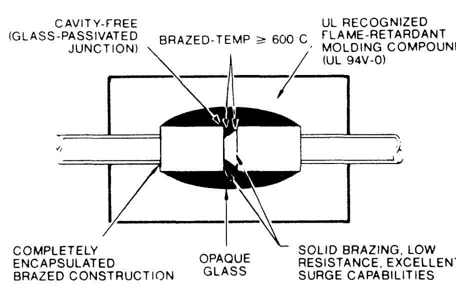


FIG. 6—SUPERECTIFIER



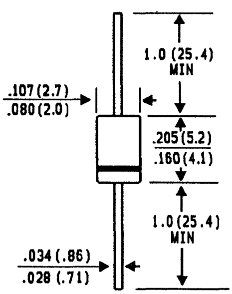
BA157GP THRU BA159GP

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 400 to 1000 Volts* ***Current** - 0.5 Ampere*

PATENTED*

DO-204AL



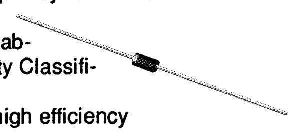
Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES

- ◆ High temperature metallurgically bonded constructed rectifiers
- ◆ For use in high frequency rectifier circuits
- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- ◆ Fast switching for high efficiency
- ◆ Glass passivated cavity-free junction
- ◆ 0.5 Ampere operation at T_A=55°C with no thermal runaway
- ◆ Typical I_R less than 0.1 μ A
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce,0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*BA157GP*	*BA158GP*	*BA159DGP*	*BA159GP*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	0 .5				Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}	20.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.5				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage	I_R	5.0				μA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	150	250	500	500	nS
Typical Junction Capacitance (NOTE 2)	C_J	15.0				pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$	50.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions : I_F= 0.5A, I_R= 1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

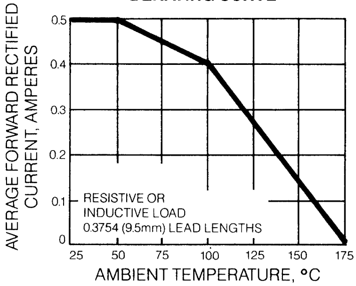


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

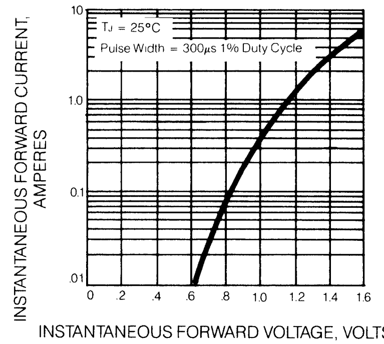


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

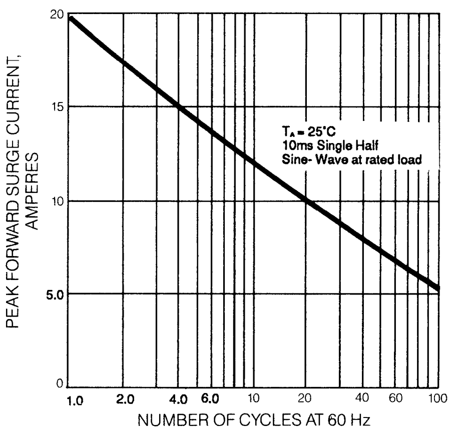


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

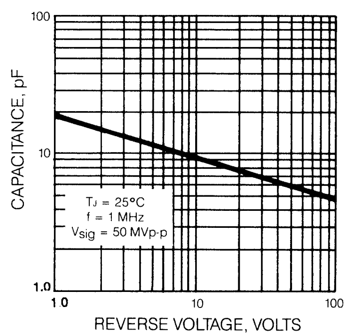
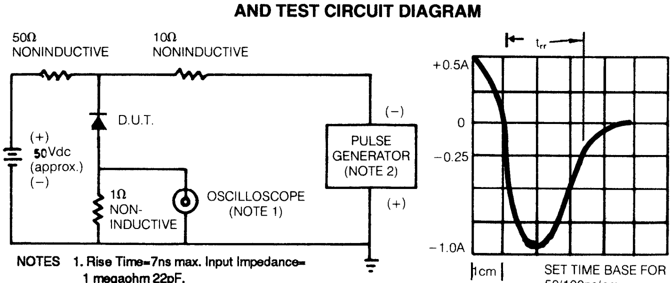
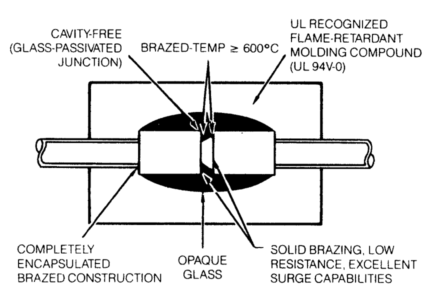


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES 1. Rise Time=7ns max. Input Impedance= 1 megaohm 22pF.
2. Rise Time=10ns max. Source Impedance= 50 ohms.

FIG. 6 — SUPERCTIFIER



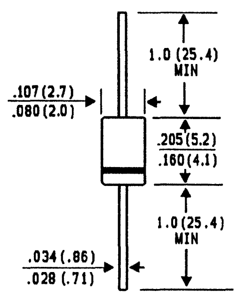
1N4933GP THRU 1N4937GP

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AL

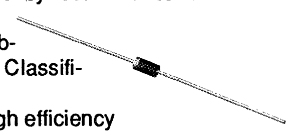


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- For use in high frequency rectifier circuits
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	1N 4933GP	1N 4934GP	1N 4935GP	1N 4936GP	1N 4937GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
* Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
* Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$	1.0					Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
* Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.2					Volts
* Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 100.0					μA
* Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	200.0					nS
Typical Junction Capacitance (NOTE 2)	C_J	15.0					pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	50.0					°C/W
* Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175					°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=1.0A, V_R=30 Volts.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
* JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

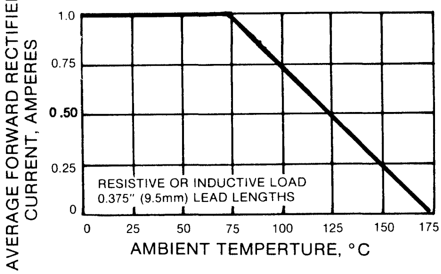


FIG. 2 — TYPICAL FORWARD CHARACTERISTICS

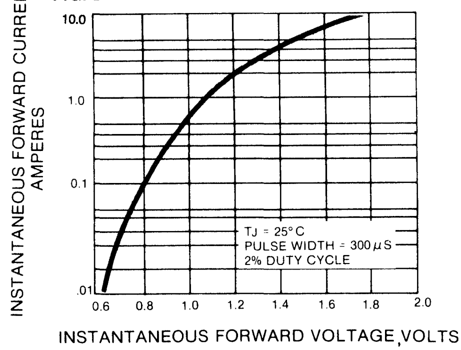


FIG. 3 — TYPICAL JUNCTION CAPACITANCE

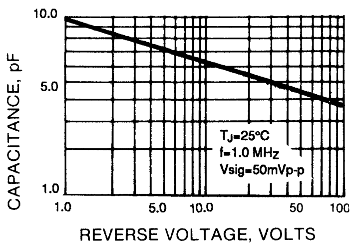


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

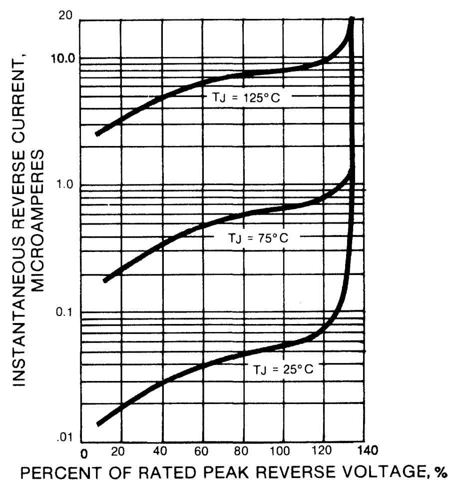


FIG. 5 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

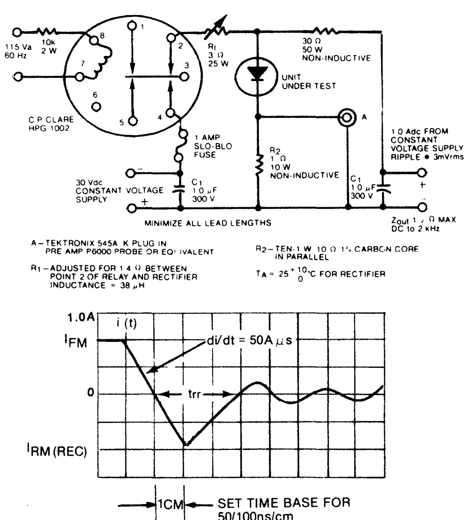
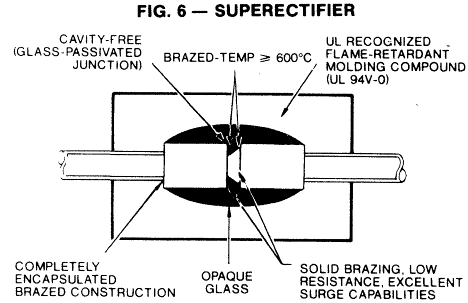


FIG. 6 — SUPERECTIFIER



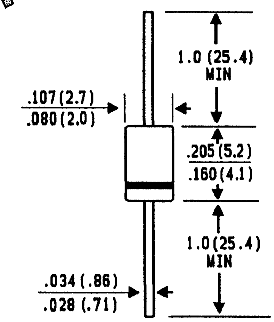
1N4942GP THRU 1N4948GP

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

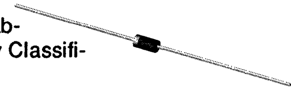
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- For use in high frequency rectifier circuits
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads,solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

SUPERECTIFIER®

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.Resistive or inductive load.

	SYMBOLS	1N 4942GP	1N 4944GP	1N 4946GP	1N 4947GP	1N 4948GP	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1.0					Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	25.0					Amps
* Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.3					Volts
* Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=150°C	I_R	1.0 200.0					µA
* Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150	150	250	250	500	nS
Typical Junction Capacitance (NOTE 2)	C_J	15.0					pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	50.0					°C/W
* Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175					°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
* JEDEC registered values

FIG. 1 — FORWARD CURRENT DERATING CURVE

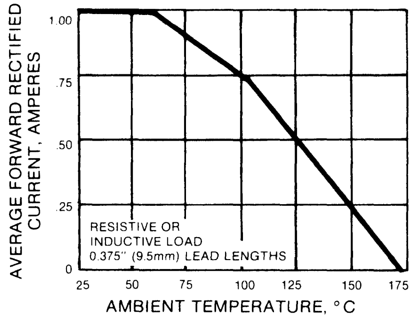


FIG. 2 - MAXIMUM NON-REPETITVE PEAK FORWARD SURGE CURRENT

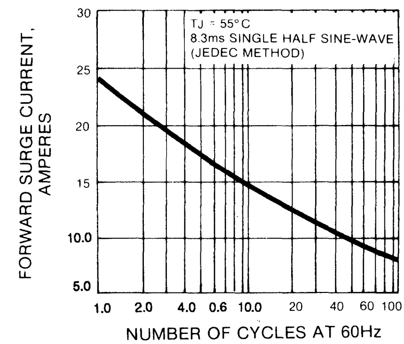


FIG. 3 — TYPICAL INSTANTEOUS FORWARD CHARACTERISTICS

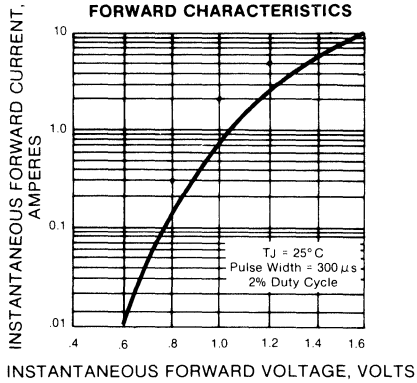


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

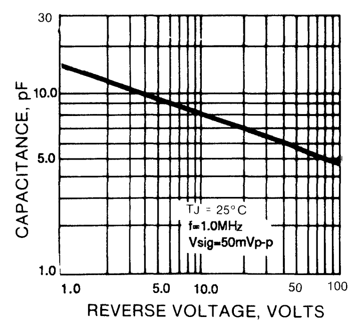
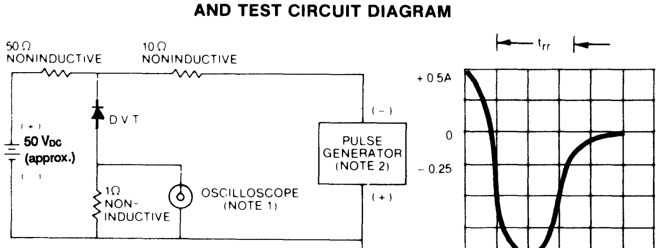


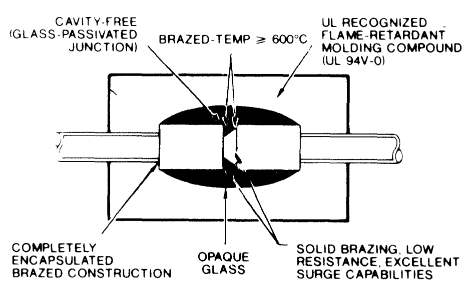
FIG. 5 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES 1 Rise Time = 7ns max Input Impedance = 1 megohm 22pF

2 Rise Time = 10ns max Source Impedance = 50 ohms

FIG. 6 — SUPERECTIFIER



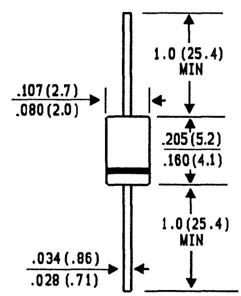
RGP10A THRU RGP10M

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AL



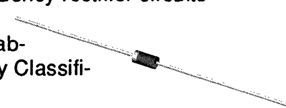
Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly by Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- For use in high frequency rectifier circuits
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	RGP 10A	RGP 10B	RGP 10D	RGP 10G	RGP 10J	RGP 10K	RGP 10M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	100	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$				1.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				30.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F				1.3				Volts
Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A=55°C	I_R				100.0				μA
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R				5.0 200.0				μA
Maximum Reverse Recovery Time T_J=25°C (NOTE 1)	T_{RR}	150				250	500		nS
Typical Junction Capacitance (NOTE 2)	C_J				15.0				pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$				50.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}				-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, recover to 0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

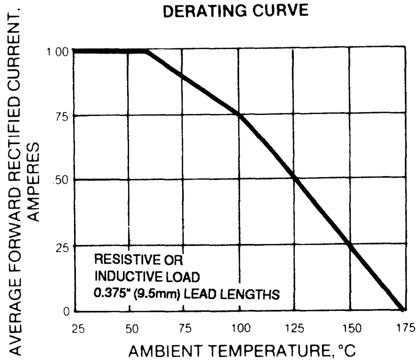


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

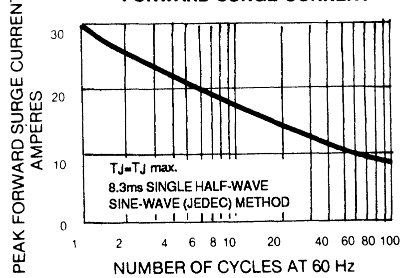


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

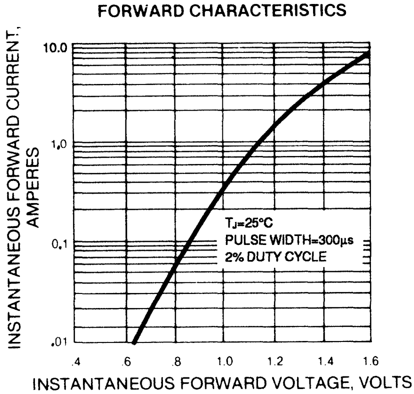


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

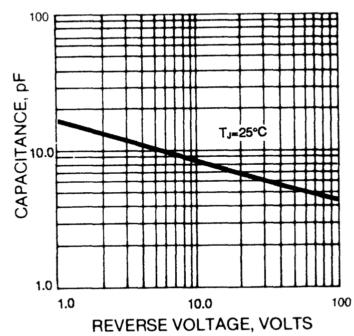
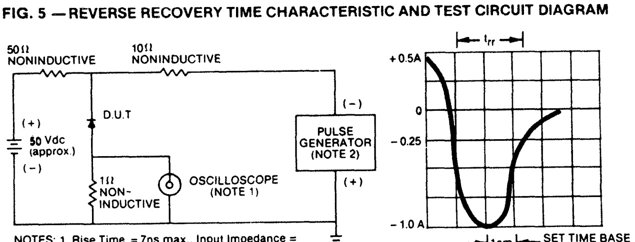
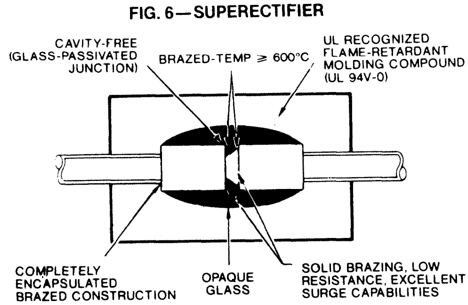


FIG. 5 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG. 6 — SUPERECTIFIER



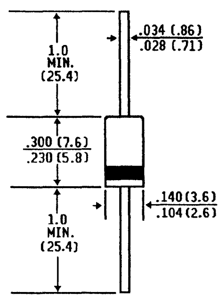
1N5615GP THRU 1N5623GP

GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 200 to 1000 Volts*   ***Current** - 1.0 Ampere*

PATENTED*

DO-204AC

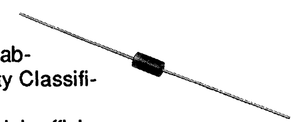


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly by Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, .4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*1N 5615GP*	*1N 5617GP*	*1N 5619GP*	*1N 5621GP*	*1N 5623GP*	*UNITS*
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
* Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Amps
* Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$			1.0			Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			50.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.2			Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R			0.5 25.0			µA
* Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150	150	250	300	500	ns
Typical Junction Capacitance (NOTE 2)	C_J			25.0			pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$			30.0			°C/W
* Operating Junction and Storage Temperature Range	T_J, T_{STG}			-65 to +175			°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

* JEDEC registered values

FIG. 1—FORWARD CURRENT DERATING CURVE

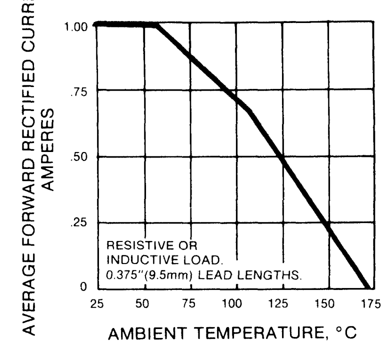


FIG. 2. MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

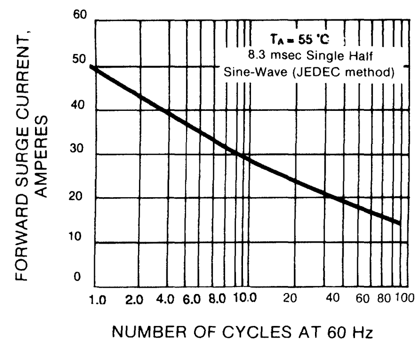


FIG. 3 —TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

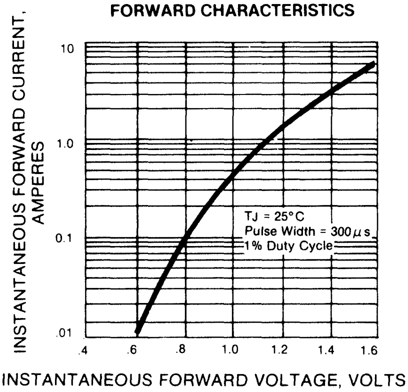


FIG. 4—TYPICAL JUNCTION CAPACITANCE

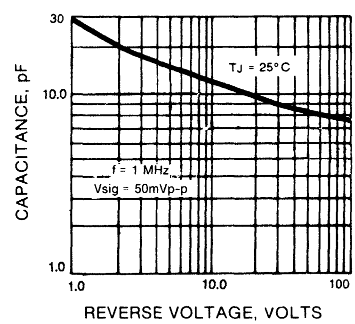
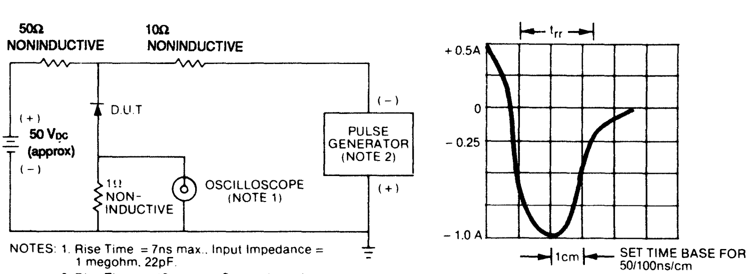


FIG. 5 —REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

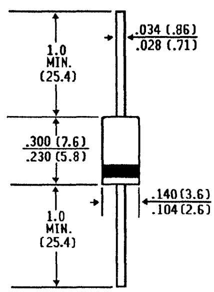
GI810 THRU GI818

GLASS PASSIVATED JUNCTION
FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AC

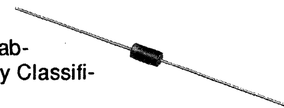


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly by Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 μA
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*GI 810*	*GI 811*	*GI 812*	*GI 814*	*GI 816*	*GI 817*	*GI 818*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$				1.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=75°C	I_{FSM}				30.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F				1.2				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R				10.0 100.0				µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}				750.0				nS
Typical Junction Capacitance (NOTE 2)	C_J				25.0				pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$				30.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}				-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=1.0A, V_R=30V.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

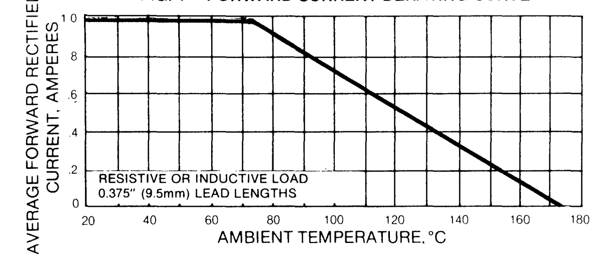


FIG. 2—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

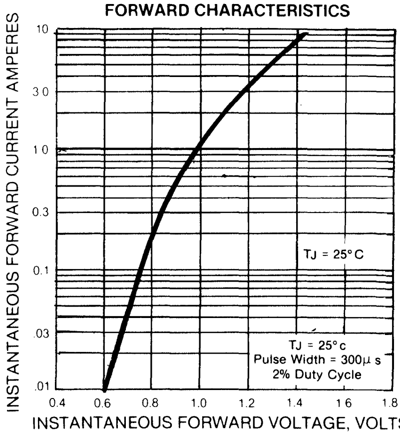


FIG. 3—TYPICAL JUNCTION CAPACITANCE

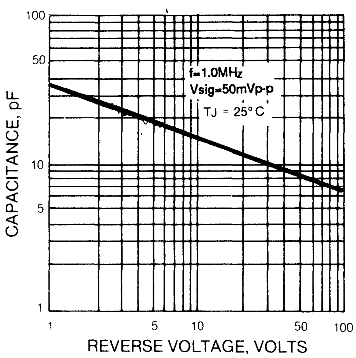


FIG. 4 — MAXIMUM NON- REPETITIVE PEAK FORWARD SURGE CURRENT

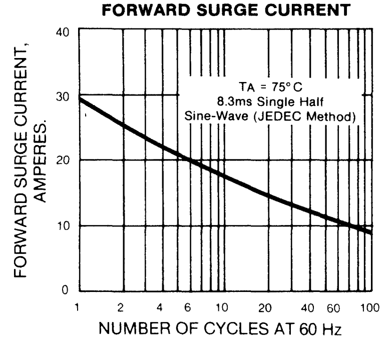


FIG. 5—REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

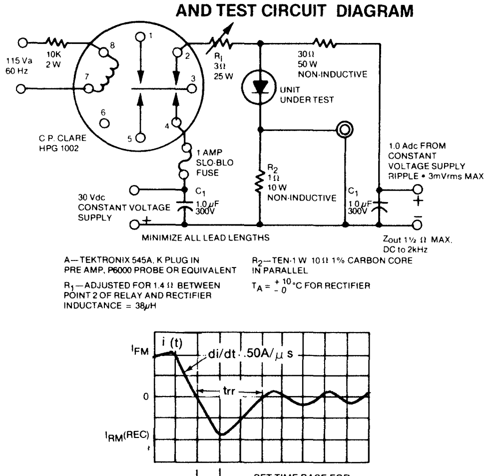
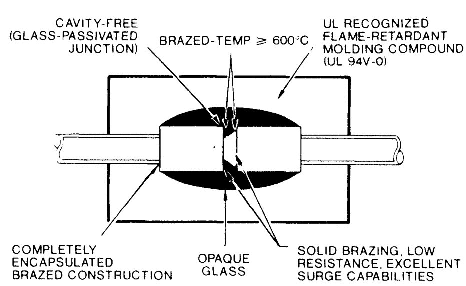


FIG. 6 — SUPERECTIFIER



RGP15A THRU RGP15M

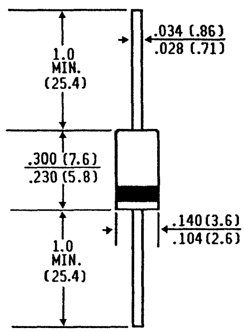
GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.5 Ampere*

FEATURES

*

DO-204AC



Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

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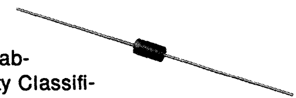


- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction
- 1.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

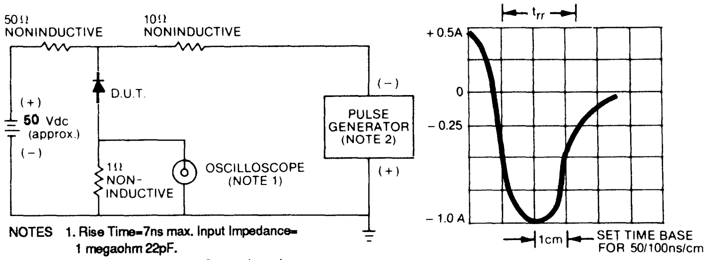
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	RGP 15A	RGP 15B	RGP 15D	RGP 15G	RGP 15J	RGP 15K	RGP 15M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1.5							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum Instantaneous Forward Voltage at 1.5A	V_F	1.3							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R	5.0 200.0							μA
Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	150				250	500		nS
Typical Junction Capacitance (NOTE 2)	C_J	25.0							pf
Typical Thermal Resistance (NOTE 3)	RθJA	30.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175							°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=.5A, I_R=1A, Irr=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1— REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES 1. Rise Time=7ns max. Input Impedance= 1 megaohm 22pF.
2. Rise Time=10ns max. Source Impedance= 50 ohms.

FIG. 2—FORWARD CURRENT DERATING CURVE

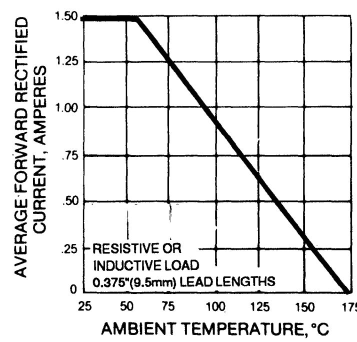


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

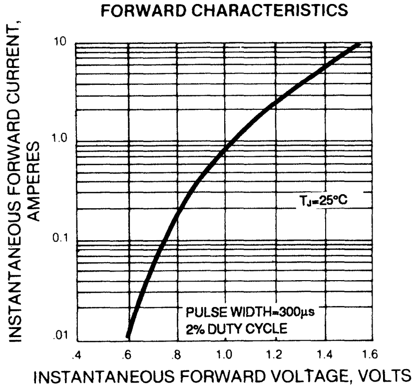


FIG. 4—TYPICAL JUNCTION CAPACITANCE

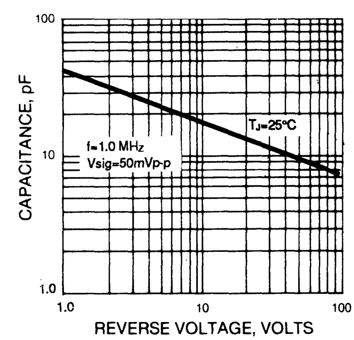


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

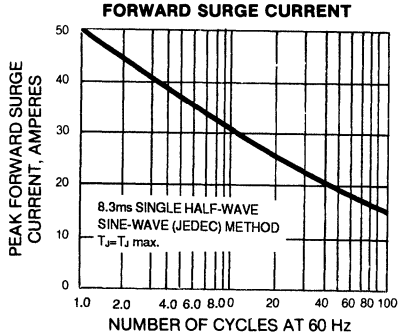
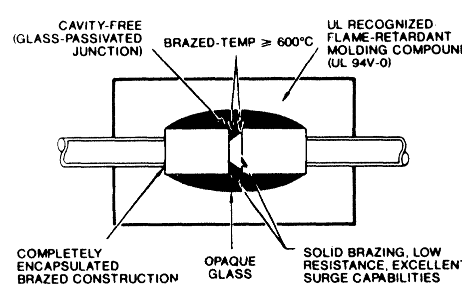


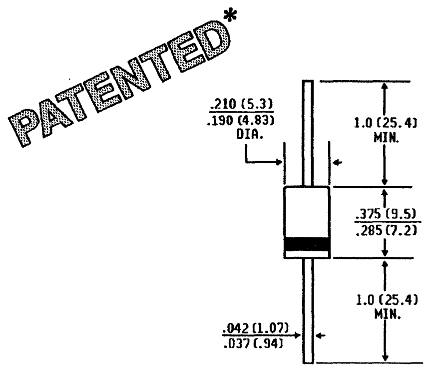
FIG. 6 — SUPERECTIFIER



RGP20A THRU RGP20J

GLASS PASSIVATED JUNCTION
FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 2.0 Amperes*



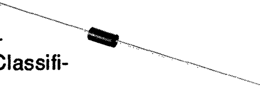
Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly by Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0



- Fast switching for high efficiency
- Glass passivated cavity-free junction
- 2.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color Band denotes cathode
Mounting Position: Any
Weight: 0.03 ounce, 0.8 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.Resistive or inductive load.

	SYMBOLS	*RGP 20A*	*RGP 20B*	*RGP 20D*	*RGP 20G*	*RGP 20J*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	2.0					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	80.0					Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	1.3					Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 100.0					μA
Maximum Full Load Reverse Current, Full Cycle Average, 375" (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$	100.0					μA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	150				250	nS
Typical Junction Capacitance (NOTE 1)	C_J	35.0					pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	22.0					°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175					°C

NOTES: 1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

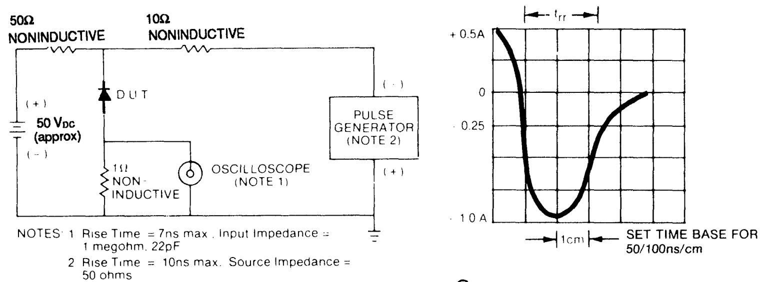


FIG. 2 — FORWARD CURRENT DERATING CURVE

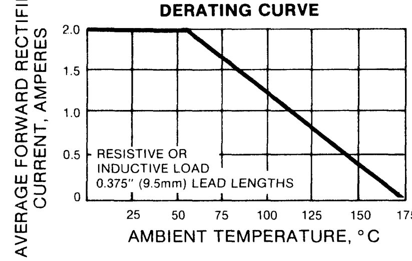


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

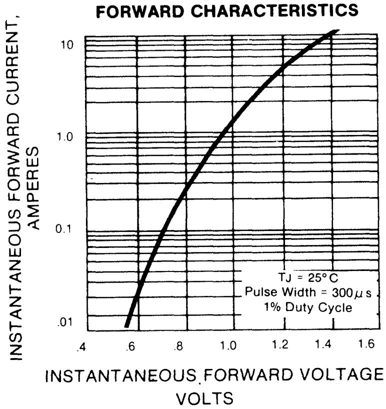


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

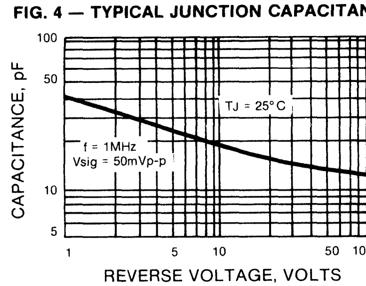


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

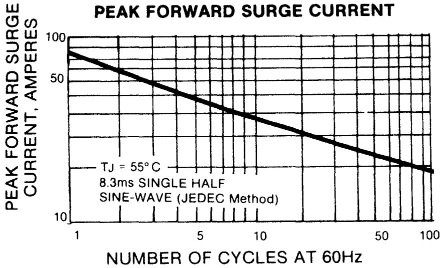
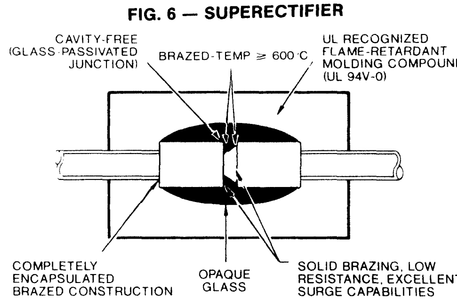


FIG. 6 — SUPERECTIFIER



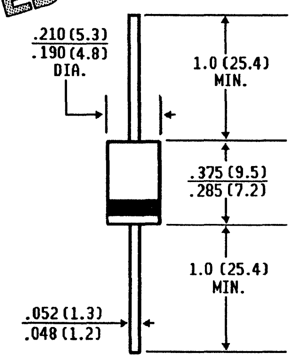
RGP25A THRU RGP25M

GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 2.5 Amperes*

PATENTED*

DO-201AD

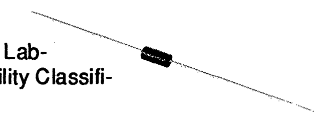


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction in D0-201AD package
- 2.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounce, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	RGP 25A	RGP 25B	RGP 25D	RGP 25G	RGP 25J	RGP 25K	RGP 25M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	2.5							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0							Amps
Maximum Instantaneous Forward Voltage at 2.5A	V_F	1.3							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 200.0							µA
Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A=55°C	I_R	100.0							µA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	150				250	500		nS
Typical Junction Capacitance (NOTE 1)	C_J	60.0							pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	16.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

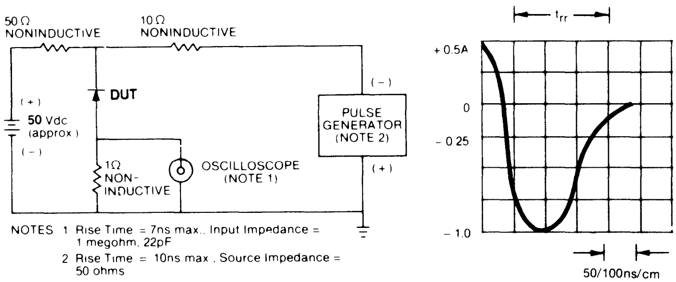


FIG. 2 — FORWARD CURRENT DERATING CURVE

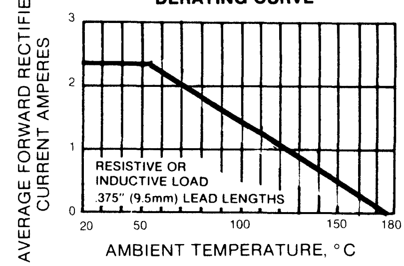


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

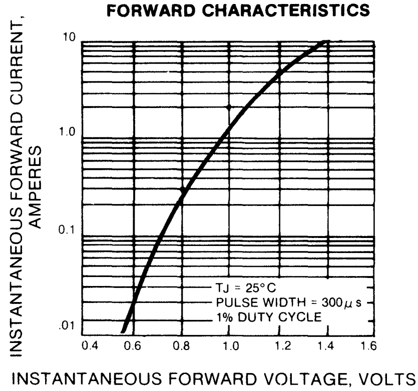


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

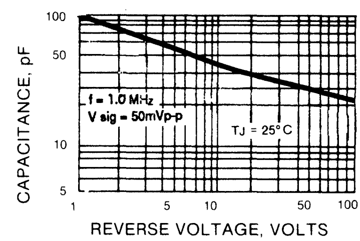


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

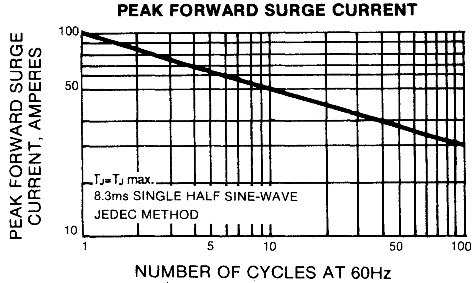
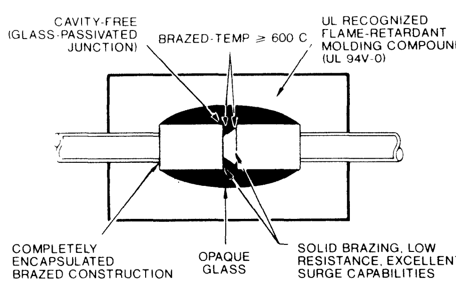


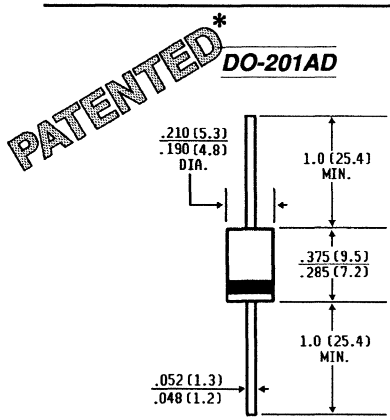
FIG. 6 — SUPERECTIFIER



RGP30A THRU RGP30M

GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 3.0 Amperes*

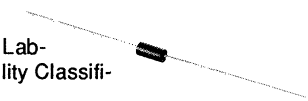


Dimensions in inches and (millimeters)

** Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976 and brazed -lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated cavity-free junction i
- 3.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded plastic over glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.04 ounce, 1.12 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	RGP 30A	RGP 30B	RGP 30D	RGP 30G	RGP 30J	RGP 30K	RGP 30M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0							Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.3							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 / 100.0							μA
Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Length T_A=55°C	$I_{R(AV)}$	100.0							μA
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	150				250	500		nS
Typical Junction Capacitance (NOTE1)	C_J	60.0							pf
Typical Thermal Resistance (NOTE 3)	$R_{\Theta JA}$	16.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, Irr= .25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

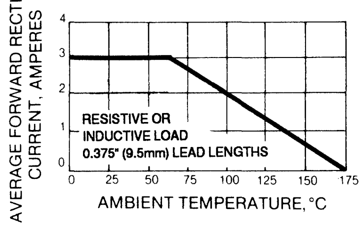


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

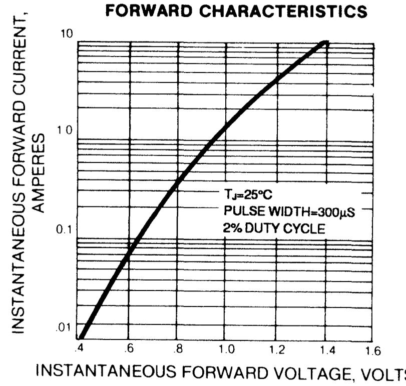


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

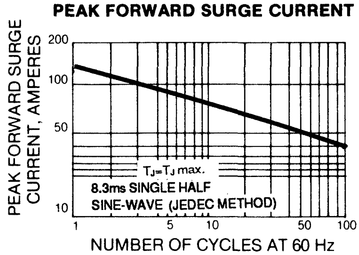


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

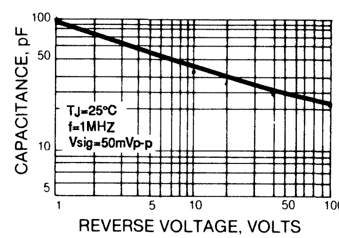
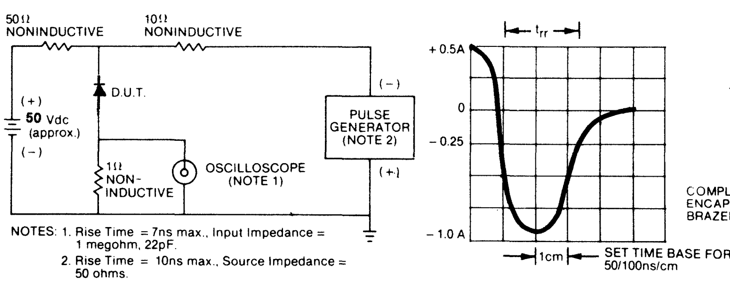
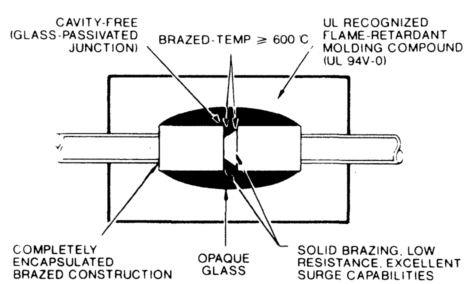


FIG. 5 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

FIG. 6 — SUPERECTIFIER



MINIATURE GLASS PASSIVATED CHIP PLASTIC RECTIFIER

1.0 AMPERE
50 VOLTS TO 1000 VOLTS

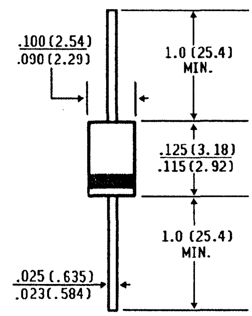
General Instrument

MPG06A THRU MPG06M

MINIATURE GLASS PASSIVATED JUNCTION PLASTIC RECTIFIER

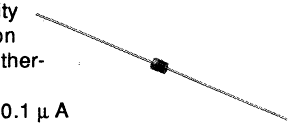
***Voltage** - 50 to 1000 Volts*   ***Current** - 1.0 Ampere*

FEATURES



Dimensions in inches
and
(millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- Low forward voltage, high current capability
- Glass passivated chip junctions
- High Surge Capability
- 1.0 Ampere operation at T_A=25°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- High temperature soldering guaranteed: 250°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic over glass passivated chip
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.0064 ounce, .181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60Hz, resistive or inductive load.

	SYMBOLS	MPG 06A	MPG 06B	MPG 06D	MPG 06G	MPG 06J	MPG 06K	MPG 06M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=25°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=25°C	I_{FSM}	40.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.1							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0							μA
Typical Junction Capacitance (NOTE 1)	C_J	10.0							pf
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	0.6							μS
Thermal Resistance Typical Maximum (NOTE 3)	$R\theta JA$	65.0 85.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditons: I_F=0.5A, 1.0A, Irr = 0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 - FORWARD CURRENT DERATING CURVE

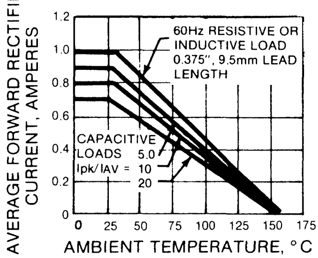


FIG. 2 — MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

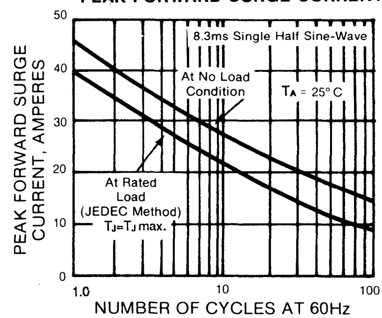


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

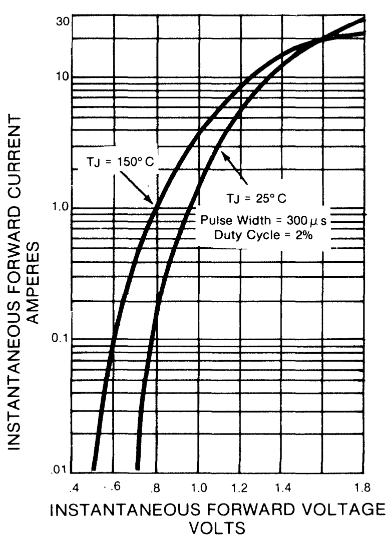


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

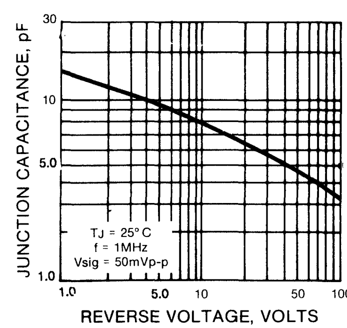
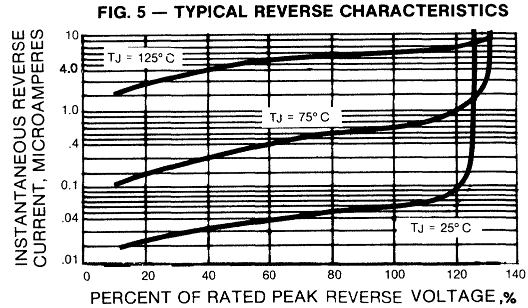


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

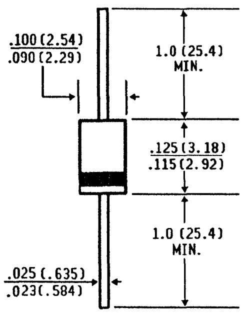


RMPG06A THRU RMPG06J

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING PLASTIC RECTIFIER

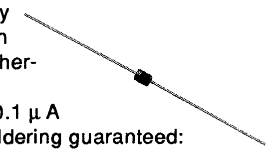
***Voltage** - 50 to 600 Volts* ***Current** - 1.0 Ampere*

FEATURES



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- Low forward voltage drops, high current capability
- Glass passivated chip junctions
- High Surge Capability
- 1.0 Ampere operation at T_A=25°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- High temperature soldering guaranteed: 250°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic over glass passivated chip
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: 0.0064 ounce, .181 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	RMPG 06A	RMPG 06B	RMPG 06D	RMPG 06G	RMPG 06J	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	70	200	400	600	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=25°C	$I_{(AV)}$			1.0			Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=25°C	I_{FSM}			40.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.3			Volts
Maximum DC Reverse Current T_A=25°C				5.0			
at Rated DC Blocking Voltage T_A=125°C	I_R			50.0			μA
Typical Junction Capacitance (NOTE 1)	C_J			6.6			pf
Typical Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}			150		200	nS
Thermal Resistance Typical				67.0			
Maximum (NOTE 3)	$R\theta JA$			85.0			°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}			-55 to +150			°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditons: I_F= 0.5A, I_R=1.0A, Irr = 0.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 - FORWARD CURRENT DERATING CURVE

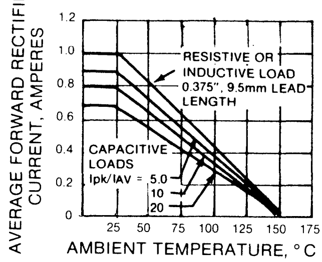


FIG. 2 — MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

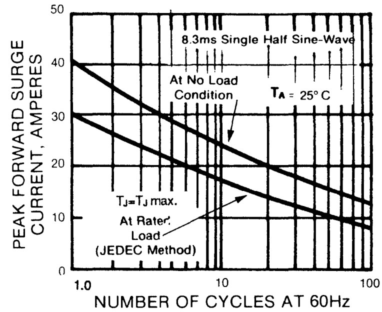


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

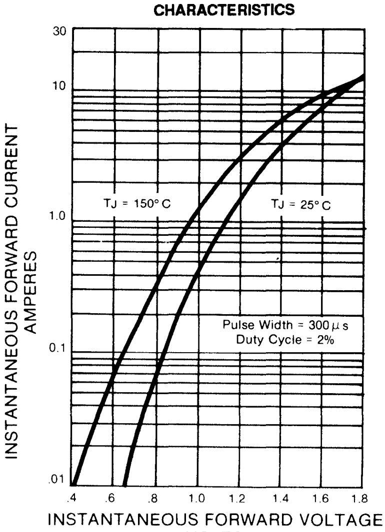


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

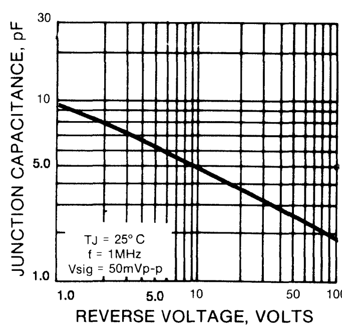
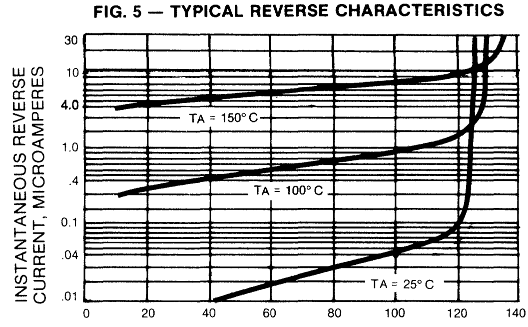


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



GLASS PASSIVATED RECITFIERS

0.2 AMPERE TO 3.0 AMPERES
50 VOLTS TO 1600 VOLTS

General Instrument

GLASS PASSIVATED RECTIFIER

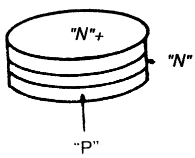
0.2 to 0.3 Amperes 50 Volts to 1600 Volts

Device Design

The Glass Passivated Rectifier is a hermetically sealed, cavityfree, diffused junction rectifier with unsurpassed operating and surge characteristics at high temperature.
Cavityfree construction with a specially developed extremely pure glass in direct contact with the silicon junction plus durable heat sink design obviate the need for solder joints and compression contact parts. The carefully matched expansion characteristics of the glass and metal parts in combination with the direct contact of the glass and silicon junction make the active rectifying elements impervious to surface contamination, moisture or other external chemical agents. Further, the long term degradation associated with organic junction protection is avoided.

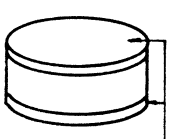
There are many steps necessary to produce such a device:

Diffused Slice



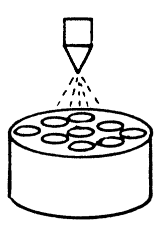
1-Diffuse a PN junction into a slice of silicon.

Metallized Slice



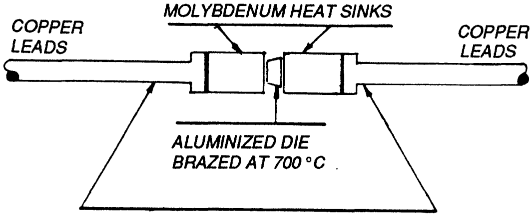
EVAPORATED ALUMINUM

2-Evaporate aluminum on both sides of the slice to make metallurgical contact.



SAND BLASTED ROUND DICE

3-Sandblast the slice to produce a round beveled die.



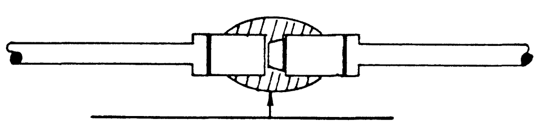
LEADS BRAZED TO MOLYBDENUM

LEADS BRAZED TO MOLYBDENUM
4. Braze the die between two molybdenum heat sinks to which leads have been attached at approximately 700°C.

5-Clean the assembly by chemically etching, washing and drying.

6-Apply glass in the form of a frit to the die and molybdenum assembly.

GLASS PASSIVATED RECTIFIER



GLASS BODY & PASSIVATION FIRED AT 600°C

7-Melt the glass by heating in an oven to approximately 600 °C.

8-Overmold glass passivated construction with UL recognized flame-retardant 94V-0 classification epoxy.

Package Design

The small size of the glass package with its capability up to 3 Ampere permits greater packing densities in electronic assemblies and equipment, while increasing reliability. Furthermore, only high temperature brazing operations are used to withstand the 600 C required to melt and fuse the glass. This technique eliminates solder construction and tremendously enhances mechanical strength and temperature cycling capability, increasing operating and storage temperature range while reducing thermal resistance.

Reliability

Specified reliability data on Glass Passivated Rectifier devices are available from the General Instrument Semiconductor Components Division Reliability Department. The basic design of the Glass Passivated rectifier and the strict positive controls over materials and manufacturing processes provide assurance of failure free performance under the most severe conditions. Processing facilities have been geared to follow the procedural requirements of Military Standard 750.Glass Passivated rectifiers are capable of withstanding environmental extremes in excess of MIL-S-19500E and of meeting requirements of MIL-STD-883, MIL-Q-9858 and MIL-I-45208. Assurance of production uniformity and reliability is provided by a test technique called "Operational Load Line Testing," which has proven product reliability with over 1 Billion Glass Passivated rectifiers now in use.

FAMILIES OF GENERAL INSTRUMENT GLASS PASSIVATED RECTIFIERS

Glass Passivated Junction Recitifiers 1.0 to 3.0 AMPERES

Types:
1N4245 thru 1N4249
1N5059 thru 1N5062
1N5614 thru 1N5622
1N5550 thru 1N5554
1N5624 thru 1N5627
G1A thru G1M
G2A thru G2M
G3A thru G3M
G4A thru G4M

Features:
- *Glass Passivated Junction*
- *High Mechanical Strength*
- *Storage up to 200 °C*
- *Voidless Construction*
- *Hermetically Sealed*
- *Avalanche Operation*
- *Low Leakage*
- *High Conductance*
- *Tin Plated Axial Leads, Solerable per MIL-STD-750/2026*

Glass Passivated Fast Recovery Junction Rectifiers 1.0 to 3.0 AMPERES

Types:
1N4942 thru 1N4948
1N5615 thru 1N5623
1N5415 thru 1N5420
RG1A thru RG1M
RG2A thru RG2M
RG3A thru RG3M
RG4A thru RG4M
BYV95 thru BYV96
BYW32 thru BYW36
BYW72 thru BYW76

Features:
- *Glass Passivated Junction*
- *Fast Switching for High Rectification Efficiency to 100 kHz*
- *High Mechanical Strength*
- *Low Leakage*
- *Hermetically Sealed*
- *Storage up to 200°C*
- *Tin Plated Axial Leads, Solderable per MIL-STD-750/2026*

High Voltage Glass Passivated Junction Rectifiers 1.0 to 3.0 Amperes

Types:
CG1, DG1
CG2, DG2
CG3, DG3
GI1-1200 thru GI1-1600

Features:
- *All Advantages of a Hermetically Sealed Glass Passivated Junction*
- *Specially designed for Clamper/Damper Applications in Television/CRT circuitry*
- *Low Leakage, VR ratings of 1400 volts to 1600 volts*
- *High Mechanical Strength*
- *Tin Plated Axial Leads, Solderable per MIL-STD-750/2026*

QUICK GUIDE TO GLASS PASSIVATED RECTIFIERS

TYPE	1N4245 thru 1N4249	1N4942* thru 1N4948*	1N5059 thru 1N5062	1N5614 thru 1N5622	1N5615* thru 1N5623*	G1A thru G1M	RG1A* thru RG1M*
CASE	DO204AP	DO204AP	DO204AP	DO204AP	DO204AP	DO204AP	DO204AP
Io(A)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
@TA(C)	55	55	55	55	55	100	55
VR= 50(V)						G1A	RG1A
VR=100(V)						G1B	RG1B
VR=200(V)	1N4245	1N4942	1N5059	1N5614	1N5615	G1D	RG1D
VR=300(V)							
VR=400(V)	1N4246	1N4944	1N5060	1N5616	1N5617	G1G	RG1G
VR=500(V)							
VR=600(V)	1N4247	1N4946	1N5061	1N5618	1N5619	G1J	RG1J
VR=800(V)	1N4248	1N4947	1N5062	1N5620	1N5621	G1K	RG1K
VR=1000(V)	1N4249	1N4948		1N5622	1N5623	G1M	RG1M
SURGE(A)	25	30	50	50	50	50	30
VF(V)	1.2	1.3	1.2	1.2	1.2	1.1	1.3

*Fast Recovery

QUICK GUIDE TO GLASS PASSIVATED RECTIFIERS

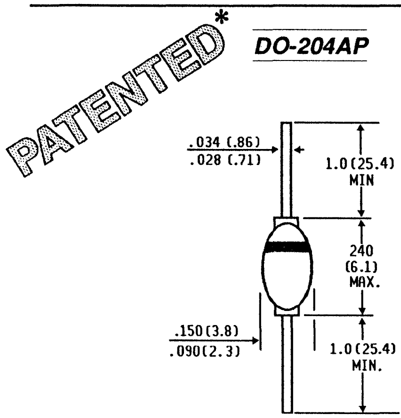
TYPE	CG1 and DG1	G2A thru G2M	RG2A* thru RG2M*	CG2 and DG2	1N5624 thru 1N5627	1N5550 thru 1N5552	1N5415* thru 1N5420*	G3A thru G3M	G4A thru G4J	RG3A* thru RG4J*	RG4A thru RG4M	CG3 and DG3
CASE	DO204AP	DO204AP	DO204AP	DO204AP	GPR3	GPR4	GPR4	GPR3	GPR4	GPR3	GPR4	GPR3
Io(A)	1.5	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
TA(C)	55	70	55	50	70	55	55	70	70	55	50	50
VR= 50(V)		G2A	RG2A				1N5415	G3A	G4A	RG3A	RG4A	
VR=100(V)		G2B	RG2B				1N5416	G3B	G4B	RG3B	RG4B	
VR=200(V)		G2D	RG2D		1N5624	1N5550	1N5417	G3D	G4D	RG3D	RG4D	
VR=300(V)												
VR=400(V)		G2G	RG2G		1N5625	1N5551	1N5418	G3G	G4G	RG3G	RG4G	
VR=500(V)							1N5419					
VR=600(V)		G2J	RG2J		1N5626	1N5552	1N5420	G3J	G4J	RG3J	RG4J	
VR=800(V)		G2K	RG2K		1N5627			G3K			RG4K	
VR=1000(V)		G2M	RG2M					G3M			RG4M	
VR>1000(V)	CG1/DG1			CG2/DG2								CG3/DG3
SURGE(A)	40	50	50	40	125	100	80	125	125	100	100	100
VF(V)	1.0	1.2	1.3	1.1	1.0	1.2/	1.1	1.1	1.1	1.3	1.3	1.2

*Fast Recovery

1N4245 THRU 1N4249

MINIATURE GLASS PASSIVATED JUNCTION RECTIFIER

Voltage - *200 to 1000 Volts* **Current** - *1.0 Ampere*

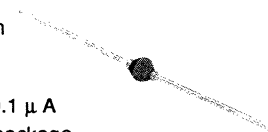


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 µA
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	1N4245	1N4246	1N4247	1N4248	1N4249	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$			1.0			Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			50.0			Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.2			Volts
*Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{R(AV)}$			50.0			µA
*Maximum Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R			1.0 25.0			µA
Typical Junction Capacitance (NOTE 1)	C_J			15.0			pf
Typical Thermal Resistance (NOTE 2)	$R_{\theta JA}$			40.0			°C/W
*Operating Temperature Range	T_J			-65 to +160			°C
*Storage Temperature Range	T_{STG}			-65 to +200			°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

*JEDEC Registered Values

FIG. 1 — FORWARD DERATING CURVE

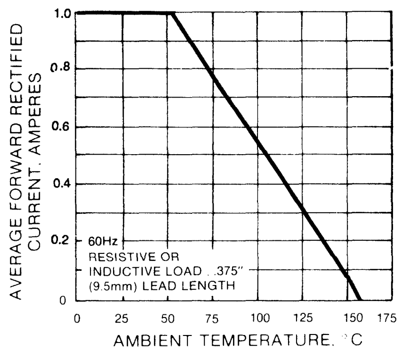


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

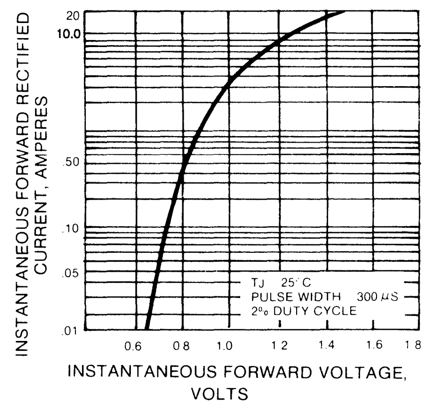


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

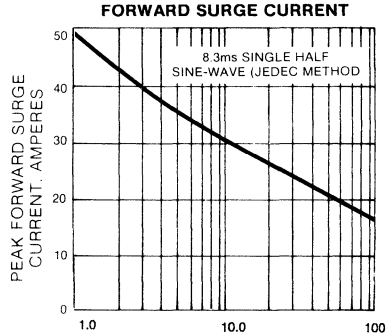


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

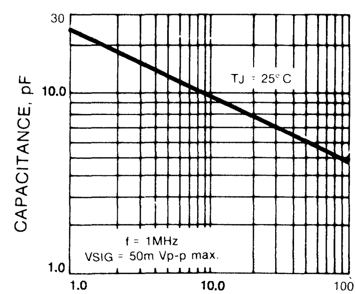
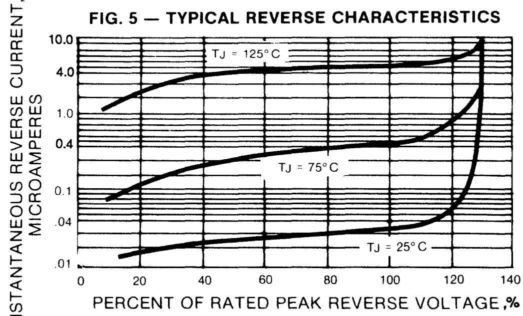


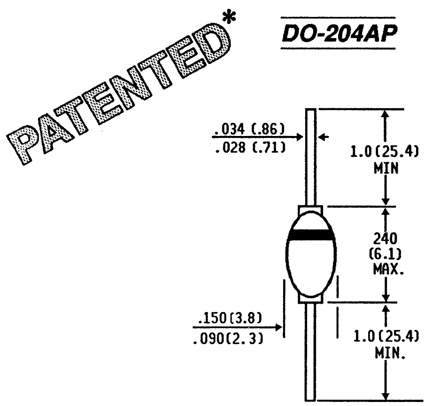
FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



1N5059 THRU 1N5062

MINIATURE GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 200 to 800 Volts* ***Current** - 1.0 Ampere*

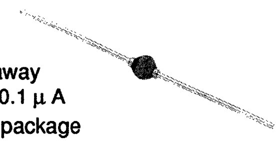


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- ◆ High temperature metallurgically bonded constructed rectifiers
- ◆ 1.0 Ampere operation at T_A=75°C with no thermal runaway
- ◆ Typical I_R less than 0.1 µ A
- ◆ Hermetically sealed package
- ◆ Glass passivated cavity-free junction D0-204AP package
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	1N5059	1N5060	1N5061	1N5062	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$	1.0				Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.2				Volts
*Maximum Full Load Reverse Current, Full Cycle Average .375", (9.5mm) T_A= 25°C	$I_{R(AV)}$	5.0				µA
Lead Lengths at T_A=75°C		150		100		
*Maximum DC Reverse Current T_A= 25°C	I_R	5.0				µA
at Rated DC Blocking Voltage T_A=175°C		300		200		
Typical Reverse Recovery Time (NOTE 1)	T_{RR}	2.0				µs
Typical Junction Capacitance (NOTE 2)	C_J	15.0				pf
Typical Thermal Resistance (NOTE 3)	RΘJA	40.0				°C/W
*Operating and Storage Temperature Range	T_J, T_{STG}	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr =.25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

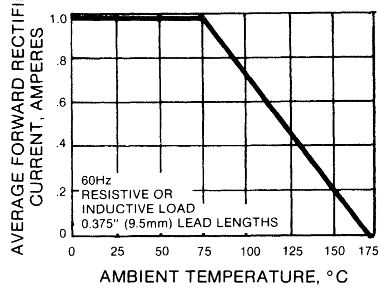


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

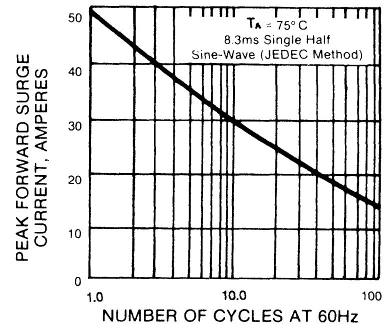


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

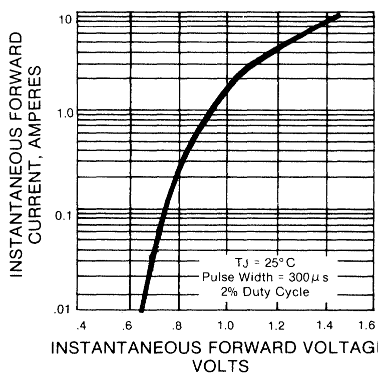


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

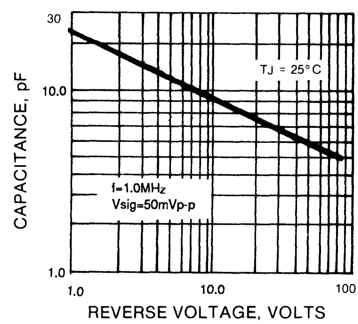


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

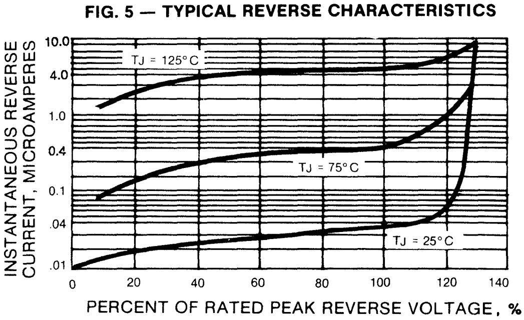
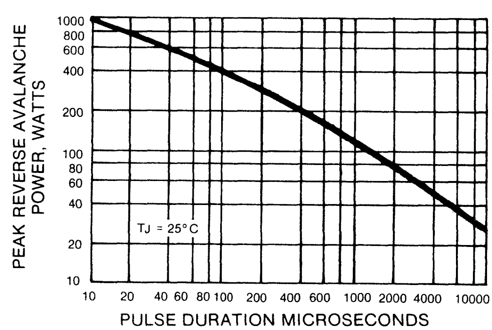


FIG. 6 — MAXIMUM NON-REPETITIVE REVERSE AVALANCHE POWER DISSIPATION



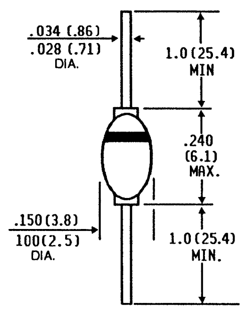
1N5614 THRU 1N5622

MINIATURE GLASS PASSIVATED MEDIUM-SWITCHING JUNCTION RECTIFIER

Voltage *- 200 to 1000 Volts* ***Current*** *- 1.0 . Ampere*

PATENTED*

DO-204AP

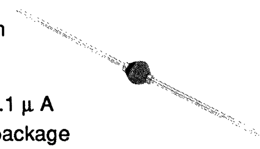


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- 1.0 Ampere operation at T_A= 55°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	1N5614	1N5616	1N5618	1N5620	1N5622	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
*Minimum Reverse Breakdown Voltage at 50 µ A	V_{BR}	220	440	660	880	1100	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1.0					Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0					Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.2					Volts
*Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C T_A=200°C	I_R	0.5 25.0 1500					µA
*Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	2.0					µs
Maximum Junction Capacitance (NOTE 2)	C_J	45.0	35.0	25.0	20.0	15.0	pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$	40.0					°C/W
*Operating Junction Temperature Range	T_J	-65 to +175					°C
*Storage Temperature Range	T_{STG}	-65 to +200					°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1 MHz and applied reverse voltage of 12 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

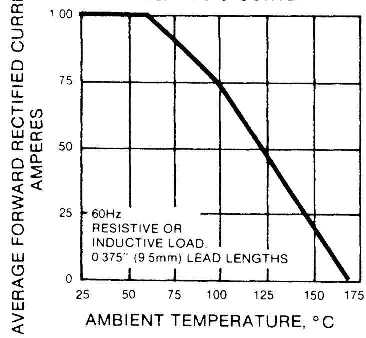


FIG. 2— MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

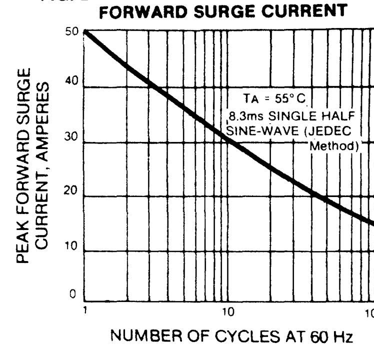


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

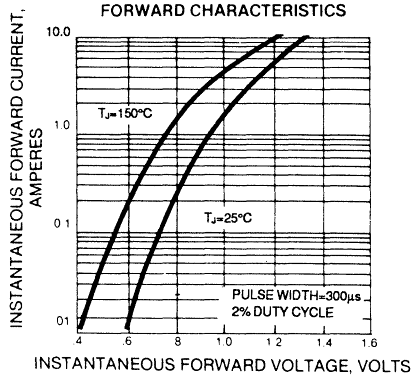


FIG. 4—TYPICAL JUNCTION CAPACITANCE

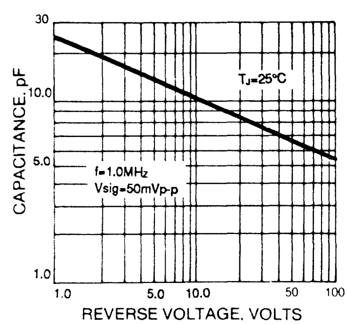
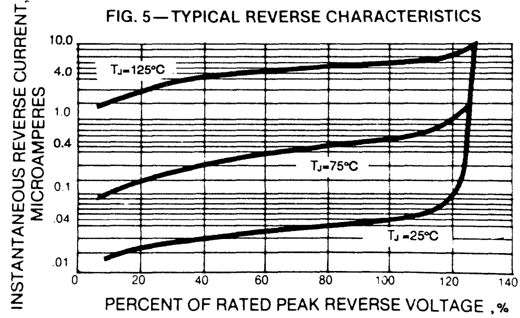


FIG. 5—TYPICAL REVERSE CHARACTERISTICS



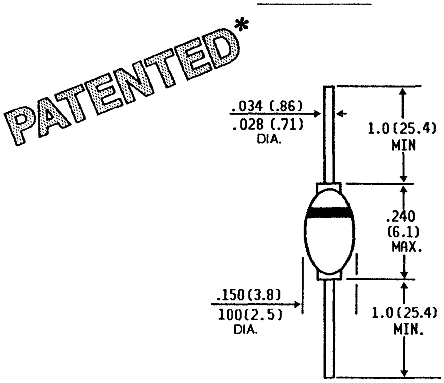
G1A THRU G1M

MINIATURE GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current**- 1.0 Ampere*

FEATURES

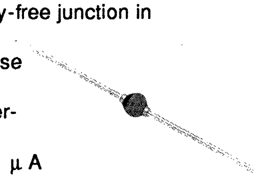
DO-204AP



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction in D0-204AP package
- Hermetically sealed case
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60Hz, resistive or inductive load.
For capacitive load, derate current by 20%

	SYMBOLS	G1A	G1B	G1D	G1G	G1J	G1K	G1M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	70	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=100°C	$I_{(AV)}$				1.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				50.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F		1.2			1.1			Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Length at T_A=100°C	$I_{R(AV)}$				200.0				µA
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R				2.0 100.0				µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}				2.0				µs
Typical Junction Capacitance (NOTE 2)	C_J				15.0				pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$				40.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}				-65 to +175				°C

NOTES:
1. Measured with I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

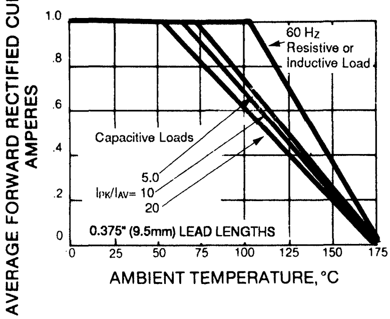


FIG. 2— MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

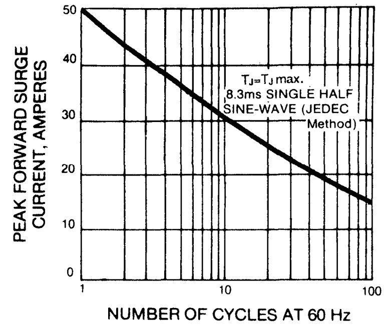


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

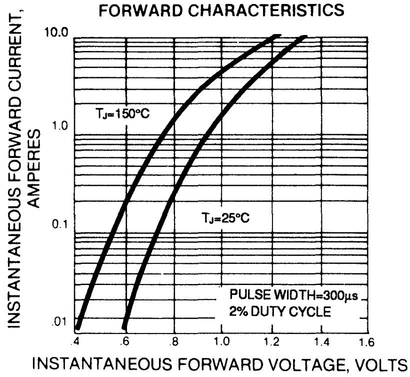


FIG. 4—TYPICAL JUNCTION CAPACITANCE

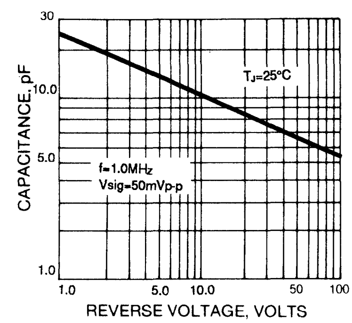
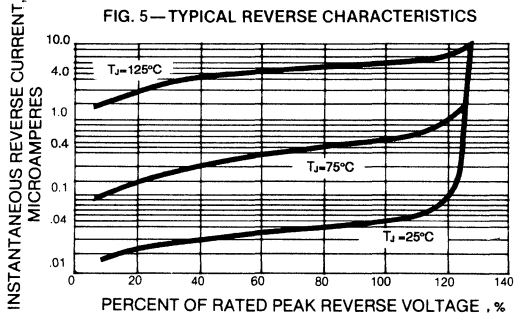


FIG. 5—TYPICAL REVERSE CHARACTERISTICS



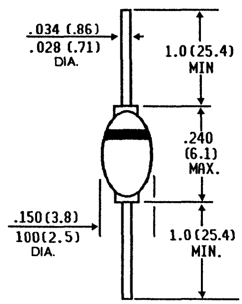
G2A THRU G2M

MINIATURE GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current**- 2.0 Amperes*

PATENTED*

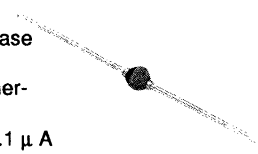
DO-204AP



Dimensions in inches
and
(millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction in D0-204AP package
- Hermetically sealed case
- 2.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%

	SYMBOLS	G2A	G2B	G2D	G2G	G2J	G2K	G2M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=75°C	$I_{(AV)}$	2.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	1.2		1.1					Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Length at T_A=100°C	$I_{R(AV)}$	100.0							μA
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=150°C	I_R	1.0 / 100.0							μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	2.0							μs
Typical Junction Capacitance (NOTE 2)	C_J	15.0							pf
Typical Thermal Resistance (NOTE 3)	RΘJA	40.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175							°C

NOTES:
1. Measured with I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

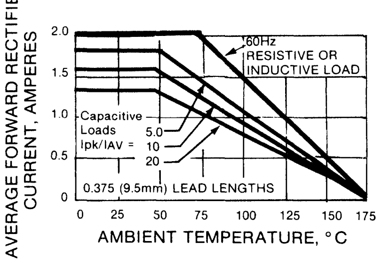


FIG. 2—MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

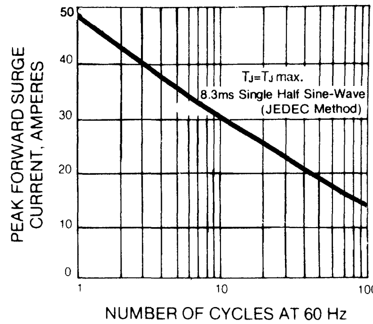


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

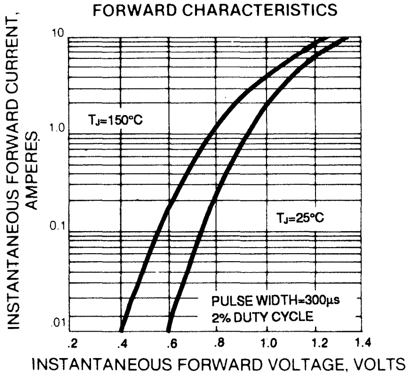


FIG. 4—TYPICAL JUNCTION CAPACITANCE

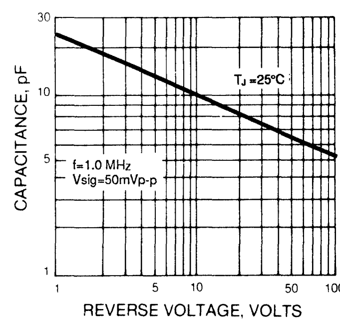
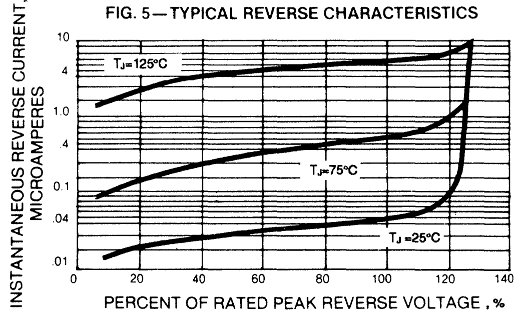


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

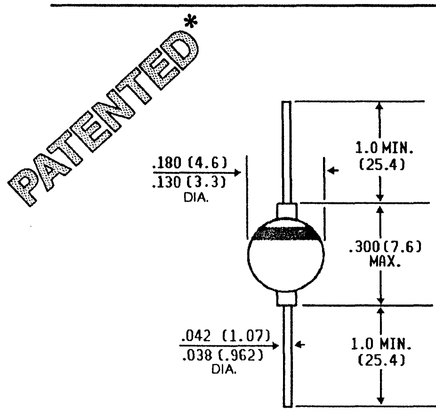


1N5550 THRU 1N5552

GLASS PASSIVATED JUNCTION RECTIFIER

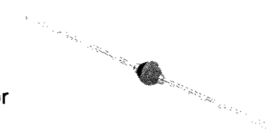
***Voltage** - 200 to 600 Volts* ***Current** - 3.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- Glass passivated cavity-free junction
- High temperature metallurgically bonded
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- Medium switching for good efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750 Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .037 ounce, 1.04 grams

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N5550	1N5551	1N5552	1UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	Volts
*Minimum Reverse Breakdown Voltage at 50 μ A	V_{BR}	240	460	660	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$		3.0		Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}		100.0		Amps
* Maximum Instantaneous Forward Voltage at 3.0A	V_F		1.0		Volts
*Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C T_A=200°C	I_R		1.0 25.0 1500.0		μA
*Maximum Junction Capacitance (NOTE 2)	C_J	150	120	100	pf
*Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}		2.0		μs
Typical Thermal Resistance (NOTE 3)	RΘJA		15.0		°C/W
*Operating Junction and Storage Temperature Range	T_J, T_{STG}		-65 to +200		°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1 MHz and applied reverse voltage of 12.0 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads mounted between heat sinks.

*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

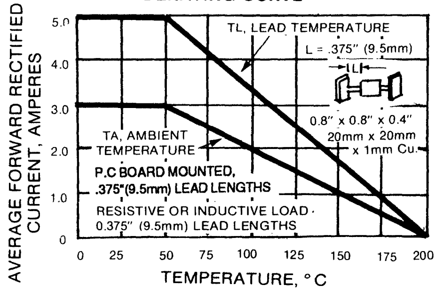


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

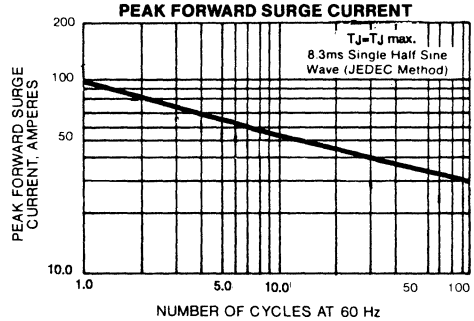


Fig. 4—TYPICAL JUNCTION CAPACITANCE

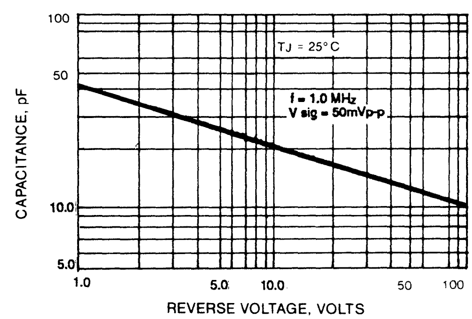


Fig. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

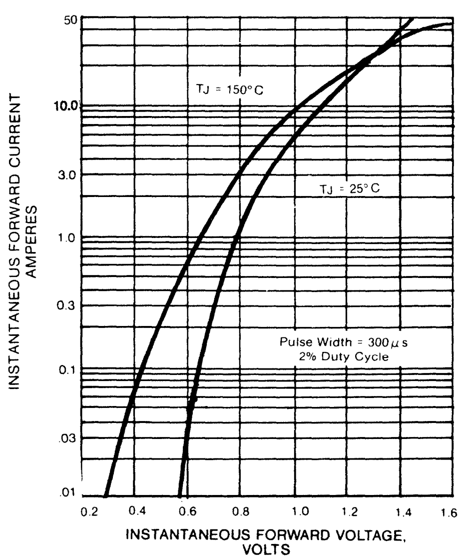
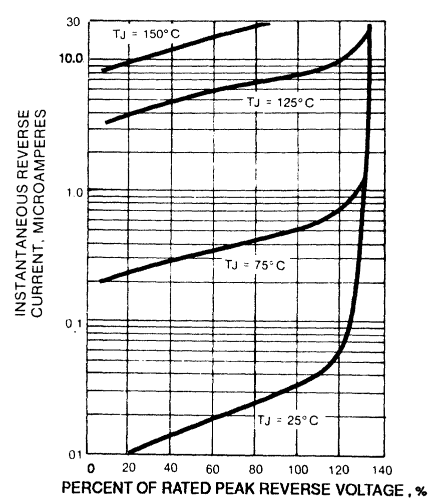


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

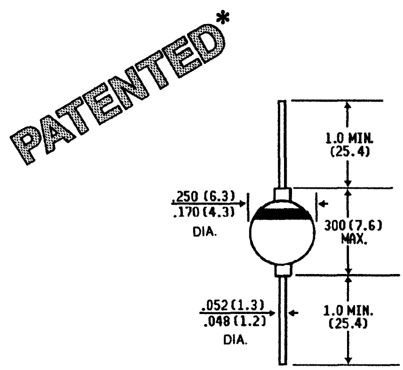


1N5624 THRU 1N5627

GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 200 to 800 Volts* ***Current** - 3.0 Amperes*

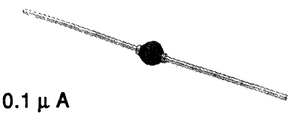
FEATURES



Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- Glass passivated cavity-free junction
- High temperature metallurgically bonded constructed rectifiers
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500



- Typical I_R less than 0.1 μ A
- 3.0 Ampere operation at T_A=70°C with no thermal runaway
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N5624	1N5625	1N5626	1N5627	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=70°C	$I_{(AV)}$	3.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	125.0				Amps
*Maximum Instantaneous Forward Voltage at 3.0A T_A=25°C	V_F	1.0				Volts
T_A=70°C		0.95				
*Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R	5.0				μA
T_A=175°C		300.0			200.0	
*Maximum Full Load Reverse Current, Full cycle Average, .375", (9.5mm) lead length at T_A=70°C	$I_{R(AV)}$	150.0			100.0	μA
Typical Junction Capacitance (NOTE 1)	C_J	40.0				pf
Typical Thermal Resistance (NOTE 2)	RθJA	15.0				°C/W
*Operating JunctionTemperature Range	T_J	-65 to +175				°C
*Storage Temperature Range	T_{STG}	-65 to +200				°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads attached between heatsinks.
*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

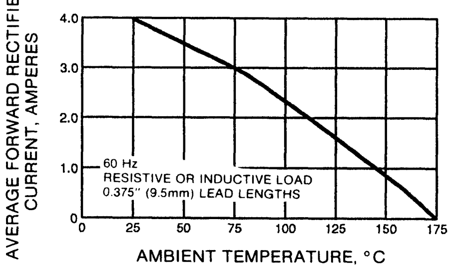


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

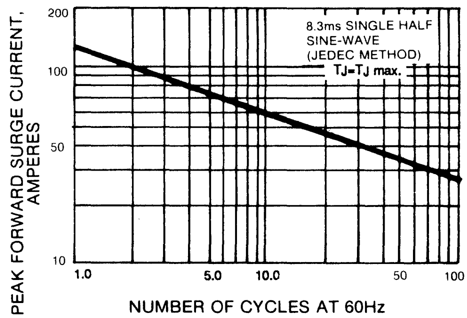


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

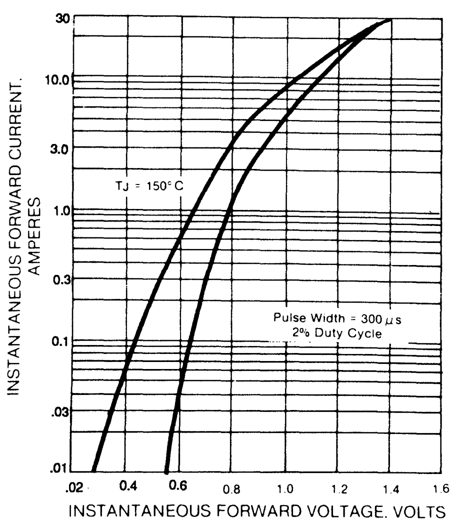


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

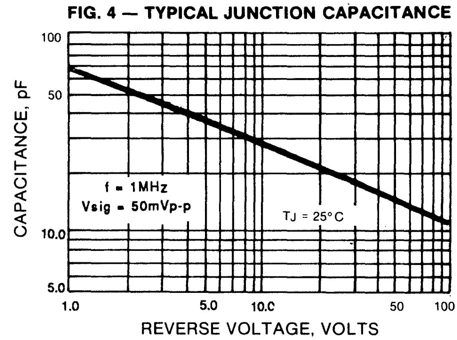
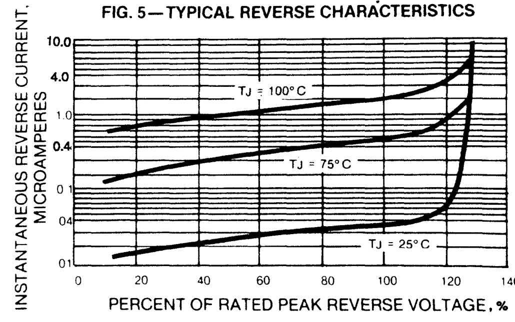


FIG. 5—TYPICAL REVERSE CHARACTERISTICS



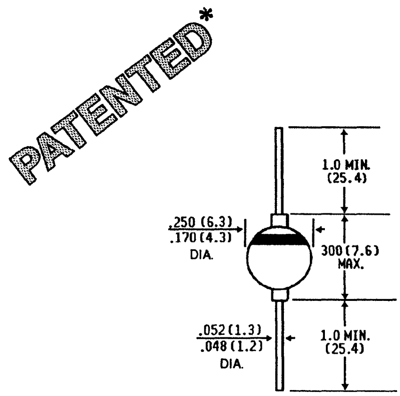
General Instrument

G3A THRU G3M

GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current**- 3.0 Amperes*

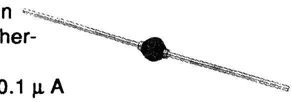
FEATURES



Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction
- Hermetically sealed package
- 3.0 Ampere operation at T_A=70°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass, hermetically sealed
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .04 ounce,1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	G3A	G3B	G3D	G3G	G3J	G3K	G3M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=70°C	$I_{(AV)}$				3.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				125.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.2			1.1				Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Length at T_A=70°C	$I_{R(AV)}$				200.0				μA
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=150°C	I_R				5.0 100.0				μA
Typical Reverse Recovery Time (NOTE 1)	T_{RR}				3.0				μs
Typical Junction Capacitance (NOTE 2)	C_J				40.0				pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$				15.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}				-65 to +175				°C

NOTES:
1. Measured with I_F=0.5A, I_R=1A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads mounted between heatsinks.

FIG. 1—FORWARD CURRENT DERATING CURVE

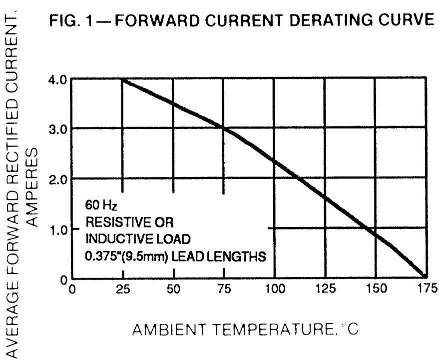


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

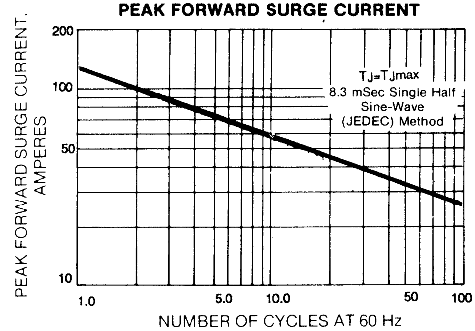


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

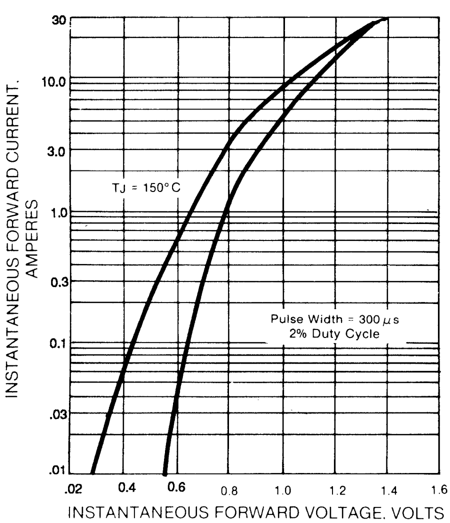


FIG. 4—TYPICAL JUNCTION CAPACITANCE

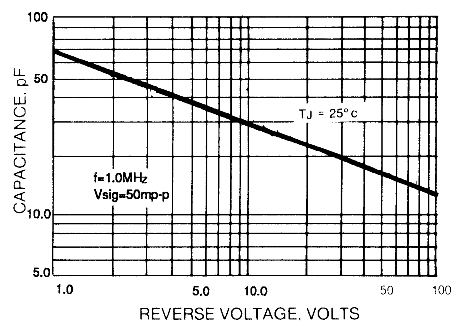
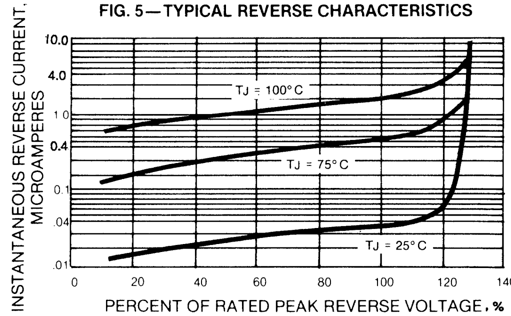


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

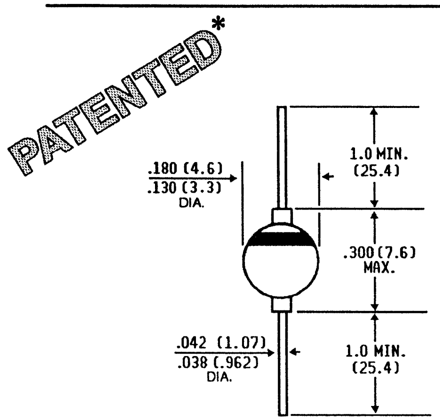


G4A THRU G4J

GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 3.0 Amperes*

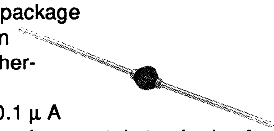
FEATURES



Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction
- Hermetically Sealed package
- 3.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .037 ounce,1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%

	SYMBOLS	G4A	G4B	G4D	G4G	G4J	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=70°C	$I_{(AV)}$	3.0					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0					Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.1					Volts
Maximum Full Load Reverse Current Full Cycle Average, .375", (9.5mm) Lead Length at T_A=70°C	$I_{R(AV)}$	200.0					µA
Maximum Average Reverse Current at Peak Reverse Voltage T_A=25°C / T_A=100°C	$I_{R(AV)}$	5.0 / 100.0					µA
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=100°C	I_R	1.0 / 100.0					µA
Typical Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	3.0					µs
Typical Junction Capacitance (NOTE 1)	C_J	40.0					pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$	15.0					°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175					°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths with both leads mounted between heatsinks.

Fig. 1—FORWARD CURRENT DERATING CURVE

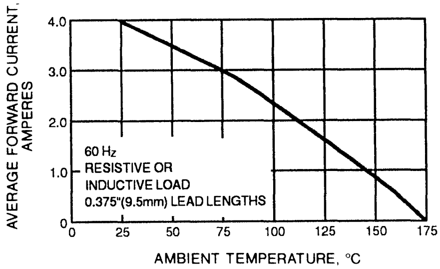


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

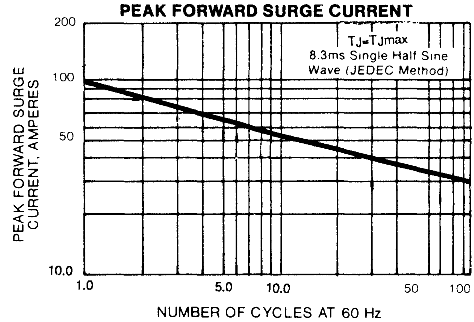


Fig. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

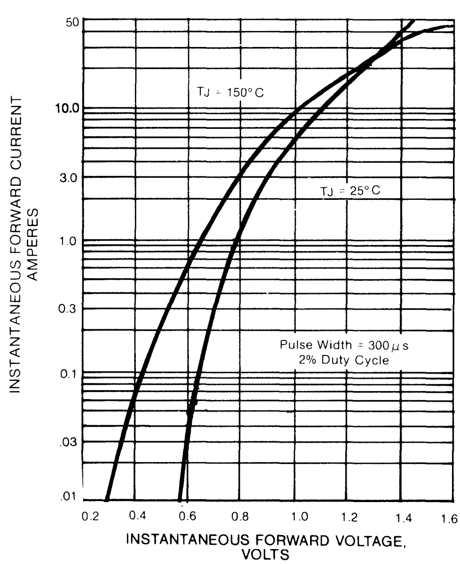


Fig. 4—TYPICAL JUNCTION CAPACITANCE

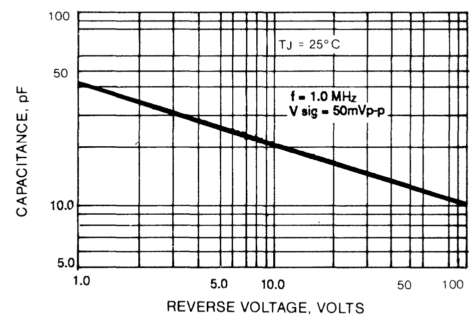
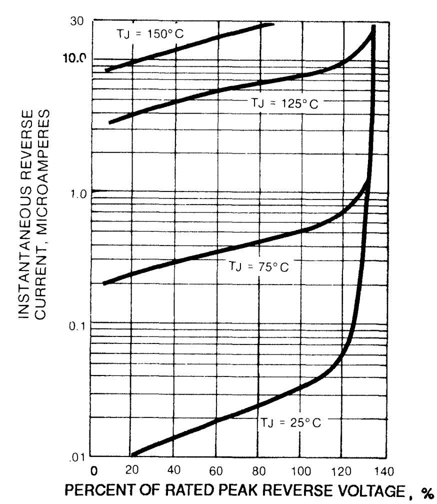


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



HIGH VOLTAGE GLASS PASSIVATED RECTIFIERS

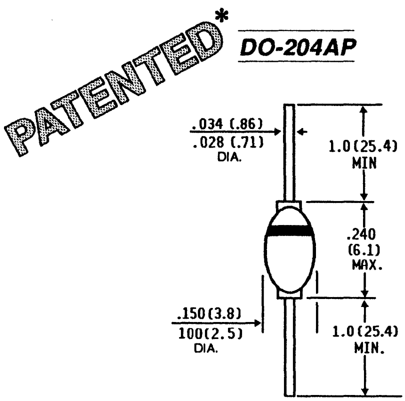
1.0 AMPERE TO 3.0 AMPERES
1200 VOLTS TO 1600 VOLTS

General Instrument

CG1 AND DG1

MINIATURE CLAMPER / DAMPER GLASS PASSIVATED JUNCTION RECTIFIER

Voltage - *1400 to 1500 Volts* ***Current -*** *1.5 Amperes*

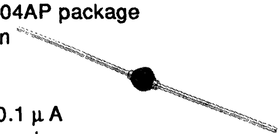


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Specially designed for clamping circuits horizantal deflection systems and damper applications
- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction in DO-204AP package
- 1.5 Ampere operation at T_A=50°C with no thermal runaway



- Typical I_R less than 0.1 µ A
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	*CG1*	*DG1*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1400	1500	Volts
Maximum RMS Voltage	V_{RMS}	980	1050	Volts
Maximum DC Blocking Voltage	V_{DC}	1400	1500	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=50°C	$I_{(AV)}$	1.5		Amps
Peak Forward Surge Current 8.3ms single half sine -wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0		Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.1		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 100		µA
Maximum Full Load Reverse Current Full Cycle Average, .375", (9.5mm) Lead Length T_A=100°C	$I_{R(AV)}$	50.0		µA
Maximum Reverse Recovery Time (NOTE 1) T_J= 25°C	T_{RR}	15.0	20.0	µs
Typical Junction Capacitance (NOTE 2)	C_J	15.0		pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	40.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175		°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=50ma.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

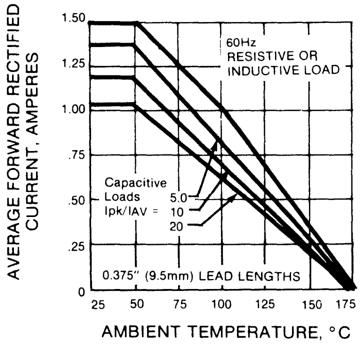


FIG. 2 — MAXIMUN NON REPETITIVE PEAK FORWARD SURGE CURRENT

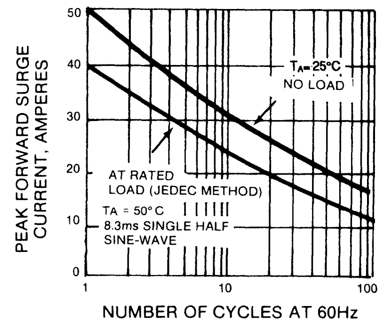


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

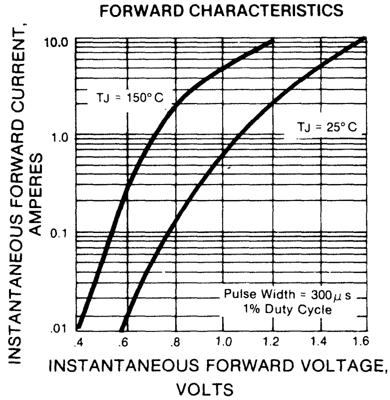


FIG. 4—TYPICAL JUNCTION CAPACITANCE

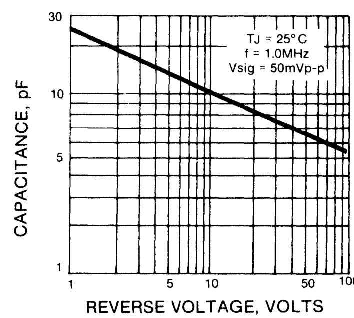


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

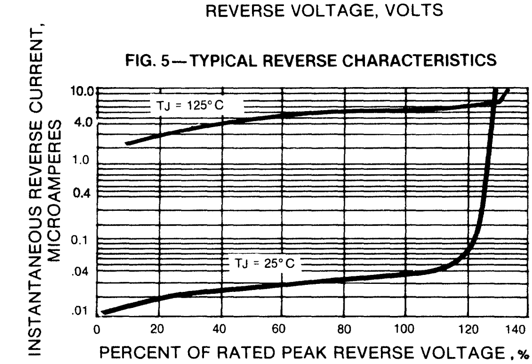
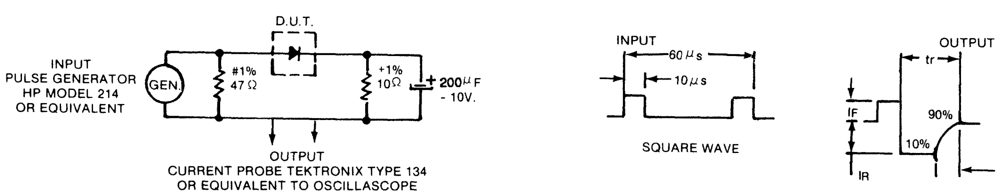


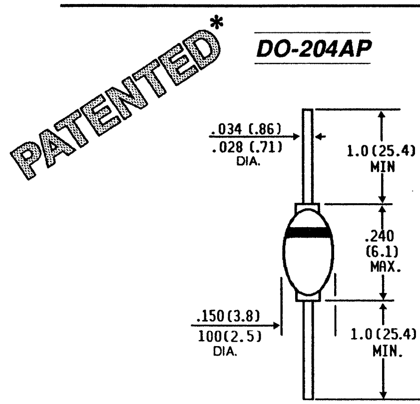
FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



GI1-1200 THRU GI1-1600

MINIATURE HIGH VOLTAGE GLASS PASSIVATED JUNCTION RECTIFIER

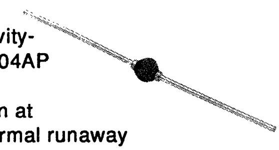
***Voltage** - 1200 to 1600 Volts* ***Current** - 1.0 Ampere*



Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES



- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction in D0-204AP package
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz Resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	*GI1-1200*	*GI1-1400*	*GI1-1600*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1200	1400	1600	Volts
Maximum RMS Voltage	V_{RMS}	840	980	1120	Volts
Maximum DC Blocking Voltage	V_{DC}	1200	1400	1600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=75°C	$I_{(AV)}$		1.0		Amps
Peak Forward Surge Current 8.3ms single half sine -wave superimposed on rated load (JEDEC Method)	I_{FSM}		30.0		Amps
Maximum Instantaneous Forward Voltage at 1.0A 3.14A	V_F		1.1 1.3		Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R		10.0 100.0		μA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}		25.0		μs
Maximum Forward Recovery Time (NOTE 2)	T_{FR}		1.0		μs
Typical Junction Capacitance (NOTE 3)	C_J		15.0		pf
Typical Thermal Resistance (NOTE 4)	RΘJA		40.0		°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}		-65 to +175		°C

NOTES:
1. Measured on Tektronix Type "S" recovery plug-in Tektronix 545 Scope or equivalent IFM=20 mA, IRM= 2mA.
2. Measured on Tektronix Type "S" recovery plug-in, Tektronix 545 or equivalent, IFM = 20mA.
3. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

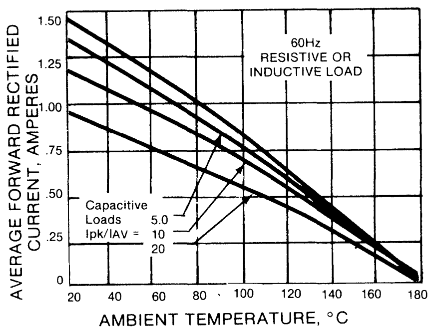


FIG. 2 — MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

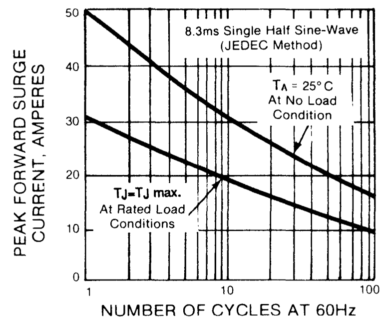


FIG. 3 — TYPICAL INSTANTANEOUS FOWARD CHARACTERISTICS

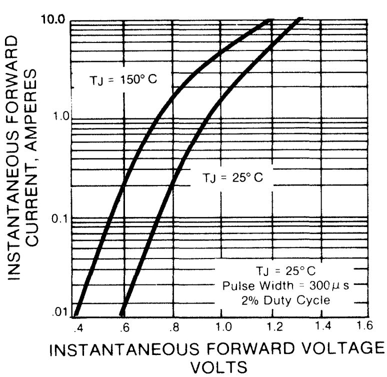


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

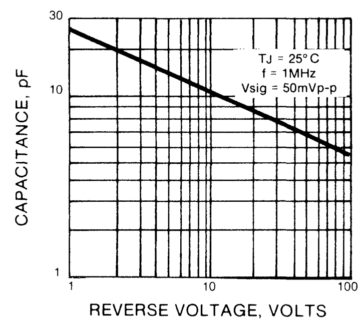
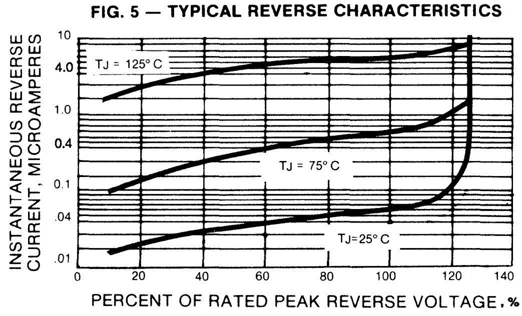


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



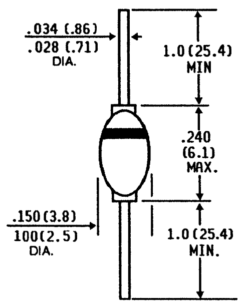
CG2 AND DG2

MINIATURE CLAMPER / DAMPER GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 1400 to 1500 Volts*   ***Current** - 2.0 Amperes*

PATENTED*

DO-204AP

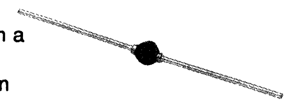


Dimensions in inches
and
(millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Specially designed for clamping circuits in horizontal deflection systems and damper applications
- High temperature metallurgically bonded
- Glass passivated cavity-free junction in a D0-204AP package



- 2.0 Ampere operation at T_A=50°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	*CG2*	*DG2*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1400	1500	Volts
Maximum RMS Voltage	V_{RMS}	980	1050	Volts
Maximum DC Blocking Voltage	V_{DC}	1400	1500	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=50°C	$I_{(AV)}$	2.0		Amps
Peak Forward Surge Current 8.3ms single half sine -wave superimposed on rated load (JEDEC Method)	I_{FSM}	40.0		Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	1.1		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 100.0		µA
Maximum Full Load Reverse Current Full Cycle Average, .375", (9.5mm) Lead Length T_A=100°C	$I_{R(AV)}$	200.0		µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	15.0	20.0	µs
Typical Junction Capacitance (NOTE 2)	C_J	15.0		pf
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	40.0		°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175		°C

NOTES:
1. Measured with I_F=0.5A, I_R=50mA.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

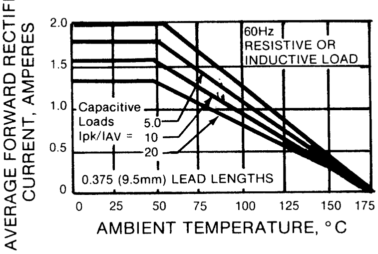


FIG. 2 — MAXIMUN NON REPETITIVE PEAK FORWARD SURGE CURRENT

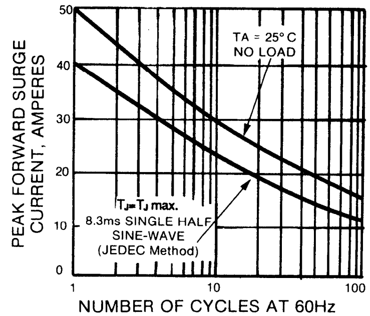


FIG. 4—TYPICAL JUNCTION CAPACITANCE

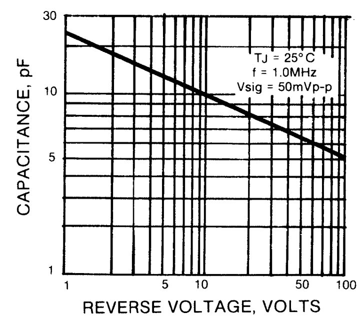


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

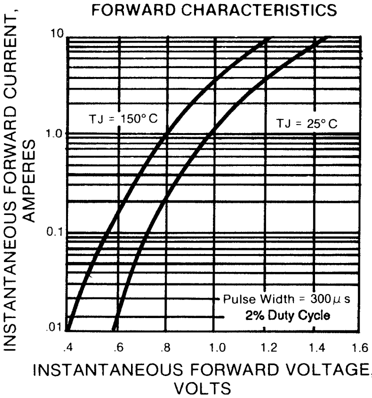


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

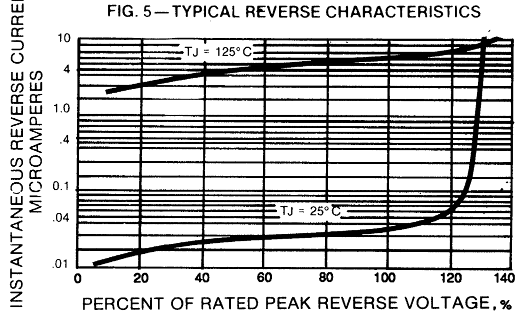
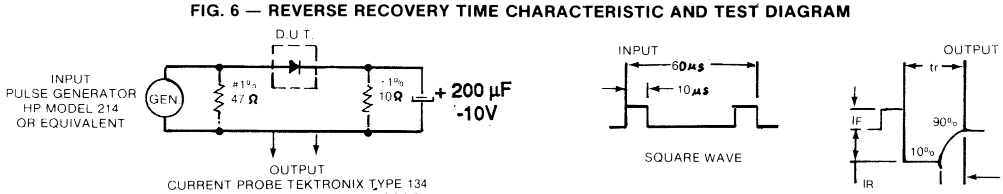


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



BY228 SERIES

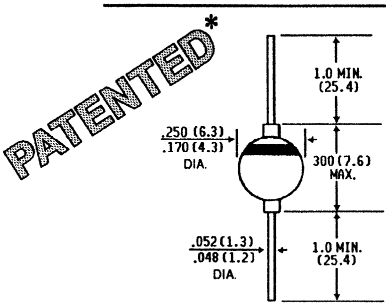
CLAMPER / DAMPER GLASS PASSIVATED JUNCTION RECTIFIER

Voltage - 1500 Volts *Current - 2.5 Amperes*

GENERAL DESCRIPTION

These silicon Glass Passivated Clamper / Damper Rectifiers are designed for TV Applications, such as clamping circuits in horizontal deflection systems and damper applications. The glass passivated construction and Dual Heat-Sink design assures reliable and stable operation.

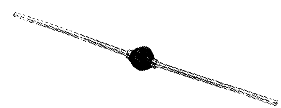
FEATURES



Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction
- 2.5 Ampere operation at T_A=50°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any ***Weight:*** .04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 50 - 60 HZ, resistive or inductive load..
For capacitive load, derate current by 20%.

	SYMBOLS	*BY228*	*UNITS*
Maximum Non Repetitive Peak Reverse Voltage	V_{RSM}	1650	Volts
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1500	Volts
Maximum RMS Voltage	V_{RMS}	1050	Volts
Maximum DC Blocking Voltage	V_{DC}	1500	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A= 50°C	$I_{(AV)}$	2.5	Amps
Peak Forward Surge Current 10ms single half sine -wave superimposed on rated load	I_{FSM}	50.0	Amps
Maximum Instantaneous Forward Voltage at 5.0A	V_F	1.6	Volts
Working Peak Forward Current at T_A=75°C	I_{FWM}	5.0	Amps
Peak Repetitive Forward Surge Current at T_A=75°C	I_{FRM}	10.0	Amps
Maximum Peak Reverse Current T_A=25°C at Rated Peak Reverse Voltage T_J=140°C	I_R	5.0 200	μA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	20.0	μS
Maximum Forward Recovery Time (NOTE 3)	T_{FR}	1.0	μS
Typical Junction Capacitance (NOTE 2)	C_J	40.0	pf
Typical Thermal Resistance (NOTE 4)	RθJA	20.0	°C/W
Operating Junction Temperature Range	T_J	-65 to +150	°C
Storage Temperature Range	T_{STG}	-65 to +200	°C

NOTES: 1. Measured with I_F = 1.0A, I_R= 50mA, di/dt=50mA/µs.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Measured with I_F=5.0A with tr-0.1 µs.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

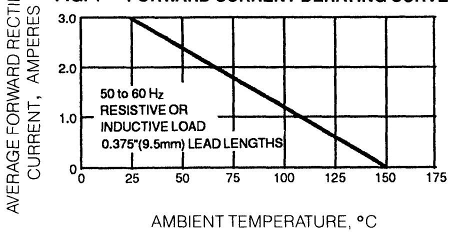


FIG. 2 — MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

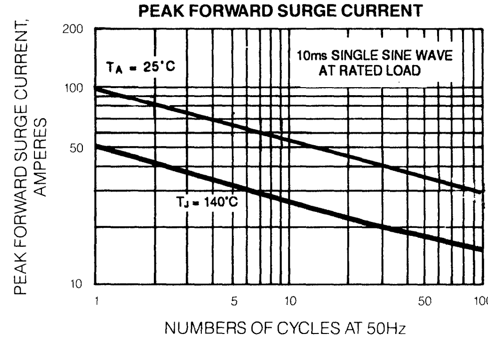


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

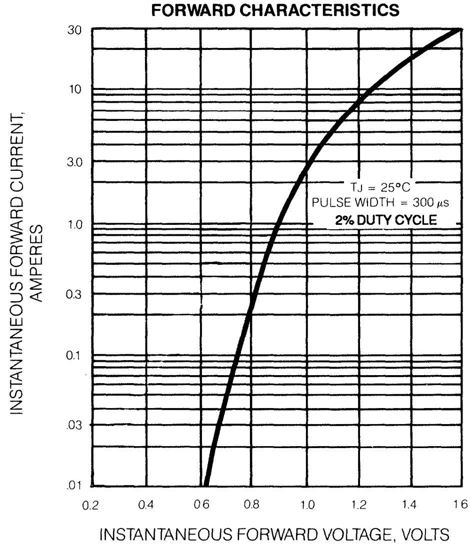


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

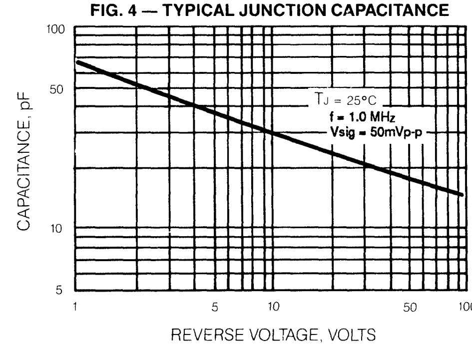


FIG. 5 - MAXIMUM REPETITIVE PEAK FORWARD SURGE CURRENT

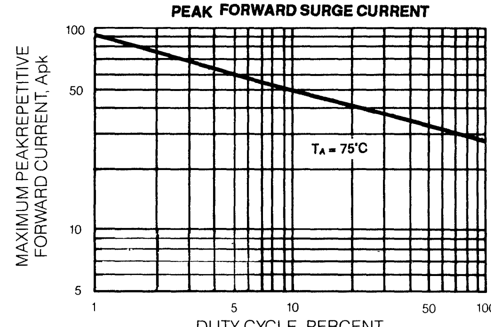
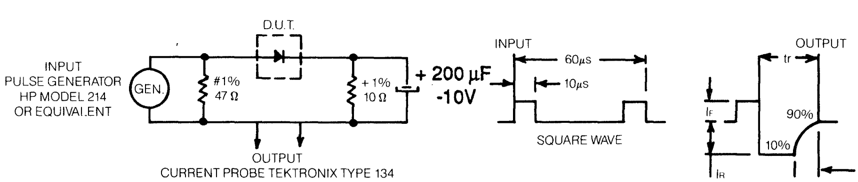


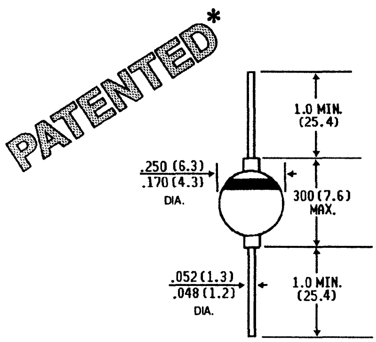
FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



CG3 AND DG3

CLAMPER / DAMPER GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 1400 to 1500 Volts* ***Current** - 3.0 Amperes*

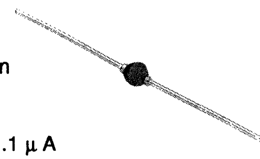


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Specially designed for clamping circuits horizontal deflection systems and damper applications
- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction
- 3.0 Ampere operation at T_A=50°C with no thermal runaway
- Typical I_R less than 0.1 µA
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	*CG3*	*DG3*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	1400	1500	Volts
Maximum RMS Voltage	V_{RMS}	980	1050	Volts
Maximum DC Blocking Voltage	V_{DC}	1400	1500	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=50°C	$I_{(AV)}$	3.0		Amps
Peak Forward Surge Current 8.3ms single half sine -wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0		Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.2		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 100.0		µA
Maximum Full Load Reverse Current Full Cycle Average, .375", (9.5mm) Lead Length T_A=70°C	$I_{R(AV)}$	200.0		µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	15.0	20.0	µs
Typical Junction Capacitance (NOTE 2)	C_J	40.0		pf
Typical Thermal Resistance (NOTE 3)	RΘJA	20.0		°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175		°C

NOTES:
1. Measured with I_F=0.5A, I_R=50mA.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

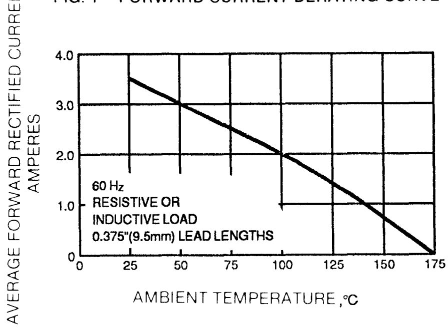


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

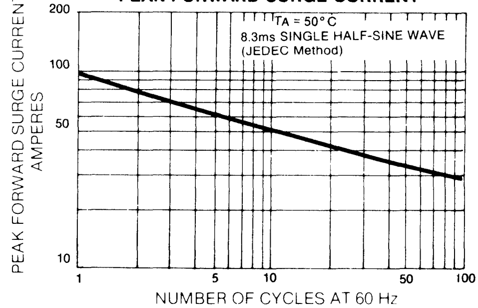


FIG. 4—TYPICAL JUNCTION CAPACITANCE

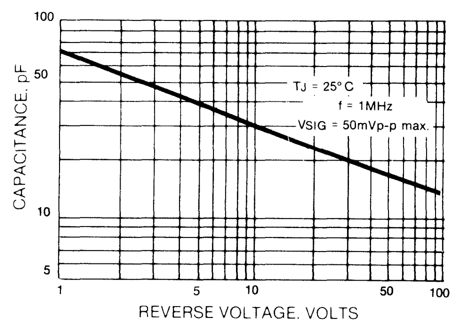


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

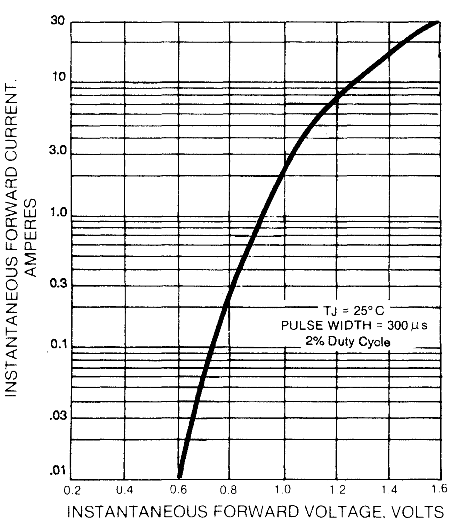


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

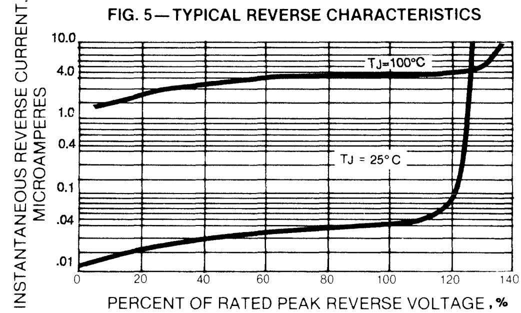
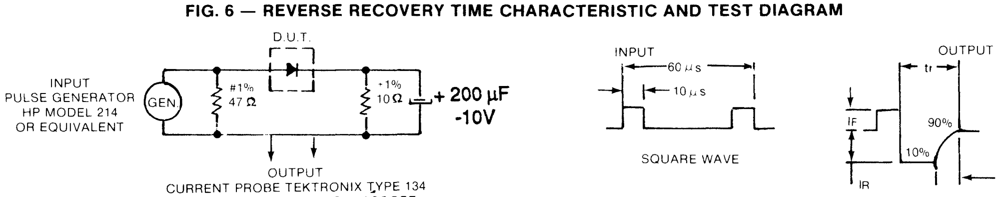


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



FAST RECOVERY GLASS PASSIVATED RECTIFIERS

1.0 AMPERE TO 3.0 AMPERES
50 VOLTS TO 1000 VOLTS

General Instrument

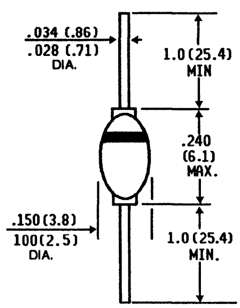
1N4942 THRU 1N4948

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AP

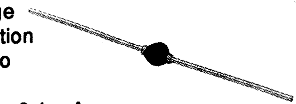


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Hermetically sealed case
- Glass passivated cavity-free junction in D0-204AP package
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	1N4942	1N4944	1N4946	1N4947	1N4948	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
*Minimum Reverse Breakdown Voltage at 50 µ A	V_{BR}	220	440	660	880	1100	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$			1.0			Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			25.0			Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.3			Volts
at 2.0A, T_A=-40°C	V_F			2.5			Volts
*Maximum DC Reverse Current T_A=25°C	I_R			1.0			µA
at Rated DC Blocking Voltage T_A= 175°C	I_R			500.0			µA
*Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150	150	250	250	500	nS
Typical Junction Capacitance (NOTE 2)	C_J			15.0			pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$			50.0			°C/W
*Operating Junction and Storage Temperature Range	T_J,T_{STG}			-65 to +175			°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.
*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

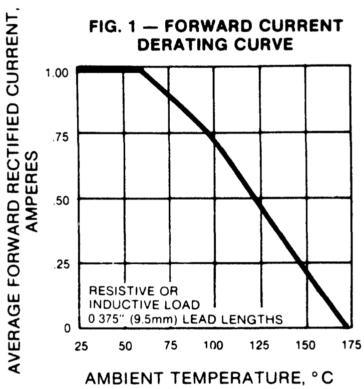


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

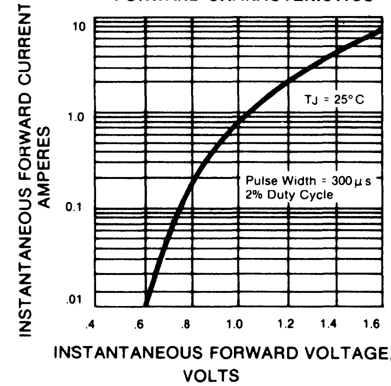


FIG. 3 -MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

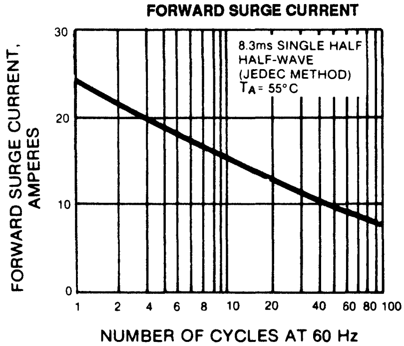


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

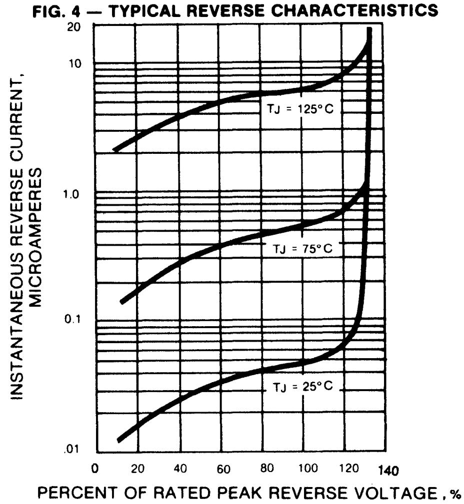


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

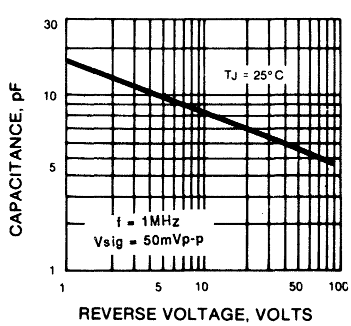
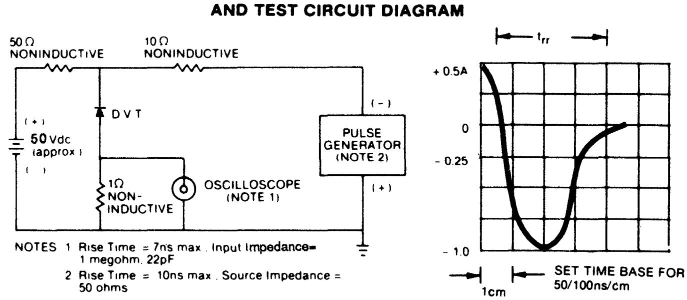


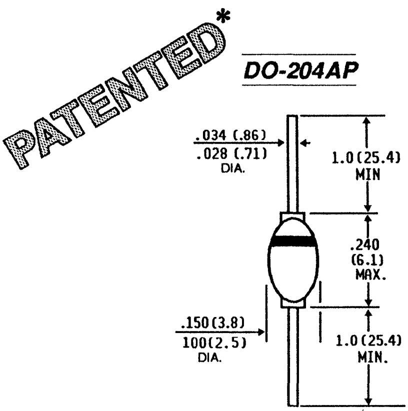
FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



1N5615 THRU 1N5623

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.0 Ampere*

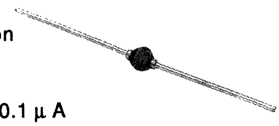


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Hermetically sealed case
- Glass passivated cavity-free junction in a D0-204AP package



- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	1N5615	1N5617	1N5619	1N5621	1N5623	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
*Minimum Reverse Breakdown Voltage at 50 μ A	V_{BR}	220	440	660	880	1100	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	1.0					Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0					Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.2					Volts
*Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=100°C / T_A=200°C	I_R	0.5 / 25.0 / 1500.0					μA
*Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150	150	250	300	500	nS
*Maximum Junction Capacitance (NOTE 2)	C_J	45	35	25	20	15	pf
Typical Thermal Resistance (NOTE 3)	RΘJA	50.0					°C/W
*Operating Junction Temperature Range	T_J	-65 to +175					°C
*Storage Temperature Range	T_{STG}	-65 to +200					°C

NOTES:
1. Reverse Recovery Test Conditions : I_F=0.5A, I_R=1.0A, Irr=25A.
2. Measured at 1 MHz and applied reverse voltage of 12 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

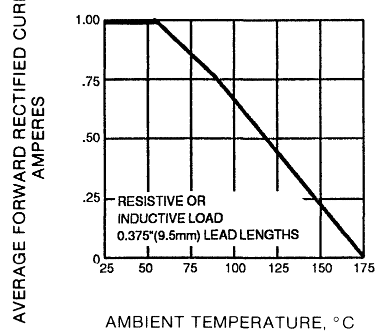


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

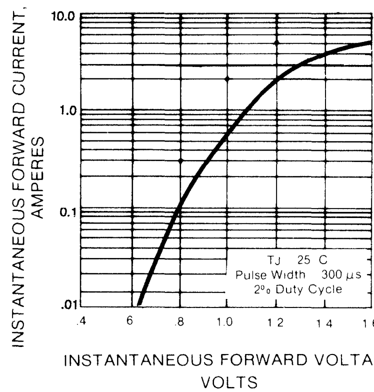


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

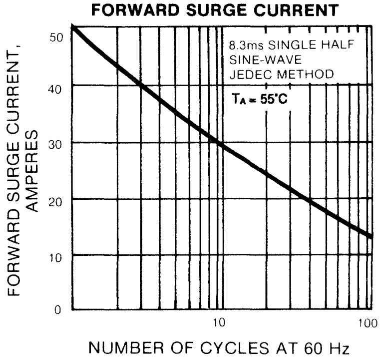


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

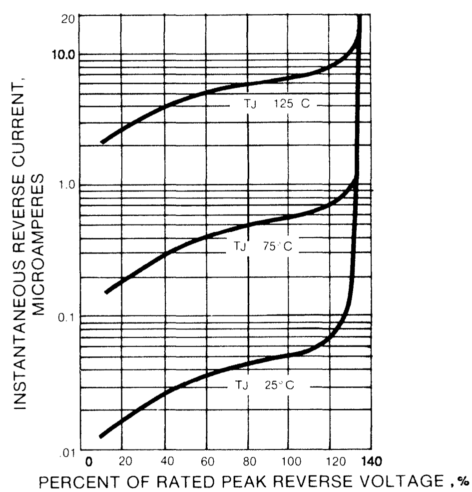


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

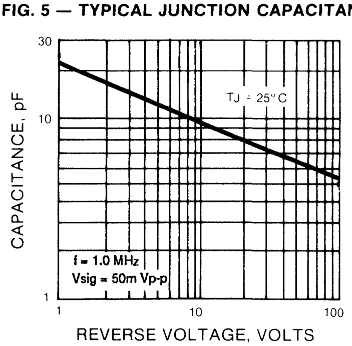
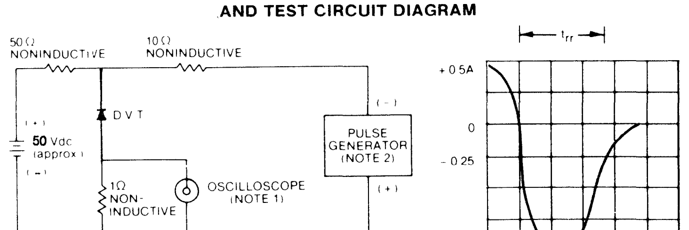


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES 1. Rise Time = 7ns max. Input Impedence = 1 megohm, 22 pF.
2. Rise Time = 10ns max. Source Impedance = 50 ohms.

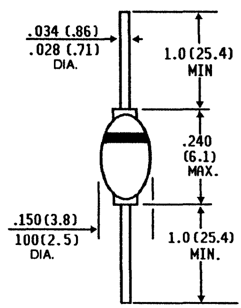
RG1A THRU RG1M

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-204AP

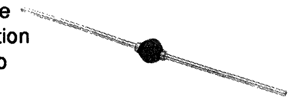


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Hermetically sealed case
- Glass passivated cavity-free junction in a D0-204AP package
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	RG1A	RG1B	RG1D	RG1G	RG1J	RG1K	RG1M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current, .375" (9.5mm) Lead Length at T_A=55°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.3							Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Length at T_A=25°C / T_A=100°C	$I_{R(AV)}$	1.0 / 100.0							μA
Maximum DC Reverse Current at Rated DC Blocking Voltage	I_R	2.0							μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150				200	250	500	nS
Typical Junction Capacitance (NOTE 2)	C_J	15.0							pf
Typical Thermal Resistance (NOTE 3)	RθJA	50.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175							°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

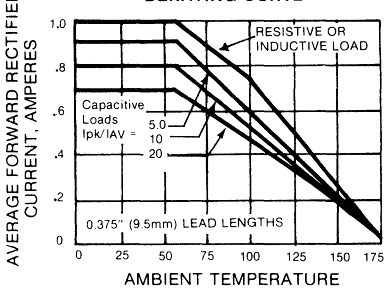


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

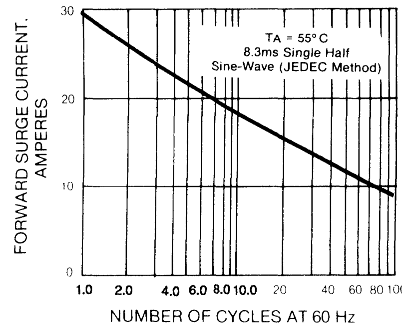


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

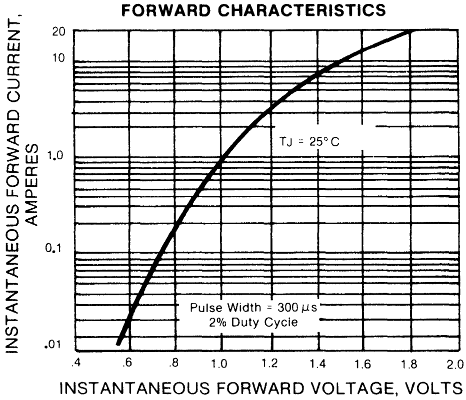


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

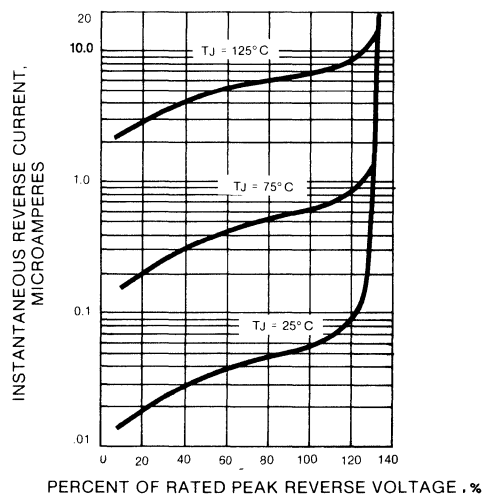


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

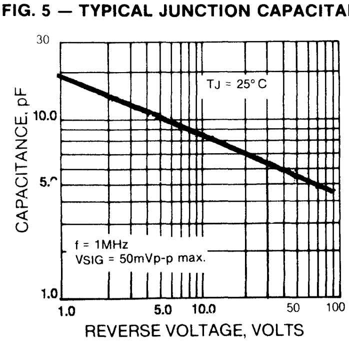
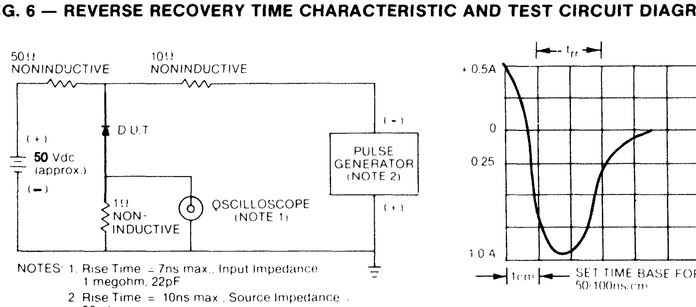


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



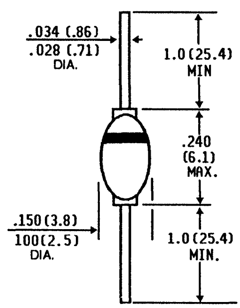
BYV95 AND BYV96 SERIES

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 200 to 1000 Volts* ***Current** - 1.5 Amperes*

PATENTED*

DO-204AP

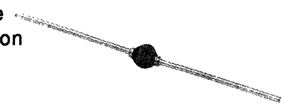


Dimensions in inches and (millimeters)

* *Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Hermetically sealed case
- Glass passivated cavity-free junction in a D0-204AP package
- 1.5 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency up to 100 KHz
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-202, Method 208
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	BYV95A	BYV95B	BYV95C	BYV96D	BYV96E	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	200	400	600	800	1000	Volts
Minimum Avalanche Breakdown Voltage at 100 μ A	V_{BR}	300	500	700	900	1100	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$			1.5			Amps
Peak Forward Surge Current, 10ms single half sine-wave superimposed on rated load at T_J=165°C	I_{FSM}			35.0			Amps
Maximum Instantaneous Forward Voltage at 3.0A T_A=25°C T_J=165°C	V_F			1.6 1.35			Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Length at T_J=25°C T_J=165°C	$I_{R(AV)}$			1.0 150.0			μA
Maximum DC Reverse Current at rated DC Blocking Voltage T_A=25°C	I_R			2.0			μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}		250			300	nS
Typical Junction Capacitance (NOTE 2)	C_J			10.0			pf
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$			50.0			°C/W
Operating Junction Temperature Range	T_J			-65 to +175			°C
Storage Temperature Range	T_{STG}			-65 to +200			°C

NOTES:
1. Measured with I_F=0.5A, I_R=1.0A, Irr = .25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0.V_{DC}.
3. Thermal Resistance from Junciton to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

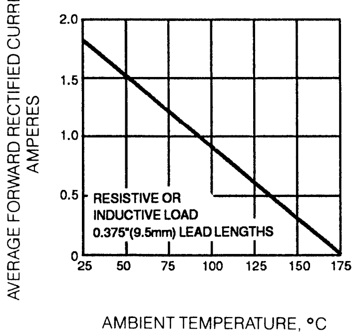


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

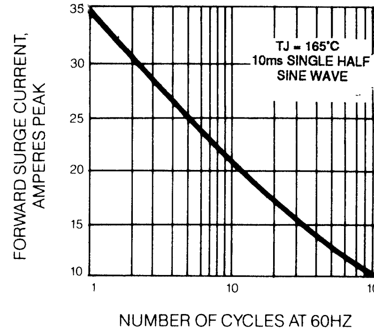


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

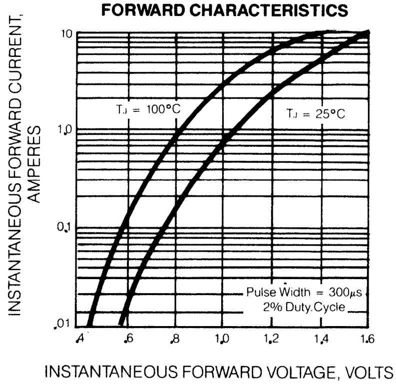


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

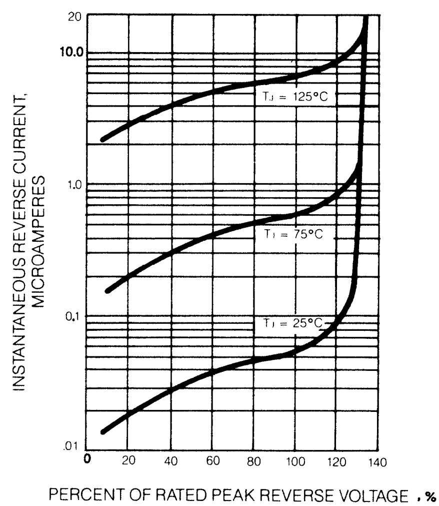


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

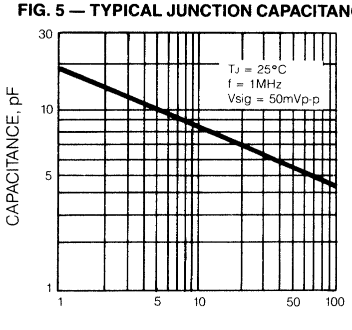
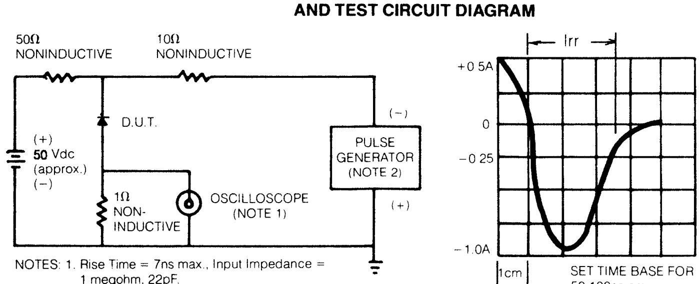


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

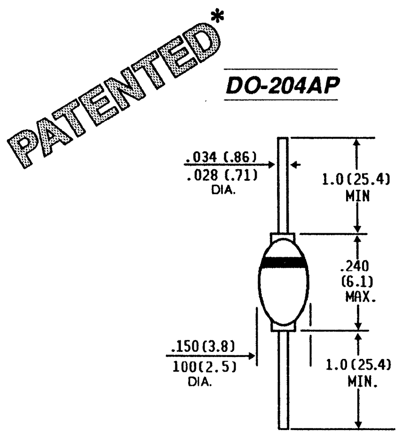


NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

RG2A THRU RG2M

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 2.0 Amperes*

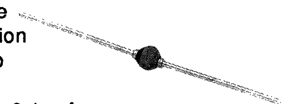


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Hermetically sealed case
- Glass passivated cavity-free junction in a D0-204AP package
- 1.0 Ampere operation at T_A=55°C with no thermal runaway
- Typical I_R less than 0.1 µ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	RG2A	RG2B	RG2D	RG2G	RG2J	RG2K	RG2M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	2.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum Instantaneous Forward Voltage at 2.0A	V_F	1.3							Volts
Maximum Full Load Reverse Current, Full Cycle Average, .375", (9.5mm) Lead Lengths at T_A=25°C / T_A=100°C	$I_{R(AV)}$	1.0 / 100.0							µA
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R	5.0							µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150				200	250	500	nS
Typical Junction Capacitance (NOTE 2)	C_J	15.0							pf
Typical Thermal Resistance (NOTE 3)	RθJA	50.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES:
1. Measured with I_F=0.5A, I_R = 1.0A, Irr= .25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

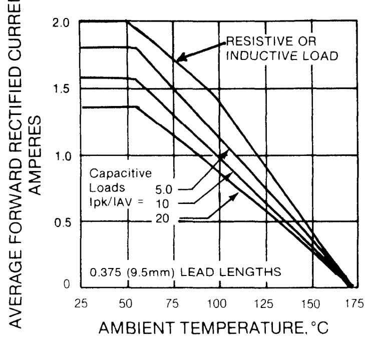


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

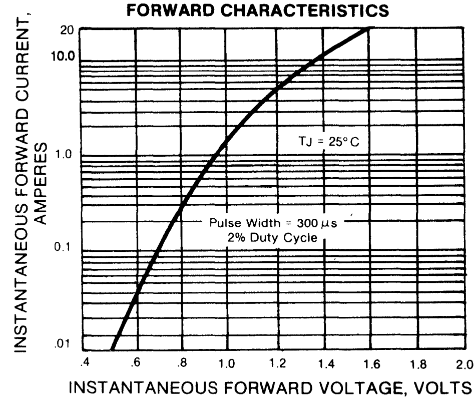


FIG. 4 — TYPICAL REVERSE CHARACTERISTIC

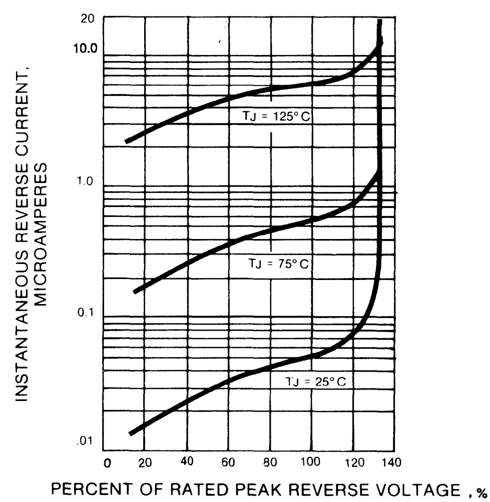


FIG.2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

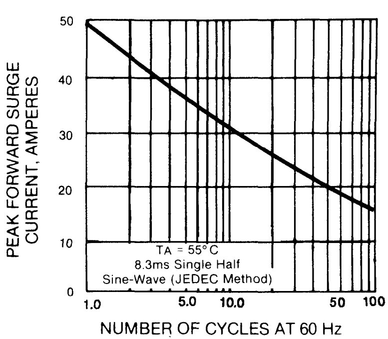


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

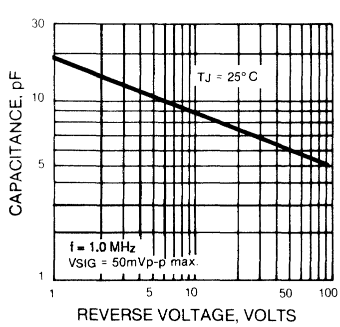
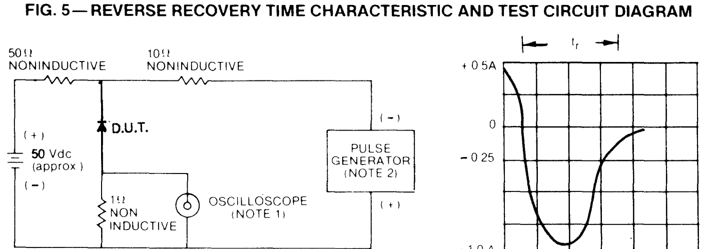


FIG. 5—REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time ≤ 7ns max., Input Impedance ≥ 1 megohm, 22pF
2. Rise Time ≤ 10ns max., Source Impedance ≤ 50 ohms

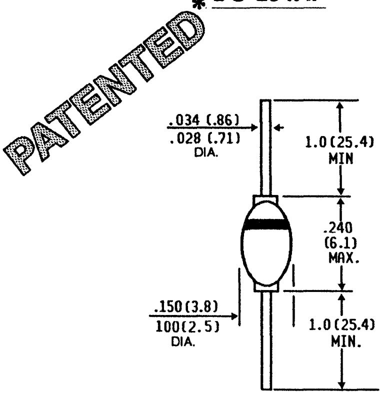
BYW32 THRU BYW36

MINIATURE GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 200 to 600 Volts* ***Current** - 2.0 Amperes*

FEATURES

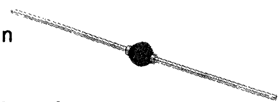
* *DO-204AP*



Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- ◆ High temperature metallurgically bonded constructed rectifiers
- ◆ Hermetically sealed case
- ◆ Glass passivated cavity-free junction in a D0-204AP package



- ◆ 2.0 Ampere operation at T_A=55°C with no thermal runaway
- ◆ Typical I_R less than 0.1 µ A
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ Fast switching for high efficiency
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AP One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD- 750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .02 ounce, .56 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*BYW32*	*BYW33*	*BYW34*	*BYW35*	*BYW36*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$			2.0			Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}			40.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.2			Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage	I_R			5.0			µA
Maximum Full Load Reverse Current Full Cycle Average, .375", (9.5mm) Lead Length T_A= 25°C / T_A=100°C	$I_{R(AV)}$			5.0 / 50.0			µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}			200			nS
Typical Junction Capacitance (NOTE 2)	C_J			15.0			pf
Typical Thermal Resistance (NOTE 3)	$R\theta JA$			50.0			°C/W
Operating Junction Temperature Range	T_J			-65 to +175			°C
Storage Temperature Range	T_{STG}			-65 to +200			°C

NOTES:
1. Measured with I_F=0.5A, I_R=1.0A, Irr=25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, P.C. Board Mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

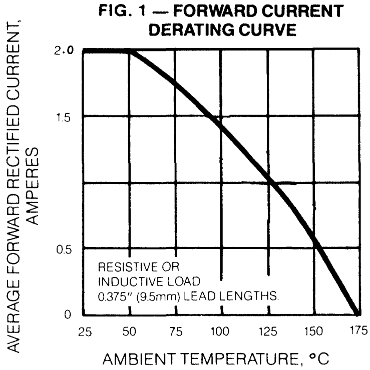


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

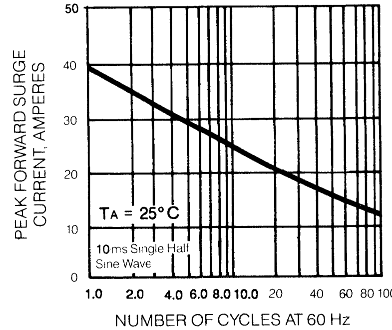


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

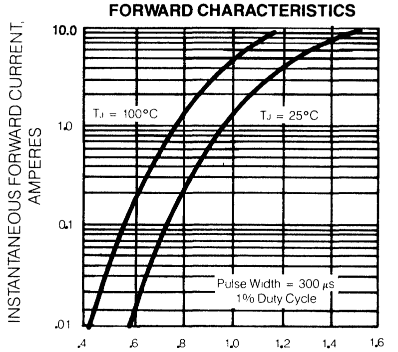


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

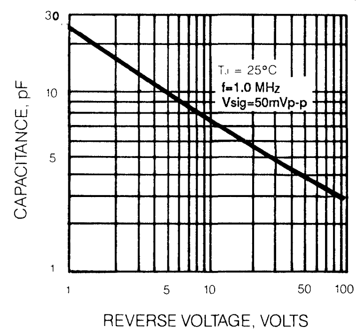


FIG. 5 — TYPICAL RECTIFICATION EFFICIENCY

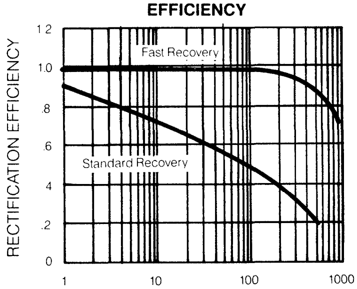
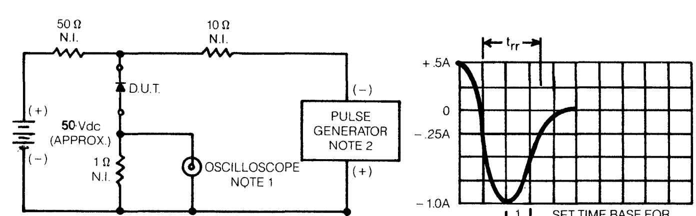


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM

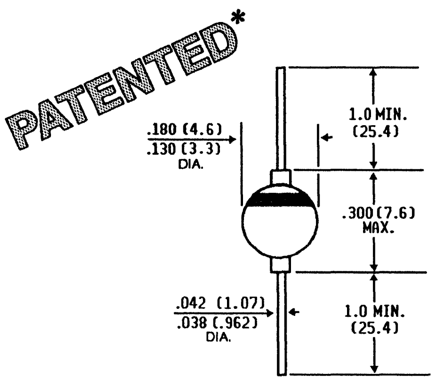


NOTES:
1. RISE TIME = 7nSEC MAX., INPUT IMPEDANCE = 1 MEGOHM, 22pF.
2. RISE TIME = 10nSEC MAX., SOURCE IMPEDANCE = 50 OHM.

1N5415 THRU 1N5420

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 3.0 Amperes*

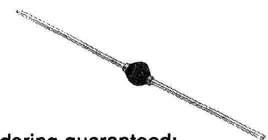


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- Glass passivated cavity-free junction
- High temperaturae metallurgically bonded
- Hermetically sealed package
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	1N5415	1N5416	1N5417	1N5418	1N5419	1N5420	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	350	420	Volts
*Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	500	600	Volts
*Minimum Reverse Breakdown Voltage at 50 μ A	V_{BR}	55	110	220	440	550	660	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$	3.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=100°C	I_{FSM}	80.0						Amps
Maximum Instantaneous Forward Voltage at 3.0A* / at 9.0A	V_F	1.10 / 1.50						Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage *T_A=25°C / T_A=100°C / *T_A=175°C	I_R	1.0 / 20.0 / 2.0						μA / μA / mA
*Maximum Junction Capacitance (NOTE 2)	C_J	200	175	150	120	110	100	pf
*Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150				250	400	nS
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	22.0						°C/W
*Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175						°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, Irr=25A.
2. Measured at 1 MHz and applied reverse voltage of 12.0 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads to heat sink.

*JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

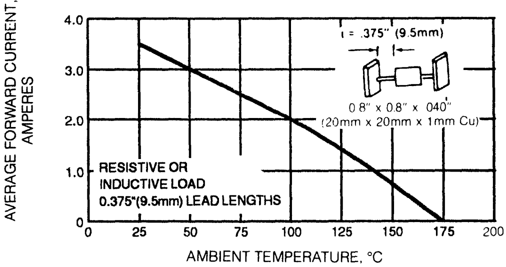


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

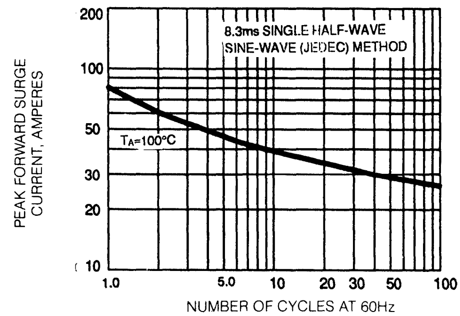


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

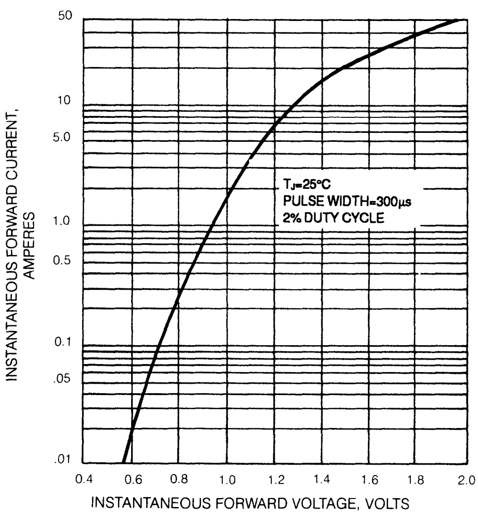


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

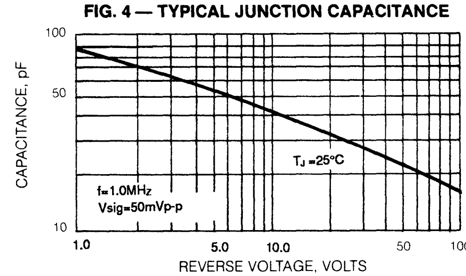


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

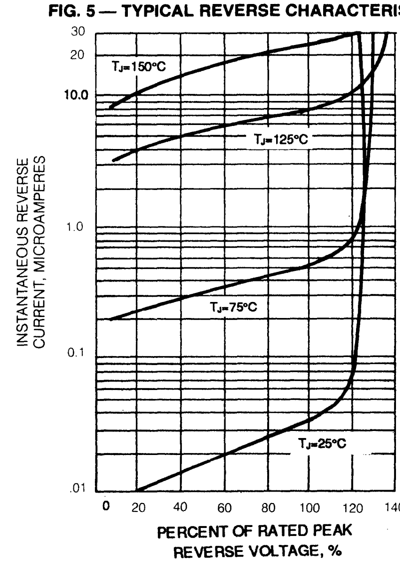
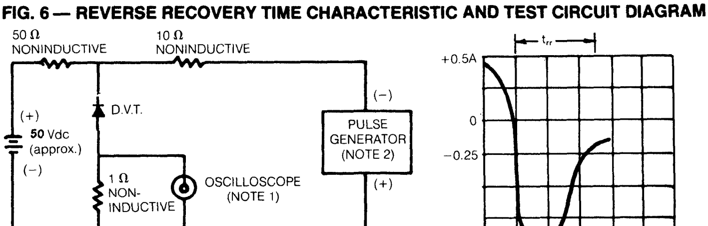


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



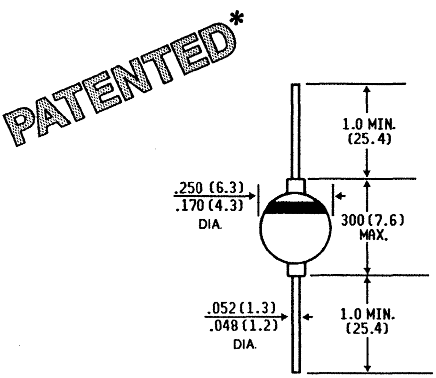
NOTES: 1. Rise Time = 7ns max. Input Impedance = 1 megohm, 22pF
2. Rise Time = 10ns max. Source Impedance = 50 ohms

RG3A THRU RG3M

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 3.0 Amperes*

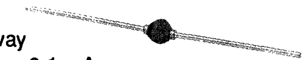
FEATURES



Dimension in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction
- Hermetically sealed package
- 3.0 Ampere operation at T_A=55°C with no thermal runaway



- Typical I_R less than 0.1 μ A
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*RG3A*	*RG3B*	*RG3D*	*RG3G*	*RG3J*	*RG3K*	*RG3M*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	220	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=55°C	$I_{(AV)}$				3.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				100.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F				1.3				Volts
Maximum Average Reverse Current T_A= 25°C at Rated Peak Reverse Voltage T_A=100°C	$I_{R(AV)}$				2.0 100.0				μA
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R				5.0				μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150				250	400	500	nS
Typical Junction Capacitance (NOTE 2)	C_J				40.0				pf
Typical Thermal Resistance (NOTE 3)	RθJA				22.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}				-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Ir=.25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads attached to heat sink.

FIG. 1 — FORWARD CURRENT DERATING CURVE

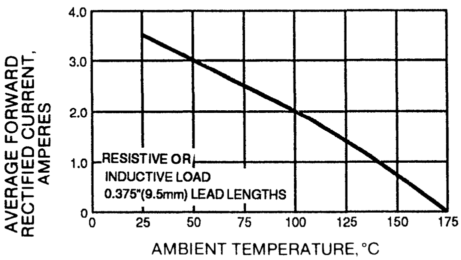


FIG. 2— MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

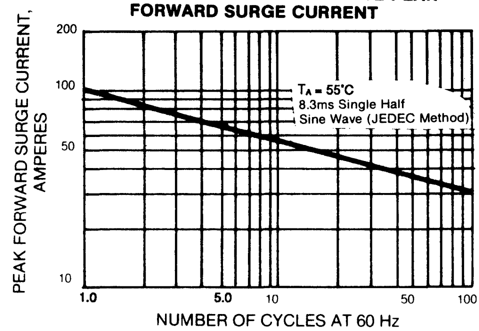


FIG. 3—TYPICAL JUNCTION CAPACITANCE

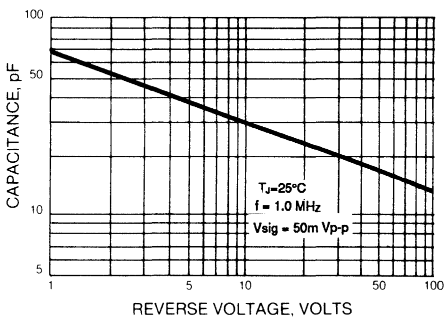


FIG. 4—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

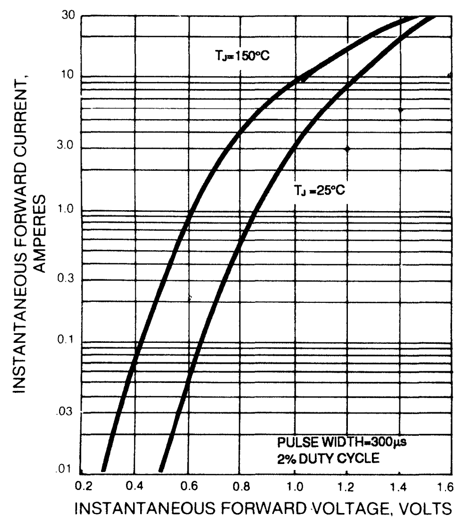


FIG. 5 — TYPICAL REVERSE CHARACTERTISTICS

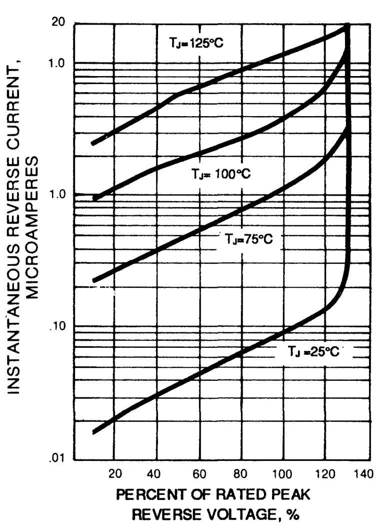
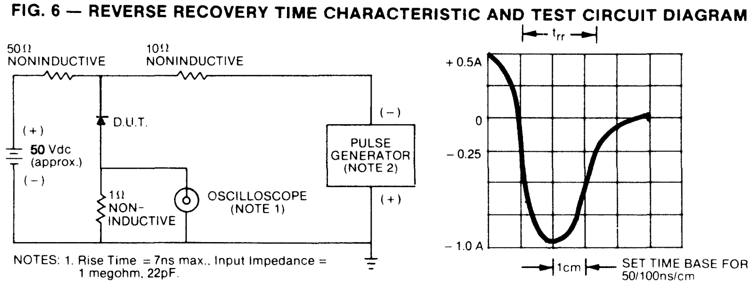


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



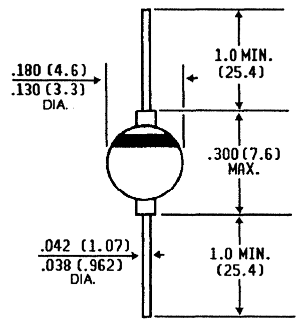
NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

RG4A THRU RG4J

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 3.0 Amperes*

PATENTED*

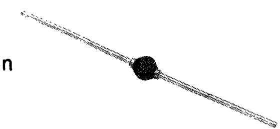


Dimensions in inches and (milimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- ◆ High temperature metallurgically bonded constructed rectifiers
- ◆ Glass passivated cavity-free junction
- ◆ Capable of meeting environmental standards of MIL-S-19500
- ◆ Fast switching for fast efficiency
- ◆ 3.0 Ampere operation at T_A=50°C with no thermal runaway
- ◆ Typical I_R less than 0.1 µ A
- ◆ Hermetically sealed package
- ◆ High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .037 ounce, 1.04 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	RG4A	RG4B	RG4D	RG4G	RG4J	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=50°C	$I_{(AV)}$			3.0			Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			100.0			Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F			1.3			Volts
Maximum Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R			5.0			µA
Maximum Average Reverse Current at Peak Reverse Voltage T_A= 25°C / T_A=100°C	$I_{R(AV)}$			2.0 / 100.0			µA
Typical Junction Capacitance (NOTE 2)	C_J			50.0			pf
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150			250		nS
Typical Thermal Resistance (NOTE 3)	RθJA			22.0			°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}			-65 to +175			°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads to heat sink.

Fig. 1—FORWARD CURRENT DERATING CURVE

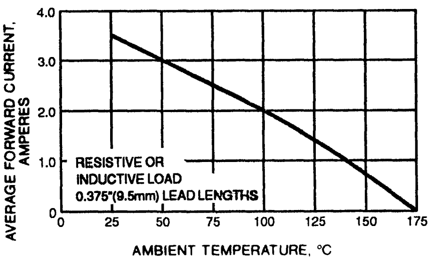


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

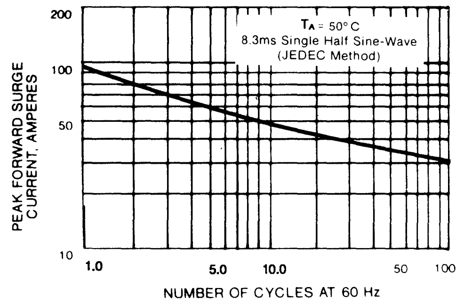


Fig. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

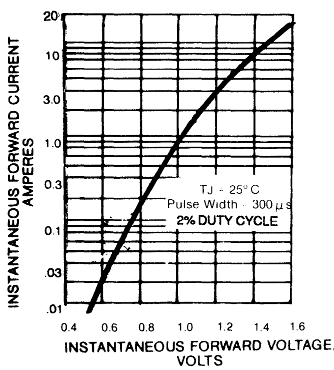


Fig. 4—TYPICAL JUNCTION CAPACITANCE

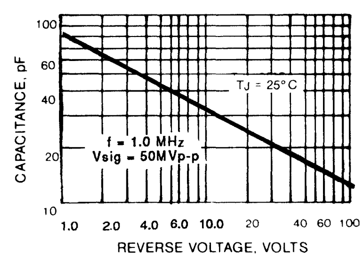


Fig. 5—TYPICAL REVERSE CHARACTERISTICS

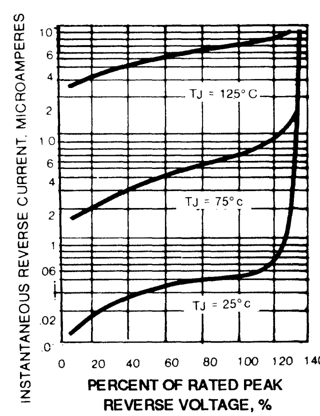
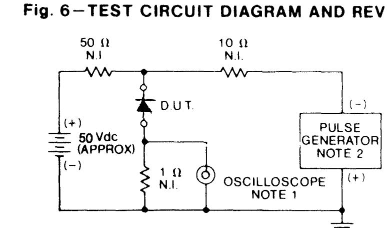
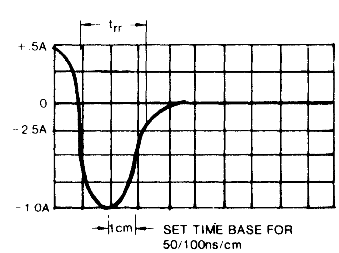


Fig. 6—TEST CIRCUIT DIAGRAM AND REVERSE RECOVERY TIME CHARACTERISTICS



NOTES:
1. RISE TIME = 7ns MAX, INPUT IMPEDANCE = 1 MEGOHM, 22pF.
2. RISE TIME = 10ns MAX, SOURCE IMPEDANCE = 50 OHM.

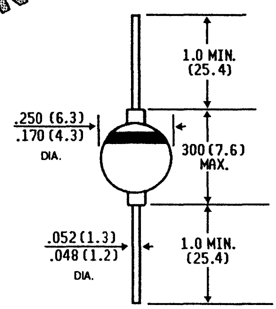


BYW72 THRU BYW76 SERIES

GLASS PASSIVATED JUNCTION FAST SWITCHING RECTIFIER

***Voltage** - 200 to 600 Volts* ***Current** - 3.0 Amperes*

PATENTED*

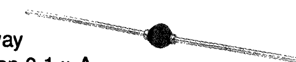


Dimensions in inches and (millimeters)

** Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976*

FEATURES

- High temperature metallurgically bonded constructed rectifiers
- Glass passivated cavity-free junction
- Hermetically sealed package
- 3.0 Ampere operation at T_A=45°C with no thermal runaway



- Typical I_R less than 0.1 µ A
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 350°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: One piece glass
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Mounting Position: Any
Weight: .04 ounce, 1.1gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*BYW72*	*BYW73*	*BYW74*	*BYW75*	*BYW76*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	300	400	500	600	Volts
Maximum RMS Voltage	V_{RMS}	140	210	280	350	420	Volts
Maximum DC Blocking Voltage	V_{DC}	200	300	400	500	600	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) Lead Lengths at T_A=45°C	$I_{(AV)}$	3.0					Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load	I_{FSM}	60.0					Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.1					Volts
Maximum Average Reverse Current at Rated Peak Reverse Voltage T_A=100°C	$I_{R(AV)}$	50.0					µA
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A= 25°C	I_R	5.0					µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	200.0					nS
Typical Junction Capacitance (NOTE 2)	C_J	40.0					pf
Typical Thermal Resistance (NOTE 3)	RθJA	22.0					°C/W
Operating Junction Temperature Range	T_J	-65 to +175					°C
Storage Temperature Range	T_{STG}	-65 to +300					°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr = 25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) Lead Lengths, with both leads attached to heat sink.

FIG. 1 — FORWARD CURRENT DERATING CURVE

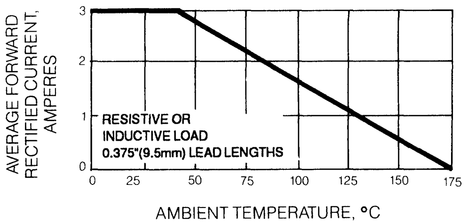


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

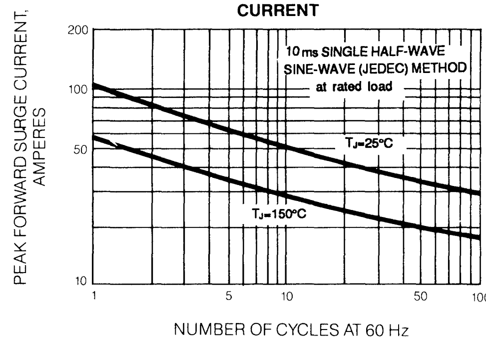


FIG. 3 — TYPICAL JUNCTION CAPACITANCE

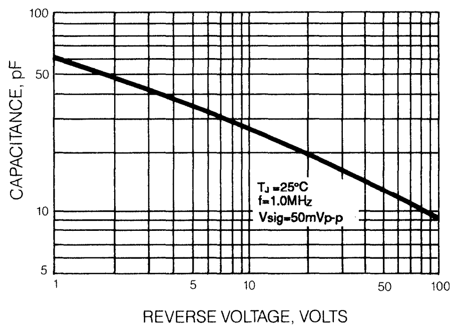


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

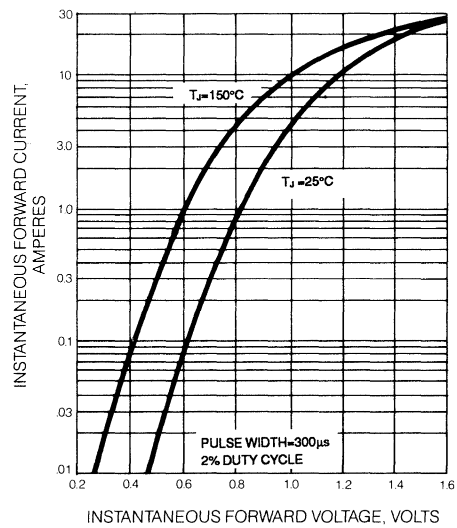


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS

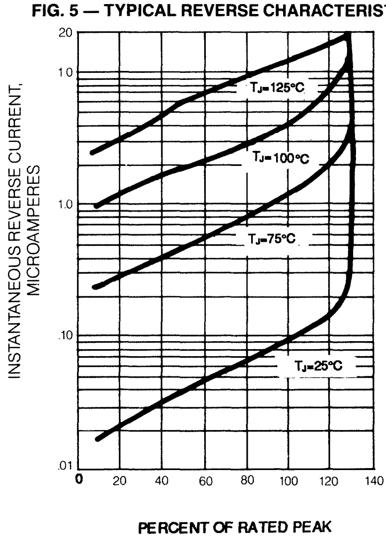
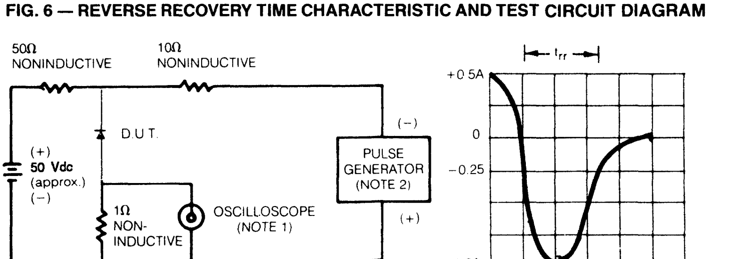


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

PLASTIC RECTIFIERS

1.0 AMPERE TO 8.0 AMPERES
50 VOLTS TO 1000 VOLTS

General Instrument

PLASTIC RECTIFIERS

1.0 Ampere to 8.0 Amperes 50 to 1000 Volts

Principle of Construction

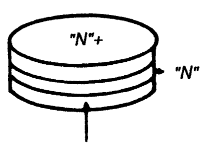
General Instrument has produced Plastic Rectifiers successfully for many years. The key factor in the production of our Plastic Rectifiers is the double nail head construction concept.

The small size allows many sub assemblies to be processed simultaneously in batch form.

This method ensures General Instrument to produce high volumes of rectifiers economically.

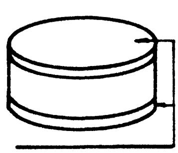
The diode construction consists of the following steps:

Diffused Slice



1 - Diffusing a PN junction into a slice of silicon.

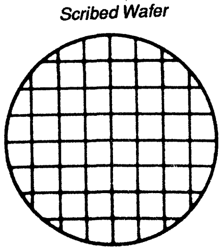
Metallized Slice



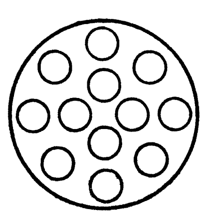
Gold and Nickel Plating

2 - Metallizing the slice of silicon.

Scribed Wafer

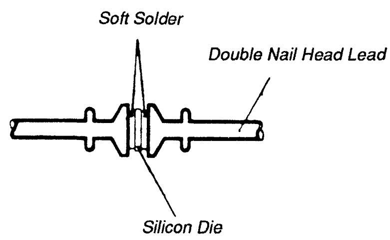


Sandblasted Round Dice



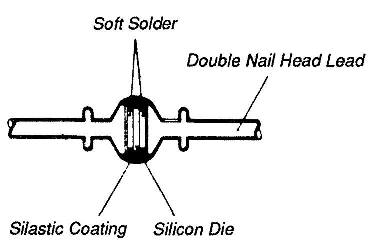
3 - Scribing and breaking the slice into individual dies,
for the 1.0 Ampere devices we use a sandblast technology
for the 3.0 thru 25.0 Ampere devices we use a saw technology.

PLASTIC RECTIFIERS



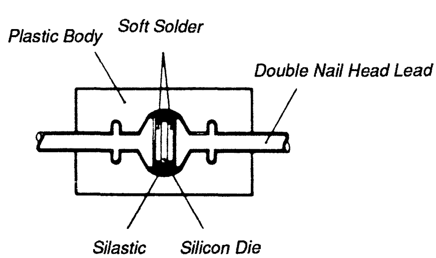
Soldering between Double Head Lead

4 - Soldering the die between two Double Nail Head Leads.



5 - Cleaning the assembly by chemical etching, washing and drying.

6 - Passivating the finished rectifier with silastic.



Double Nail Head Plastic Rectifier

7 - Overmolding by General Instrument proprietary 4B flame retardant molding compound.

8 - Lead tinning, electrical testing, marking and packing.

FAMILIES OF GENERAL INSTRUMENT PLASTIC RECTIFIERS

Miniature Plastic Rectifiers 1.0 to 1.5 AMPERES

Types:
1N4001 thru 1N4007
M100A thru M100M
1N5391 thru 1N5399

Features:
- *Low Cost*
- *Diffused Junction*
- *Low Leakage*
- *High Current Capability*
- *Easily Cleaned with Freon, Alcohol, Chlorothene and similar Solvents*
- *Plated axial leads, solderable per MIL-STD-750, Method 2026*
- *Case: Jedec DO-204AL*
- *High Temperature Soldering Guaranteed 250°C/10 Seconds/.375" (10mm) Lead Length at 5 lbs (2.25 kg) Tension*

Plastic Power Rectifiers 3.0 to 8.0 AMPERES

Types:
1N5400 thru 1N5408
P300A thru P300M
GI500 thru GI510
GI750 thru GI758
P600A thru P600M
NS8AT thru NS8MT*

Features:
- *High Surge Current Capability*
- *Void-Free Plastic Packages*
- *High Current Operation*
- *Typical Ir less than .1μA*
- *High Temperature Soldering Guaranteed 250°C/10 Seconds/.375" (10mm) Lead Length at 5 lbs (2.25 kg) Tension*

** This series uses glass passivated chip junctions.*

Fast Recovery Plastic Rectifiers 1.0 to 6.0 AMPERES

Types:
BY396P thru BY399
1N4933 thru 1N4937
BY500-100 thru BY500-800
SRP100A thru SRP100K
GI820 thru GI826
SRP300A thru SRP300K
GI850 thru GI856
SRP600A thru SRP600K
GI910 thru GI917

Features:
- *High Surge Current Capability*
- *Void-Free Plastic Packages*
- *High Current Operation*
- *Typical Ir less than 1.0 μA*
- *High Temperature Soldering Guaranteed 250°C/10 Seconds/.375" (10mm) Lead Length at 5 lbs (2.25 kg) Tension*
- *Controlled Soft Recovery Guarantees on SRP100A thru SRP100K, SRP300A thru SRP300K, BY500-100 thru BY500-800 and SRP600A thru SRP600K series*
- *Plated axial leads, solderable per MIL-STD-750, Method 2026*

QUICK GUIDE TO PLASTIC RECTIFIERS

TYPE	1N4001 thru 1N4007	M100A thru M100M	1N4933* thru 1N4937*	SRP100A* thru SRP100K*	1N5391 thru 1N5399	1N5400 thru 1N5408	P300A thru P300M	GI500 thru GI510	GI910* thru GI917*	GI850* thru GI856*	SRP300A* thru SRP300K	BY396P* thru BY399P*
CASE	DO-204AL	DO-204AL	DO-204AL	DO-204AL	DO204AL	DO201AD	DO201AD	DO201AD	DO201AD	DO201AD	DO201AD	DO201AD
Io(A)	1.0	1.0	1.0	1.0	1.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0
@TA(°C)	75	100	75	55	75 at TL	55	55	95	90	90	55	50
VR= 50(V)	1N4001	M100A	1N4933	SRP100A	1N5391	1N5400	P300A	GI500	GI910	GI850	SRP300A	
VR= 100(V)	1N4002	M100B	1N4934	SRP100B	1N5392	1N5401	P300B	GI501	GI911	GI851	SRP300B	BY396P
VR= 200(V)	1N4003	M100D	1N4935	SRP100D	1N5393	1N5402	P300D	GI502	GI912	GI852	SRP300D	BY397P
VR= 300(V)					1N5394	1N5403						
VR= 400(V)	1N4004	M100G	1N4936	SRP100G	1N5395	1N5404	P300G	GI504	GI914	GI854	SRP300G	BY398P
VR= 500(V)					1N5396	1N5405						
VR= 600(V)	1N4005	M100J	1N4937	SRP100J	1N5397	1N5406	P300J	GI506	GI916	GI856	SRP300J	
VR= 800(V)	1N4006	M100K		SRP100K	1N5398	1N5407	P300K	GI508	GI917		SRP300K	BY399P
VR=1000(V)	1N4007	M100M			1N5399	1N5408	P300M	GI510				
SURGE(A)	30	50	30	30	50	200	200	100	100	150	100	100
VF(V)	1.1	1.0/1.1	1.2	1.3	1.4	1.2	1.1	.1.1	1.25	1.25	1.3	1.25

*Fast Recovery

QUICK GUIDE TO PLASTIC RECTIFIERS

TYPE	BY500-100* thru BY500-800*	GI750 thru GI758	P600A thru P600M	GI820* thru GI826*	SRP600A* thru SRP600K*	NS8AT thru NS8MT
CASE	DO201AD	P600	P600	P600	P600	TO-220AC
Io(A)	5.0	6.0	6.0	5.0	6.0	8.0
@TA(°C)	45	60	60	55	55	100Tc
VR= 50(V)		GI750	P600A	GI820	SRP600A	NS8AT
VR= 100(V)	BY500-100	GI751	P600B	GI821	SRP600B	NS8BT
VR= 200(V)	BY500-200	GI752	P600D	GI822	SRP600D	NS8DT
VR= 400(V)	BY500-400	GI754	P600G	GI824	SRP600G	NS8GT
VR= 600(V)	BY500-600	GI756	P600J	GI826	SRP600J	NS8JT
VR= 800(V)	BY500-800	GI758	P600K		SRP600K	NS8KT
VR=1000(V)			P600M			NS8MT
SURGE(A)	200	400	400	300	300	175
VF(V)	1.35	.9/.95	.9/1.0	1.0	1.3	1.1

*Fast Recovery

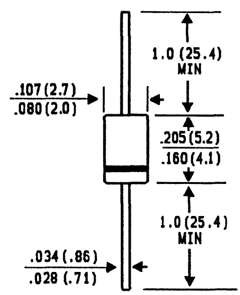
1N4001 THRU 1N4007

MINIATURE PLASTIC RECTIFIER

VOLTAGE* - *50 to 1000 Volts* *CURRENT* - *1.0 Ampere

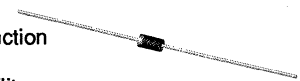
FEATURES

DO-204AL



Dimension in inches
and
(millimeters)

- The plastic package carries Underwriters Laboratory Flammability Classification 94V-O
- Low cost construction utilizing void-free molded plastic technique
- Double Diffused junction
- Low leakage
- High current capability
- Easily cleaned with Freon, Alcohol, Chlorothene and similar solvents
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.012 ounce, 0.3 gram
Mounting Position: Any
Handling Precautions: None

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*1N 4001*	*1N 4002*	*1N 4003*	*1N 4004*	*1N 4005*	*1N 4006*	*1N 4007*	*UNITS*
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
*Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=75°C	$I_{(AV)}$	1.0							Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.1							Volts
*Maximum Full Load Reverse Current Full Cycle Average .375", (9.5mm) lead lengths at T_L=75°C	$I_{R(AV)}$	30.0							µA
*Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 50.0							µA
Typical Reverse Recovery Time (NOTE 1) T_A=25°C	T_{RR}	30.0							µS
Typical Junction Capacitance (NOTE 2) T_J =25°C	C_J	15.0							pF
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	50.0							°C/W
Maximum DC Blocking Voltage Temperature	T_A	+150							°C
*Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50 to +175							°C

NOTES:
1. Measured on Tektronix Type "S" recovery plug-in. Tektronix 545 Scope or equivalent, IFM = 20mA, IRM =1mA.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Reslstance from Junction to Ambient at. 375" (9.5mm) lead lengths, P.C. Board mounted.
*JEDEC Registered Value

FIG. 1 — FORWARD CURRENT DERATING CURVE

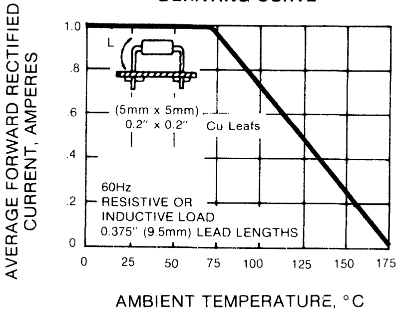


FIG. 2 — TYPICAL FORWARD CHARACTERISTICS

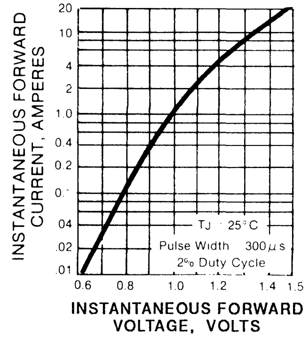


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

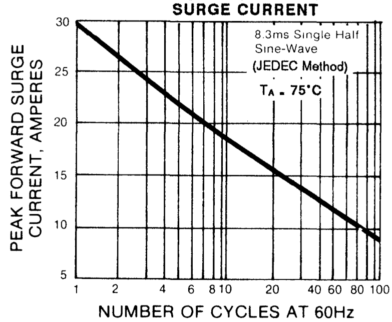


FIG. 4 — PEAK FORWARD SURGE CURRENT

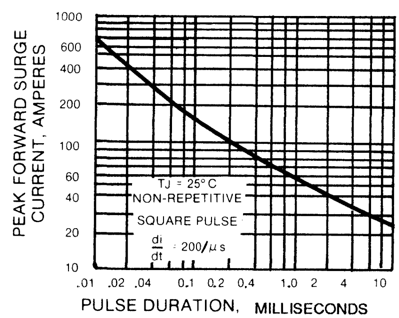


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

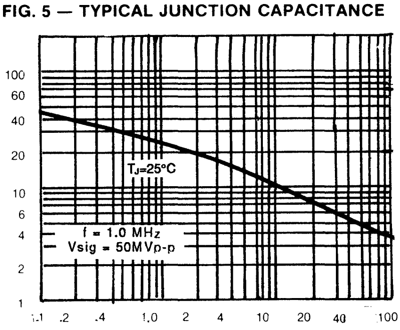
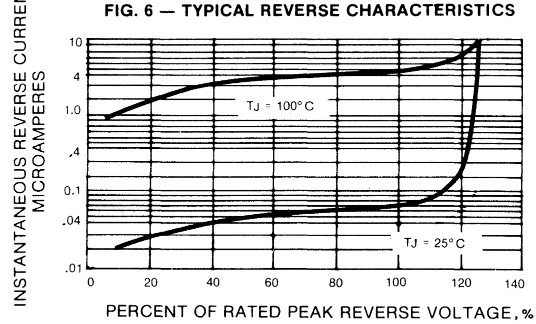


FIG. 6 — TYPICAL REVERSE CHARACTERISTICS

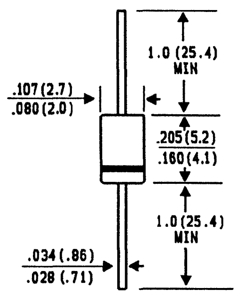


M100A THRU M100M

MINIATURE LOW CURRENT PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.0 Ampere*

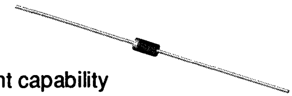
DO-204AL



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Low cost construction utilizing void-free molded plastic technique
- Diffused junction
- Low leakage
- High surge current capability
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.012 ounce, 0.3 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	M100 A	M100 B	M100 D	M100 G	M100 J	M100 K	M100 M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=100°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.0					1.1		Volts
Maximum Full Load Reverse Current Full Cycle Average .375", (9.5mm) lead lengths at T_A=55°C	I_R	100							µA
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A= 100°C	I_R	1.0 50.0							µA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.0							µS
Typical Junction Capacitance (NOTE 1) T_J=25°C	C_J	30.0							pF
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	50.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50 to +150							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Measured with I_F=0 .5A, I_R=0.1A, Irr=.25A
3. Thermal Reslstance from Junction to Ambient at . 375" (9.5mm) lead lengths, P.C. Board mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

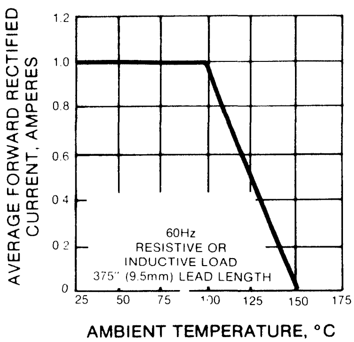


FIG. 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

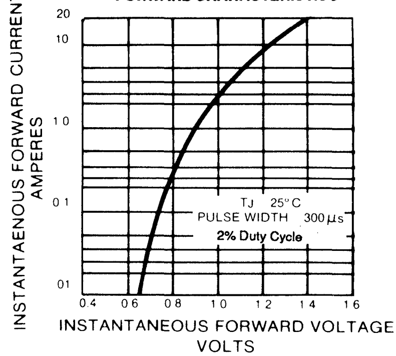


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

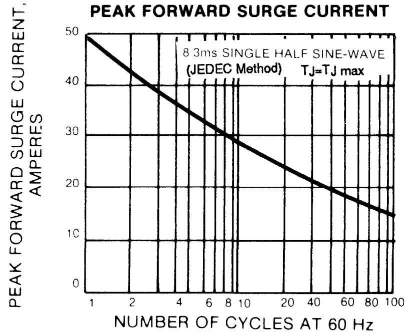


Fig. 4—TYPICAL JUNCTION CAPACITANCE

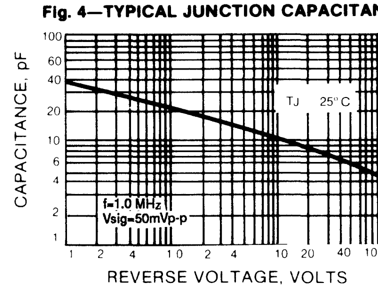


Fig. 5— TYPICAL REVERSE CHARACTERISTICS

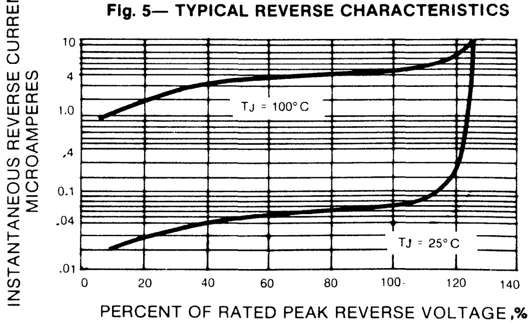
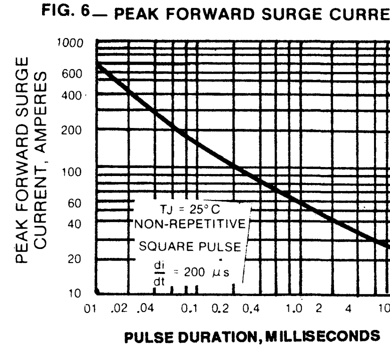


FIG. 6— PEAK FORWARD SURGE CURRENT



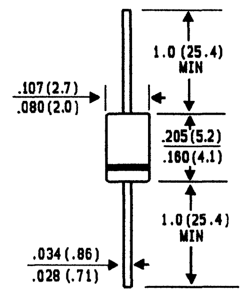
1N5391 THRU 1N5399

MINIATURE LOW CURRENT PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.5 Amperes*

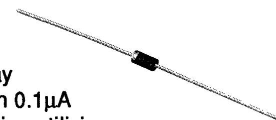
FEATURES

DO-204AL



Dimensions in inchtes and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- 1.5 Ampere operation at T_L= 70°C with no thermal runaway
- Typical I_R less than 0.1μA
- Low cost construction utilizing void-free molded plastic technique
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: **JEDEC DO-204AL, molded plastic**
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Weight: 0.012 ounce, 0.3 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.

	SYMBOLS	1N 5391	1N 5392	1N 5393	1N 5394	1N 5395	1N 5396	1N 5397	1N 5398	1N 5399	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum RMS Voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum Average Forward Rectified Current .500, (12.7mm) lead lengths at T_L=70°C	$I_{(AV)}$					1.5					Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}					50.0					Amps
*Maximum Instantaneous Forward Voltage at 1.5A, T_A=70°C	V_F					1.4					Volts
* Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A= 150°C	I_R					5.0 300.0					μA
*Maximum Full Load Reverse Current Full Cycle Average,.375",(9.5mm) Lead Length at T_L=70°C	I_R					300.0					μA
Typical Reverse Recovery Time (NOTE 2)	T_{RR}					2.0					μS
Typical Junction Capacitance (NOTE 1)	C_J					15.0					pF
Typical Thermal Resistance (NOTE 3)	RθJA					50.0					°C/W
*Maximum DC Blocking Voltage Temperature	T_A					+150					°C
*Operating Junction Temperature Range	T_J					-50 to +170					°C
*Storage Temperature Range	T_{STG}					-50 to +175					°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Measured with I_F=0.5A, I_R=0.1A, Irr= .25A.
3. Thermal Resistance from Junction to Ambient at ,375" (9.5mm) lead lengths, P.C. Board mounted.
*JEDEC Registered Value.

FIG. 1 — FORWARD CURRENT DERATING CURVE

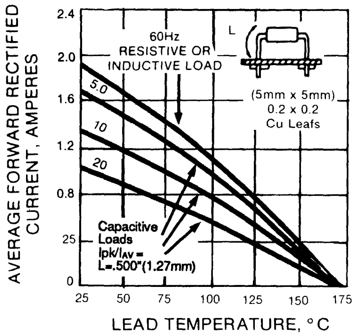


FIG. 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

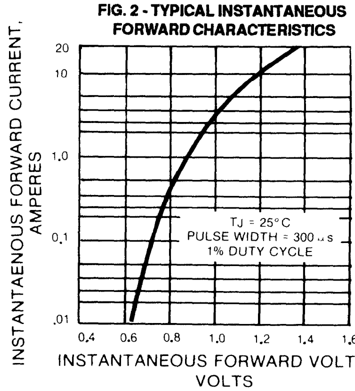


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

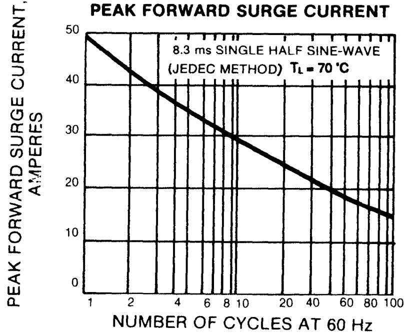


Fig. 4—TYPICAL JUNCTION CAPACITANCE

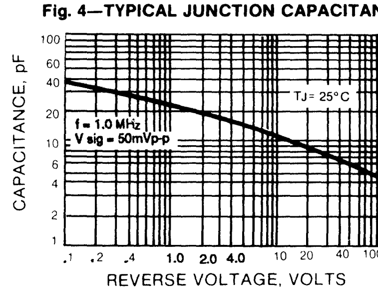
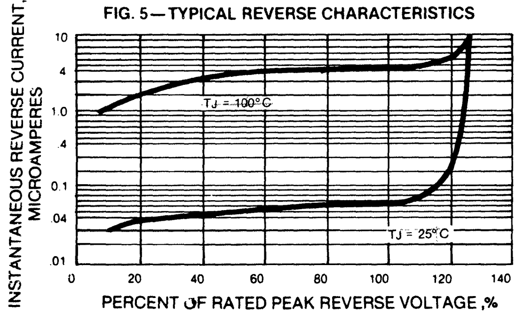


FIG. 5—TYPICAL REVERSE CHARACTERISTICS



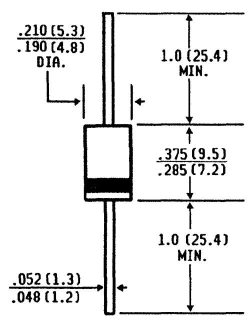
1N5400 THRU 1N5408

MEDIUM CURRENT PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 3.0 Amperes*

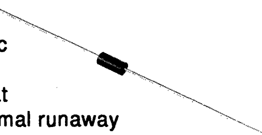
FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Void-free molded plastic package
- 3.0 Ampere operation at T_L= 105°C with no thermal runaway
- Typical I_R less than 0.1μA
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD Molded plastic
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color Band denotes cathode
Weight: 0.04 ounce, 1.1 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	1N 5400	1N 5401	1N 5402	1N 5403	1N 5404	1N 5405	1N 5406	1N 5407	1N 5408	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum RMS Voltage	V_{RMS}	35	70	140	210	280	350	420	560	700	Volts
*Maximum DC Blocking Voltage to T_A=150°C	V_{DC}	50	100	200	300	400	500	600	800	1000	Volts
*Maximum Average Forward Rectified Current .5", (12.5mm) lead lengths at T_L=105°C	$I_{(AV)}$	3.0									Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0									Amps
*Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.2									Volts
* Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=150°C	I_R	10.0 / 500.0									μA
*Maximum Full Load Reverse Current Full Cycle Average, .5", (12.5 mm) Lead Length at T_L=105°C	$I_{R(AV)}$	500.0									μA
Typical Junction Capacitance (NOTE 1) T_J=25°C	C_J	28.0									pF
*Typical Thermal Resistance (NOTE 2)	RθJA	15.0									°C/W
Maximum DC Blocking Voltage Temperature	T_A	+150									°C
*Operating Junction Temperature Range	T_J	+50 to +170									°C
*Storage Temperature Range	T_{STG}	-50 to +175									°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Thermal Resistance from Junction to Ambient at ,375" (9.5mm) lead lengths, P.C. Board mounted.
*JEDEC Registered Value

FIG. 1 — FORWARD CURRENT DERATING CURVE

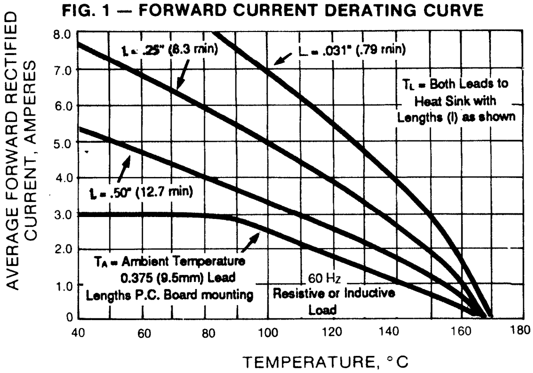


FIG. 2—MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

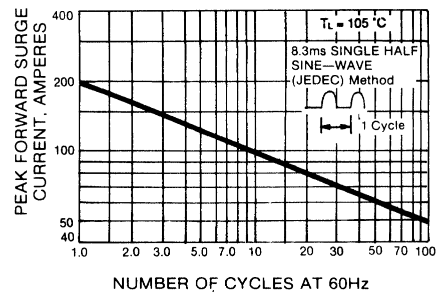


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

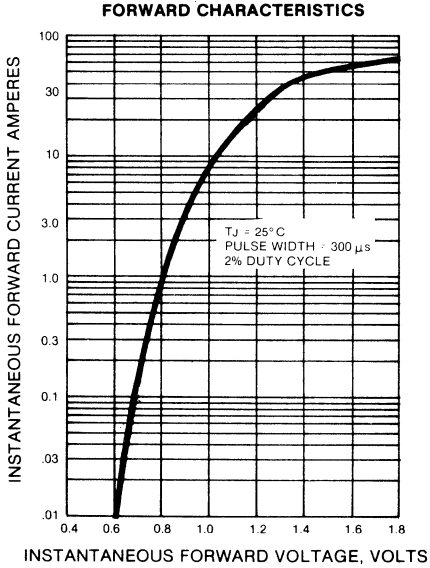


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

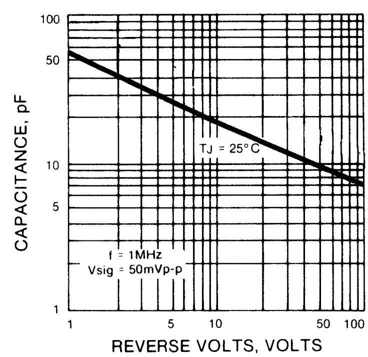
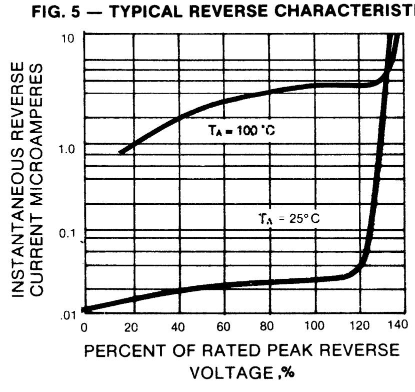


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



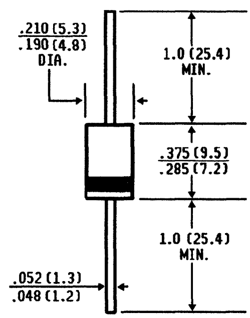
GI500 THRU GI510

MEDIUM CURRENT PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 3.0 Amperes*

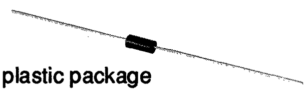
FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Typical I_R less than 0.1 µA



- Void-free molded plastic package
- High current operation of 3 Amperes at T_A= 95°C with no thermal runaway
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC D0-201AD Molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Weight: 0.04 ounce, 1.1 gram

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*G1 500*	*GI 501*	*GI 502*	*GI 504*	*GI 506*	*GI 508*	*GI 510*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A= 95°C	$I_{(AV)}$	3.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0							Amps
Maximum Instantaneous Forward Voltage at 9.4A T_J= 25°C / T_J=175°C	V_F	1.1 / 1.0							Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=100°C	I_R	5.0 / 50.0							µA
Typical Junction Capacitance (NOTE 2) T_J= 25°C	C_J	28.0							pF
Typical Reverse Recovery Time (NOTE 3)	T_{RR}	2.5							µS
Typical Thermal Resistance (NOTE 1)	$R\theta JA$	15.0							°C/W
Operating Junction Temperature Range	T_J	-50 to +150							°C
Storage Temperature Range	T_{STG}	-50 to +175							°C

NOTES:
1. Thermal Resistance from Junction to applied at ambient .375" (9.5mm) lead lengths, P.C. Board mounted.
2. Measured at 1MHz and applied reverse voltage of 4.0 volts.
3. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr= 0.25A.

FIG. 1 — FORWARD CURRENT DERATING CURVE

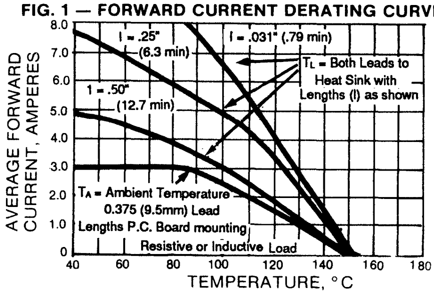


FIG. 2 — MAXIMUM PEAK FORWARD SURGE CURRENT

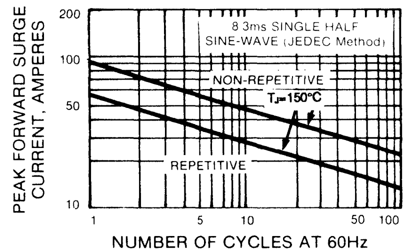


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

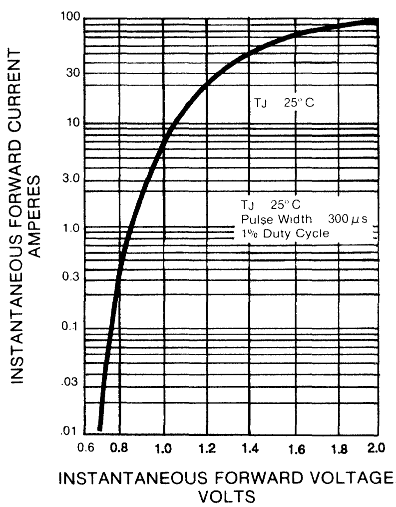


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

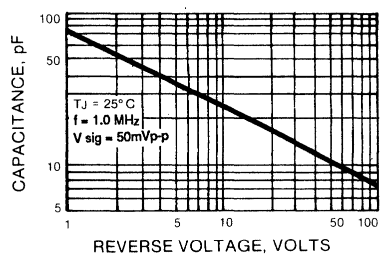
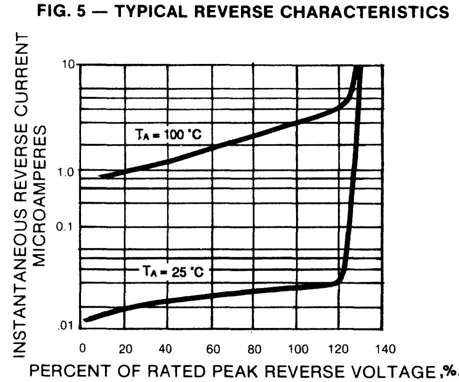


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



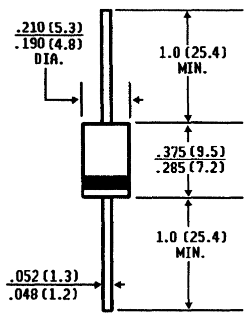
P300A THRU P300M

MEDIUM CURRENT PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 3.0 Amperes*

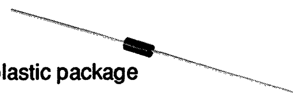
FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Typical I_R less than 0.1 µA



- Void-free molded plastic package
- 3.0 Ampere operation at T_A=90°C with no thermal runaway
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD Molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Weight: 0.4 ounce, 1.1 gram

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	P300 A	P300 B	P300 D	P300 G	P300 J	P300 K	P300 M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	3.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0							Amps
Maximum Instantaneous Forward Voltage at 3.0A T_J=25°C	V_F	1.2							Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 25.0							µA
Typical Junction Capacitance (NOTE 1) T_J= 25°C	C_J	28.0							pF
Typical Reverse Recovery Time (NOTE 2)	T_{RR}	2.5							µS
Typical Thermal Resistance (NOTE 3)	RθJA	15.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150							°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, P.C. Board mounted.

FIG. 1—FORWARD CURRENT DERATING CURVE

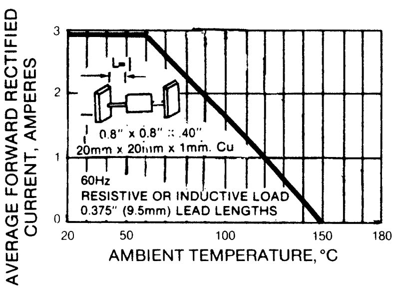


FIG. 2— MAXIMUM PEAK FORWARD SURGE CURRENT

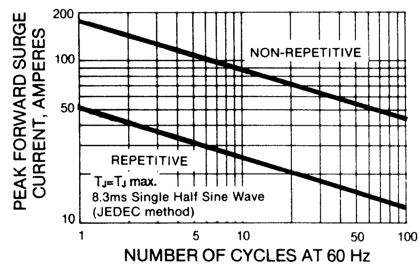


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

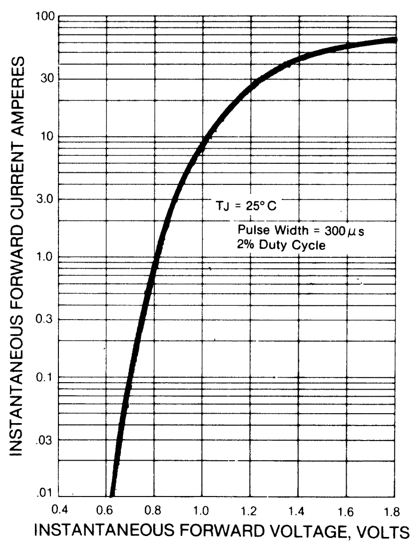


FIG. 4—TYPICAL JUNCTION CAPACITANCE

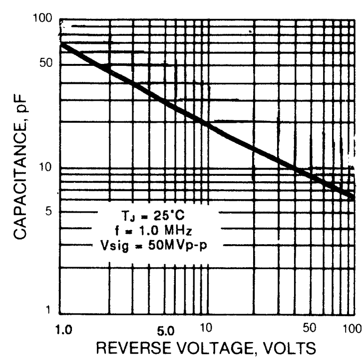
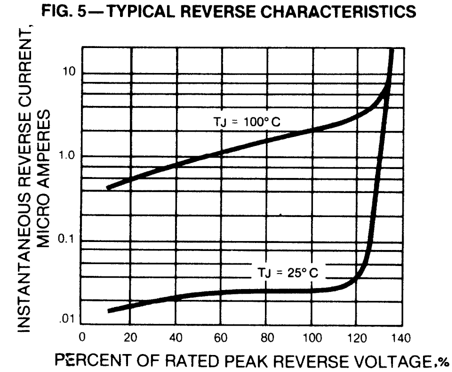


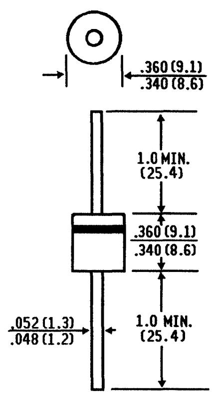
FIG. 5—TYPICAL REVERSE CHARACTERISTICS



GI750 THRU GI758

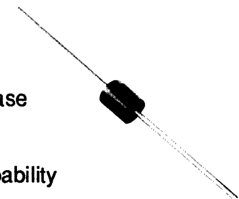
HIGH CURRENT PLASTIC RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 6.0 Amperes*



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High Current Capability
- Diffused Junction
- Completely Insulated Case
- Uniform Molded Body
- High Surge Current Capability
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: Void-free Molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Weight: 0.07 ounce, 2.1 grams

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GI750	GI751	GI752	GI754	GI756	GI758	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current at T_A=60°C P.C. Board Mounting (FIG. 1) T_L=60°C .125", (3.18mm) Lead Lengths (FIG. 2)	$I_{(AV)}$	6.0 22.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0						Amps
Maximum Instantaneous Forward Voltage at 6.0A 100A	V_F	0.90 1.25					0.95 1.30	Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 1.0						µA mA
Typical Junction Capacitance (NOTE 2)	C_J	300.0						pF
Typical Thermal Resistance (NOTE 1)	$R\theta JL$	10.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50 to +150						°C

NOTES:
1. Thermal Resistance from Junction to Lead at .50"(12.7mm) lead lengths, with both leads attached to heat sinks.
2. Measured at 1.0 MHZ and applied reverse voltage of 4.0 volts.

FIG. 1 — MAXIMUM FORWARD CURRENT DERATING CURRENT

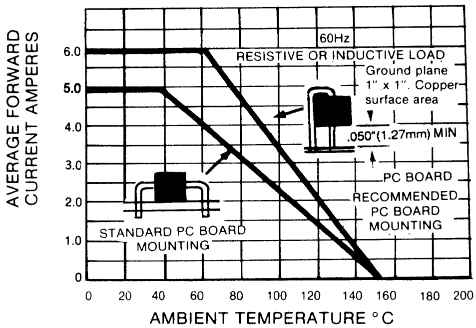


FIG. 2 — MAXIMUM FORWARD CURRENT DERATING CURVE

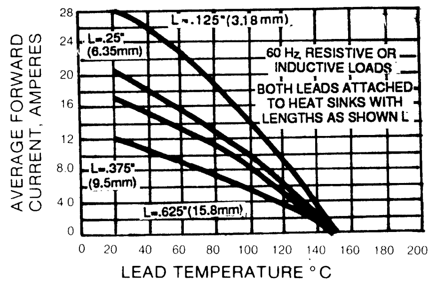


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

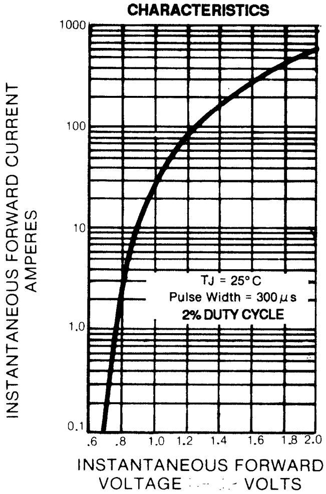


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

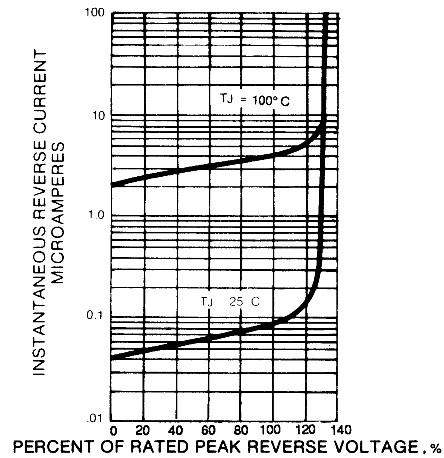


FIG. 5 — MAXIMUM PEAK FORWARD SURGE CURRENT

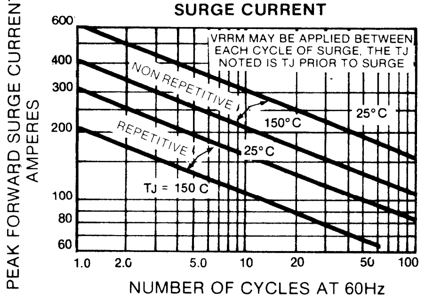
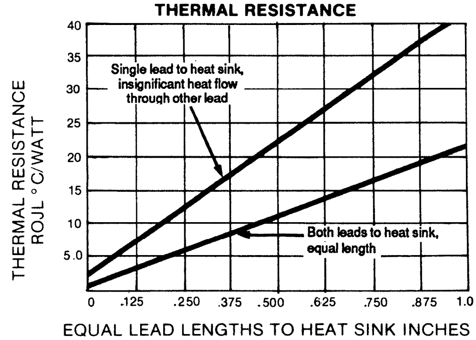


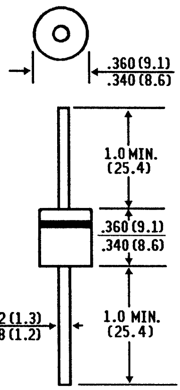
FIG. 6 — TYPICAL STEADY STATE THERMAL RESISTANCE



P600A THRU P600M

HIGH CURRENT PLASTIC RECTIFIER

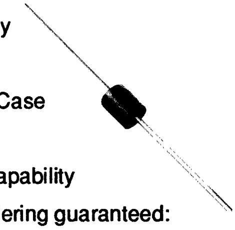
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 6.0 Amperes*



Dimensions in inches
and
(millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High Current Capability
- Diffused Junction
- Completely Insulated Case
- Uniform Molded Body
- High Surge Current Capability
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Void-free molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Weight: 0.07 ounce, 2.1grams

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	*P600A*	*P600B*	*P600D*	*P600G*	*P600J*	*P600K*	*P600M*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_A=60°C .375" (9.5mm) Lead Lengths (FIG 1) T_L=60°C .125" (3.18mm) Lead Lengths (FIG 2)	$I_{(AV)}$	6.0 22.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0							Amps
Maximum Instantaneous Forward Voltage at 6.0A 100A	V_F	0.90 1.30						1.0 1.4	Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 1.0							µA mA
Typical Junction Capacitance (NOTE 2)	C_J	300.0							pF
Typical Thermal Resistance (NOTE 1)	$R\theta JL$	10.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50 to +150							°C

NOTES:
1. Thermal Resistance from Junction to Lead at .50"(12.7mm) lead lengths, with both leads attached to heat sinks.
2. Measured at 1.0 MHZ and applied reverse voltage of 4.0 volts.

FIG. 1 - FORWARD CURRENT DERATING CURVE

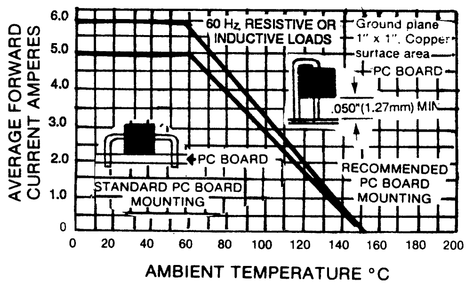


FIG. 2 - FORWARD CURRENT DERATING CURVE

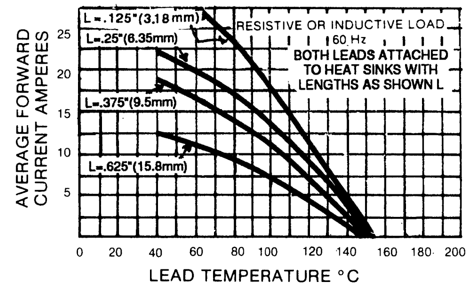


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

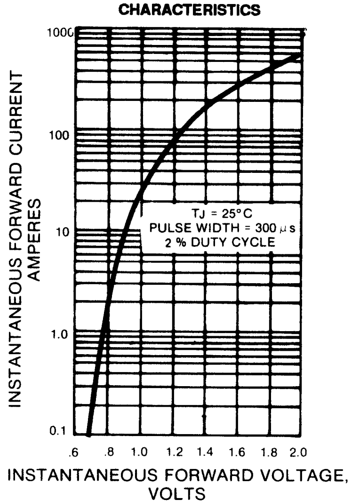


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

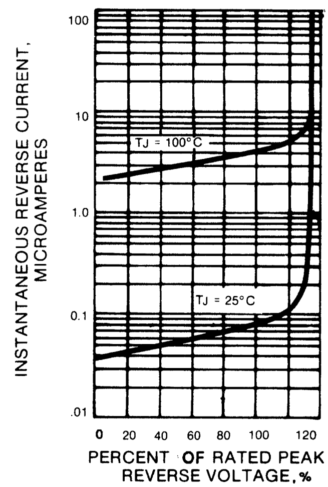


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

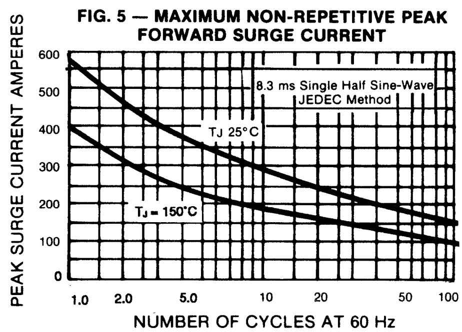
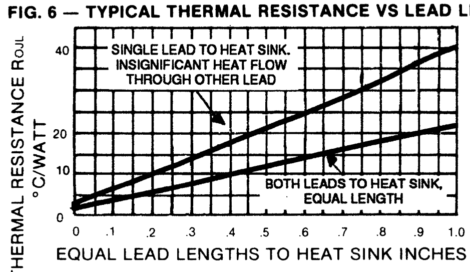


FIG. 6 — TYPICAL THERMAL RESISTANCE VS LEAD LENGTH



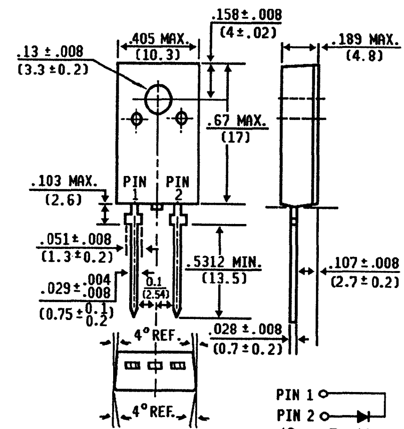
NSF8AT THRU NSF8MT

HIGH CURRENT GLASS PASSIVATED RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 8.0 Amperes*

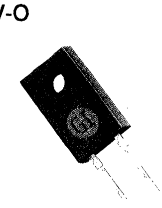
FEATURES

ITO-220



Dimensions in inches
and
(millimeters)

- Fully Isolated Overmolded Package
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High surge current capability
- High current capability
- Low forward voltage
- Glass passivated chip junction
- Internal Insulation: 1.5k V_{RMS}\
- High temperature soldering guaranteed: 265°C/10 seconds .160" (4.06 mm) lead lengths at 5 lbs/ (2.3 kg) tension



MECHANICAL DATA

Case: ITO-220 fully overmolded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: As marked

Weight: .08 ounces, 2.24 gram

Mounting Position: Any

Mounting Torque: 5 in. - lbs. max.

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	NSF8 AT	NSF8 BT	NSF8 DT	NSF8 GT	NSF8 JT	NSF8 KT	NSF8 MT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$	8.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0							Amps
Maximum Instantaneous Forward Voltage at 8.0A	V_F	1.1							Volts
Maximum Reverse Current T_C=25°C at Rated DC Blocking Voltage T_C=100°C	I_R	10.0 / 100.0							µA
Typical Junction Capacitance (NOTE 2)	C_J	55.0							pF
Typical Thermal Resistance (NOTE 1)	$R_{\theta JC}$	3.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150							°C

NOTES:
1. Thermal Resistance Junction to Case.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.

Fig. 1—FORWARD CURRENT DERATING CURVE

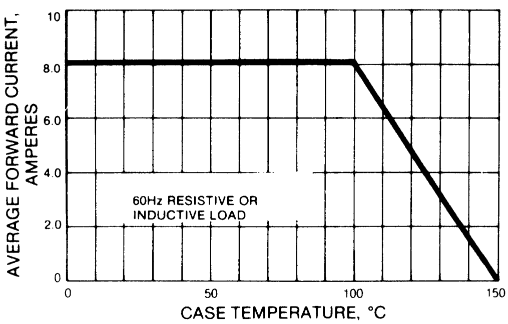


FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

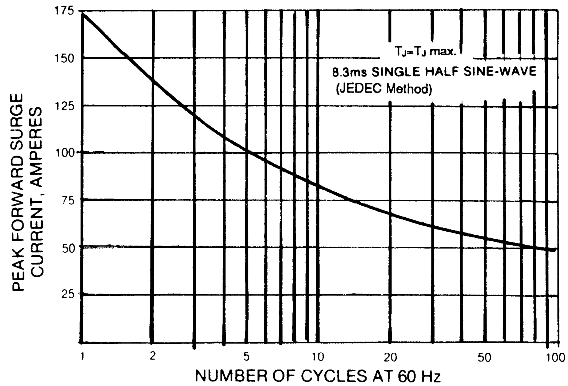


Fig. 2—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

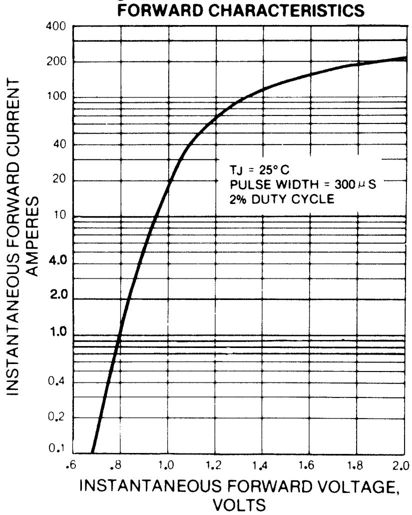


Fig. 4—TYPICAL REVERSE CHARACTERISTICS

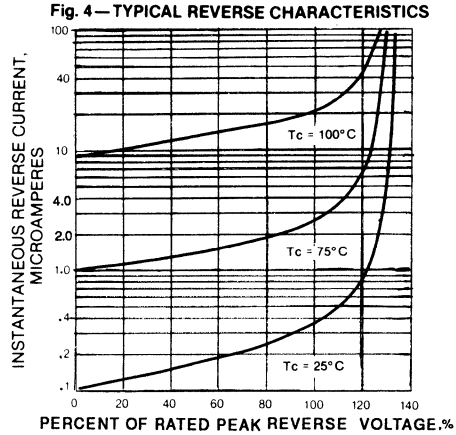
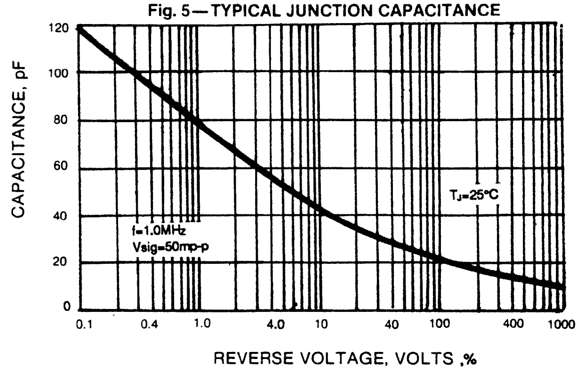


Fig. 5—TYPICAL JUNCTION CAPACITANCE



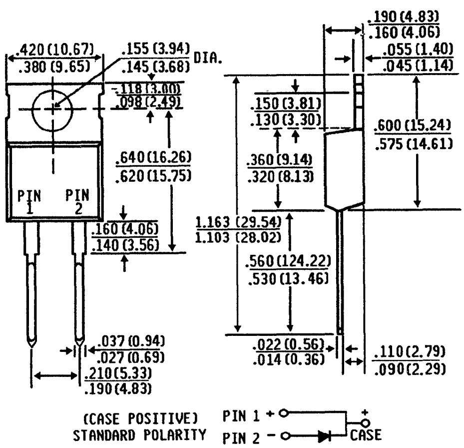
NS8AT THRU NS8MT

HIGH CURRENT GLASS PASSIVATED PLASTIC RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 8.0 Amperes*

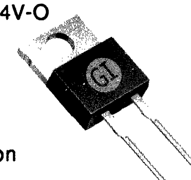
FEATURES

<u>TO-220AC</u>



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High current capability
- High surge current capability
- Low forward voltage drop
- Glass passivated chip junction
- High temperature soldering guaranteed: 265°C/10 seconds/.160" (4.06 mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC TO-220AC molded plastic

Terminals: Plated Axial Leads solderable per MIL-STD-750, Method 2026

Polarity: As marked

Weight: 0.08 ounce, 2.24 gram

Mounting Torque: 5 in. - lbs. max.

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	NS8 AT	NS8 BT	NS8 DT	NS8 GT	NS8 JT	NS8 KT	NS8 MT	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_C=100°C	$I_{(AV)}$				8.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				175.0				Amps
Maximum Instantaneous Forward Voltage at 8.0A	V_F				1.1				Volts
Maximum Reverse Current at Rated DC Blocking Voltage T_C=25°C / T_C=100°C	I_R				10.0 / 100.0				µA
Typical Junction Capacitance (NOTE 2) T_J=25°C	C_J				55.0				pF
Typical Thermal Resistance (NOTE 1)	$R\theta JC$				3.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}				-55 to +150				°C

NOTES:
1. Thermal Resistance from Junction to Case.
2. Measured at 1 MHz and applied reversed voltage of 4.0 volts.

FIG. 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

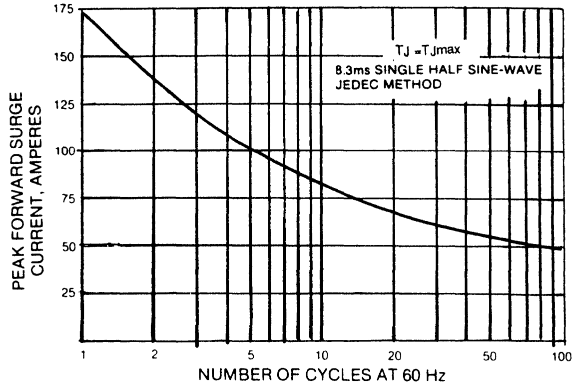


Fig. 1—FORWARD CURRENT DERATING CURVE

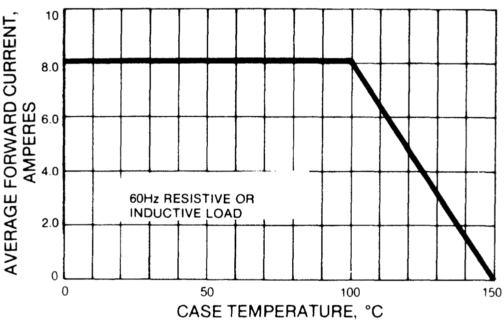


Fig. 4—TYPICAL REVERSE CHARACTERISTICS

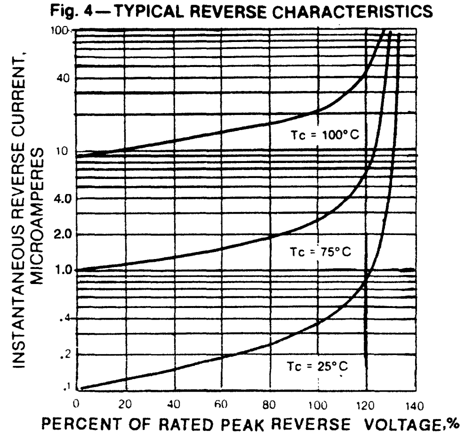


Fig. 2—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

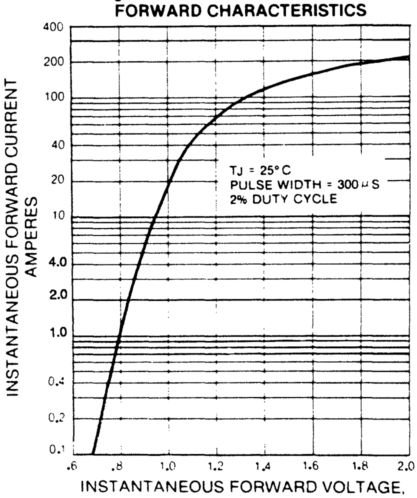
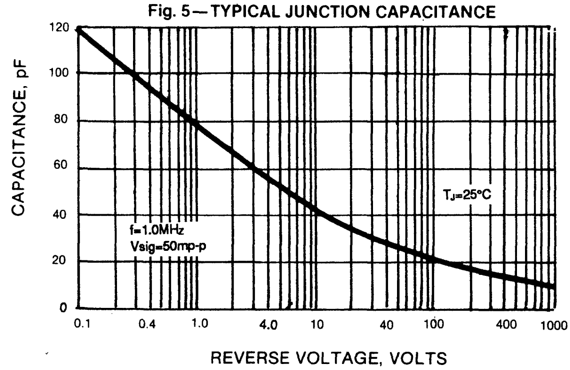


Fig. 5—TYPICAL JUNCTION CAPACITANCE



FAST RECOVERY PLASTIC RECTIFIERS

1.0 AMPERE TO 6.0 AMPERES
50 VOLTS TO 800 VOLTS

General Instrument

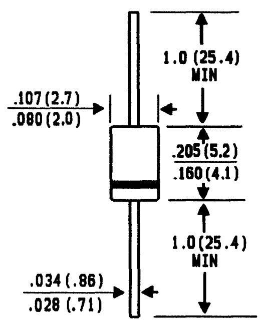
1N4933 THRU 1N4937

MINIATURE FAST SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 50 to 600 Volts* ***CURRENT** - 1.0 Ampere*

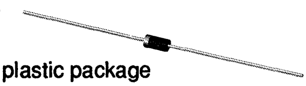
FEATURES

DO-204AL



Dimension in inches and (millimeters)

- Low cost
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Fast switching for high efficiency
- Void-free molded plastic package
- 1.0 Ampere operation at T_A=75°C with no thermal runaway
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.012 ounce, 0.34 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	1N4933	1N4934	1N4935	1N4936	1N4937	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
*Maximum RMS Voltage	V_{RMS}	35	70	145	280	420	Volts
*Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
*Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=75°C	$I_{(AV)}$	1.0					Amps
*Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) at T_A=75°C	I_{FSM}	30.0					Amps
*Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.2					Volts
*Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 100.0					μA
*Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	200.0					nS
*Maximum Reverse Recovery Current (NOTE 1)	I_{RM}(Rec)	2.0					Amps
Typical Junction Capacitance (NOTE 2)	C_J	15.0					pF
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	41.0					°C/W
*Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150					°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=1.0A, V_R=30V., di/dt= 50A/μs.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 V_{DC}.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, P.C. Board mounted.
   *JEDEC registered values

FIG. 1 — FORWARD CURRENT DERATING CURVE

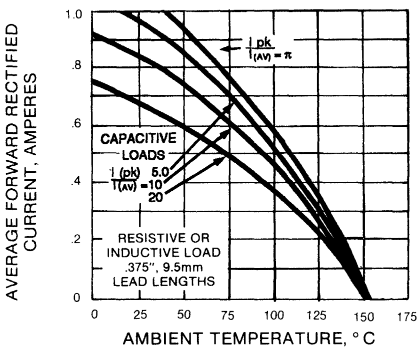


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

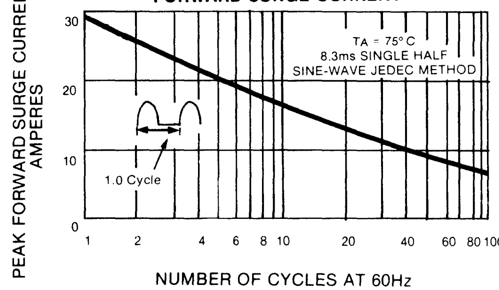


FIG. 3 — TYPICAL JUNCTION CAPACITANCE

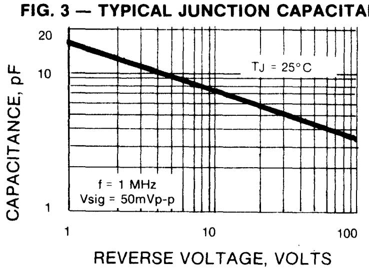


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

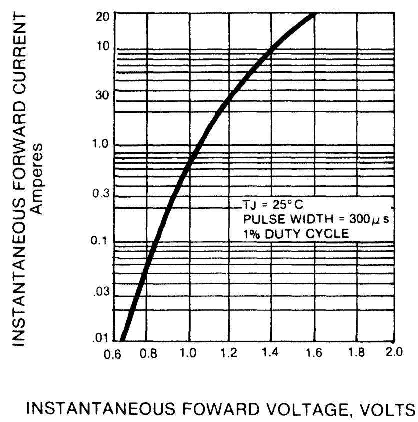


FIG. 5 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

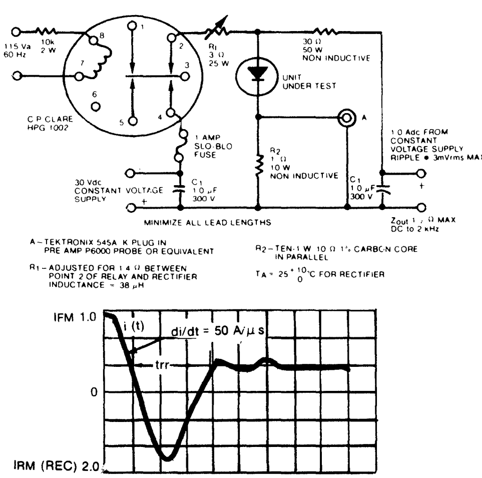
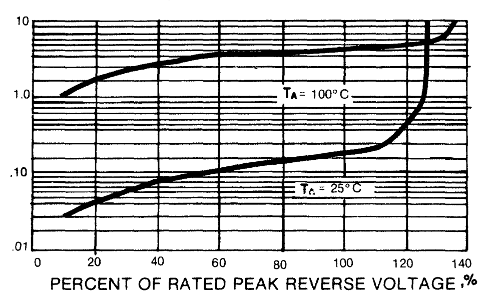


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

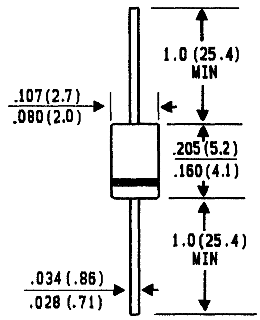


SRP100A THRU SRP100K

MINIATURE SOFT RECOVERY FAST SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 1.0 Ampere*

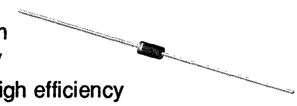
DO-204AL



Dimension in inches and (millimeters)

FEATURES

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Void-free molded plastic in DO-41 package
- 1.0 Ampere operation at T_A=55°C with no thermal runaway



- Fast switching for high efficiency
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AL, molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Band denotes cathode

Mounting Position: Any

Weight: 0.012 ounce, 1.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	SRP 100A	SRP 100B	SRP 100D	SRP 100G	SRP 100J	SRP 100K	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	1.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0						Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.3						Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 200.0						μA
Maximum Reverse Recovery Time (NOTE 2) T_J= 25°C	T_{RR}	100				200		nS
Typical Junction Capacitance (NOTE 1) T_J=25°C	C_J	12.0						pF
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$	41.0						°C/W
Operating Junction Temperature Range	T_J	-50 to +125						°C
Storage Temperature Range	T_{STG}	-50 to +150						°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, P.C. Board mounted.

FIG. 1 — FORWARD CURRENT DERATING CURVE

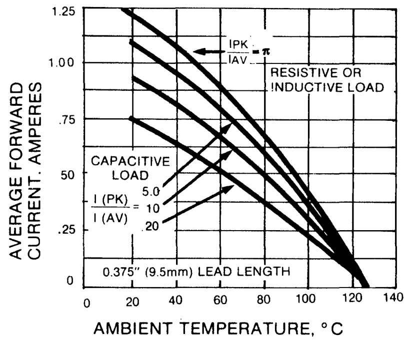


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

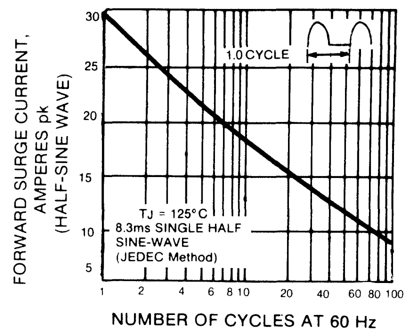


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

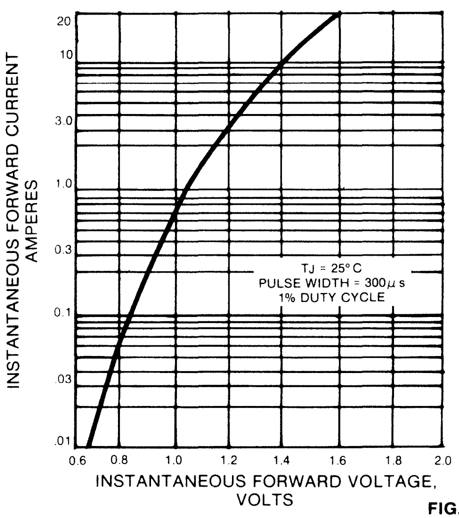


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

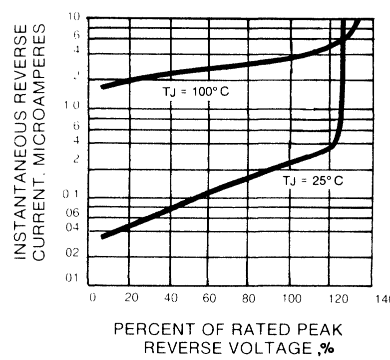


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

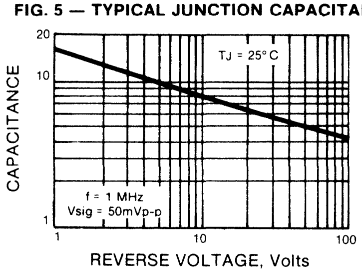
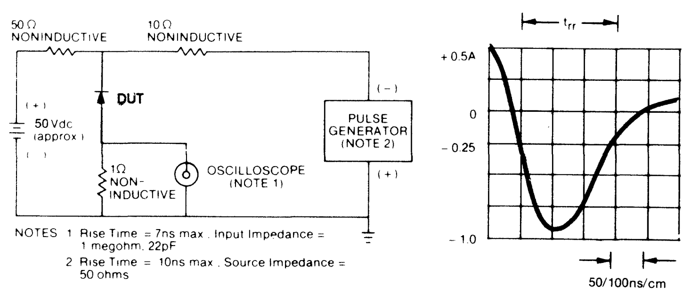


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



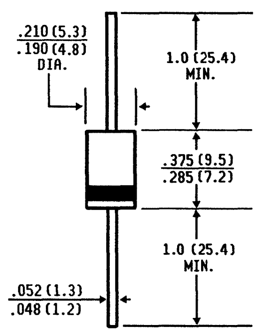
GI850 THRU GI858

SOFT RECOVERY, FAST SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 3.0 Amperes*

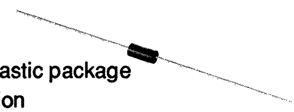
FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Fast switching for high efficiency
- Void-free molded plastic package
- High current operation
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: .04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	GI850	GI851	GI852	GI854	GI856	GI858	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	510	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Non-repetitive Peak Reverse Voltage	V_{RSM}	75	150	250	450	650	880	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=90°C	$I_{(AV)}$	3.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0						Amps
Maximum Instantaneous Forward Voltage at 3A T_J=25°C 9.4A T_J=175°C	V_F	1.25 1.10						Volts
Maximum DC Reverse Current T_A=25°C		10.0						
at Rated DC Blocking Voltage T_A=100°C	I_R	150	150	200	250	300	500	µA
Typical Junction Capacitance T_J=25°C (NOTE 1)	C_J	28.0						pF
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	200.0						nS
Maximum Reverse Recovery Current (NOTE 2)	$I_{RM(REC)}$	2.0						Amps
Typical Thermal Resistance (NOTE 3)	$R_{\theta JA}$	15.0						°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150						°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=1.0A, V_R=30V, di/dt=50A/µs.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, with both leads to heat sink.

FIG. 1 — FORWARD CURRENT DERATING CURVE

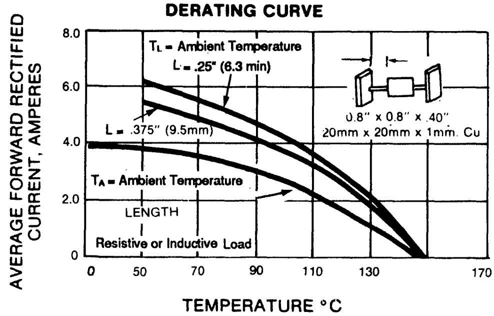


FIG. 2 — MAXIMUM PEAK FORWARD SURGE CURRENT

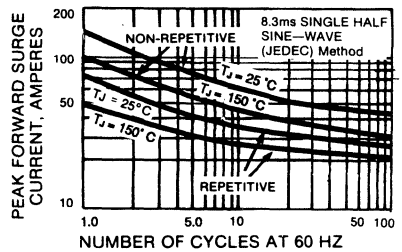


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

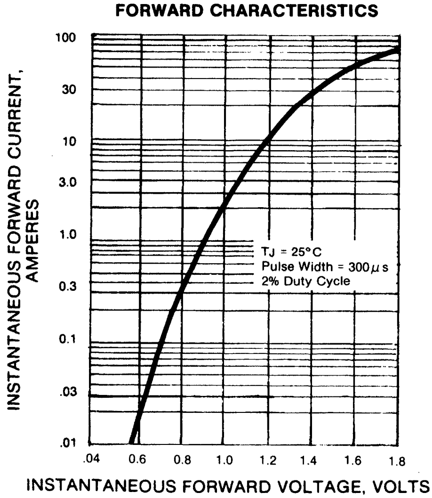


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

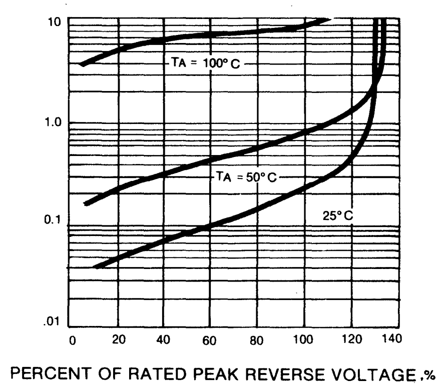
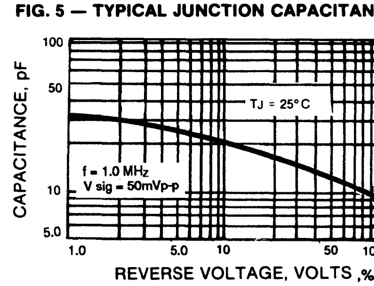


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



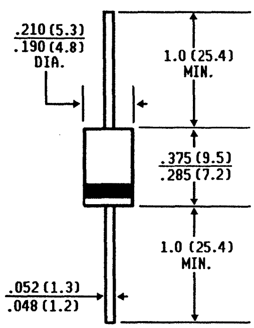
GI910 THRU GI917

SOFT RECOVERY, MEDIUM-SWITHING PLASTIC RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 3.0 Amperes*

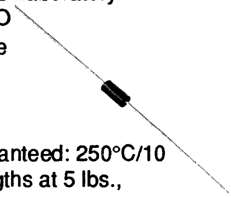
FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Void-free molded plastic package
- High current operation of 3.0 Amperes at T_A=90°C
- Fast switching for high efficiency
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Mounting Position: Any

Weight: 0.04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*GI910*	*GI911*	*GI912*	*GI914*	*GI916*	*GI917*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=90°C	$I_{(AV)}$	3.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0						Amps
Maximum Instantaneous Forward Voltage at 3.0A T_J=25°C / 9.4A T_J=175°C	V_F	1.25 / 1.10						Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=100°C	I_R	10.0 / 300.0						µA
Typical Junction Capacitance (NOTE 1) T_J=25°C	C_J	28.0						pF
Maximum Reverse Recovery Time T_J=25°C (NOTE 2)	T_{RR}	750						nS
Maximum Reverse Recovery Current	$I_{RM(REC)}$	2.0						Amps
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	15.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50 to +150						°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
2. Reverse Recovery Test Conditions: I_F=1.0A, V_R=30V, di/dt=50 A/µs.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, both leads to a heat sink.

FIG. 1 — FORWARD CURRENT DERATING CURVE

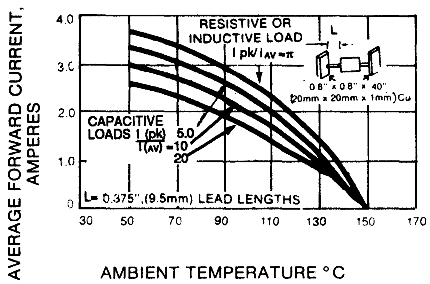


FIG. 2 — MAXIMUM FORWARD SURGE CURRENT

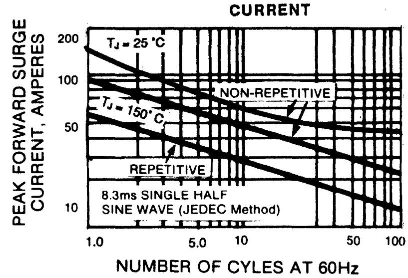


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

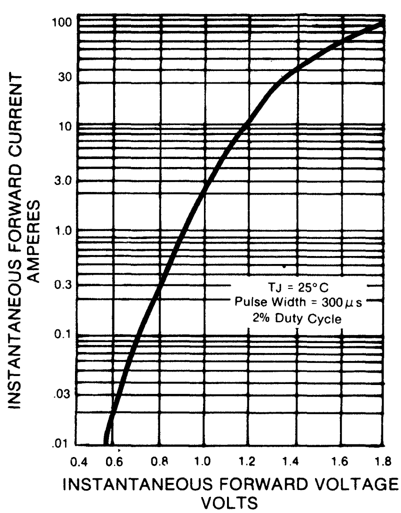


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

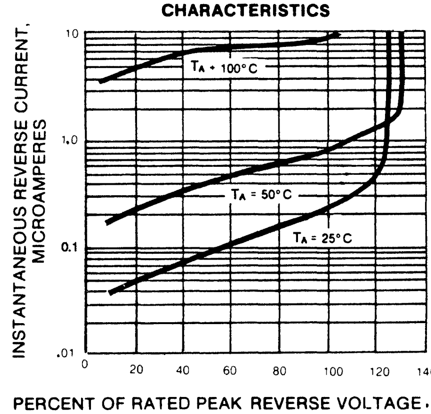


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

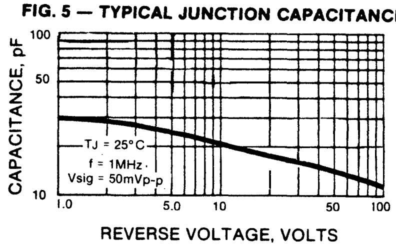
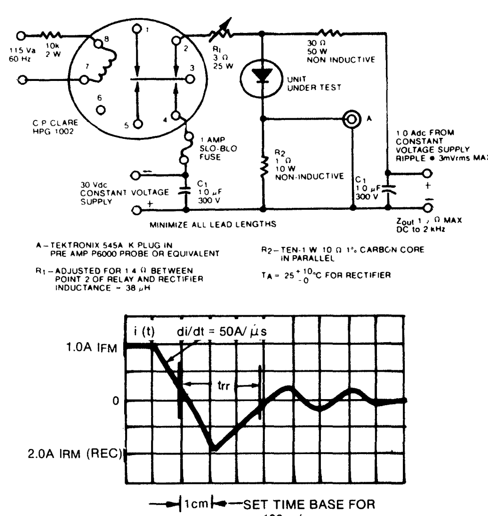


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



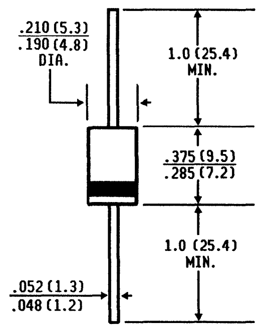
SRP300A THRU SRP300K

SOFT RECOVERY, FAST-SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 3.0 Amperes*

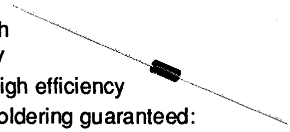
FEATURES

DO-201AD



Dimension in inches
and
(millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Void-free molded plastic package
- 3.0 Ampere operation at T_A=55°C with no thermal runaway
- Fast switching for high efficiency
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Mounting Position: Any

Weight: 0.04 ounce, 1.1 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*SRP 300A*	*SRP 300B*	*SRP 300D*	*SRP 300G*	*SRP 300J*	*SRP 300K*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$			3.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			150.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F			1.3				Volts
Maximum DC Reverse Current T_A=25°C	I_R			10.0				μA
at Rated DC Blocking Voltage T_A=100°C			200		300	400	500	
Maximum Reverse Recovery Time (NOTE 2) T_J=25°C	T_{RR}	100	100	150	150	200	200	nS
Typical Junction Capacitance (NOTE 1) T_J=25°C	C_J			28.0				pF
Typical Thermal Resistance (NOTE 3)	$R\Theta JA$			15.0				°C/W
Operating Junction Temperature Range	T_J			-50 to +125				°C
Storage Temperature Range	T_{STG}			-50 to +150				°C

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
2. Reverse Recovery Test Conditions: I_F=0..5A, I_R=1.0A, Irr=.25A.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths with both leads to heat sink.

FIG. 1—FORWARD CURRENT DERATING CURVE

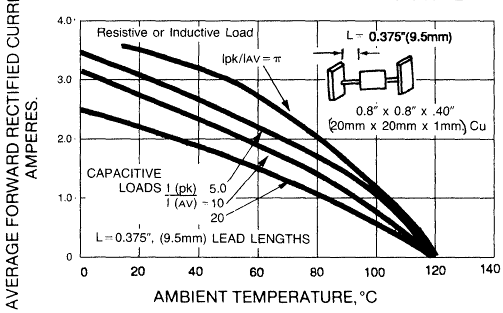


FIG. 2—MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

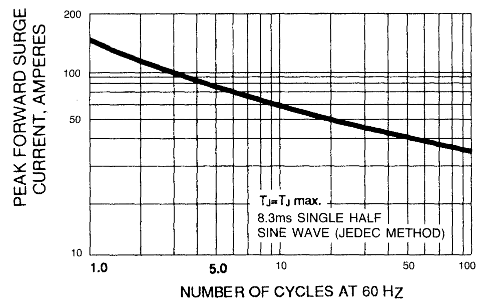


FIG. 3—TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

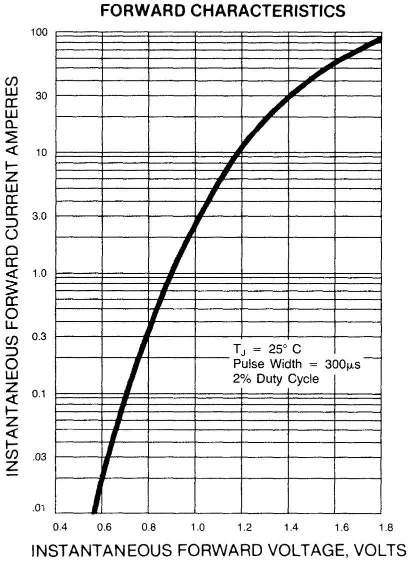


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

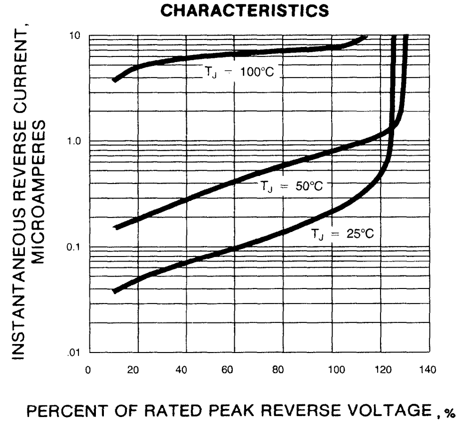


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

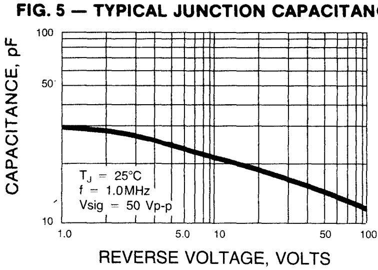
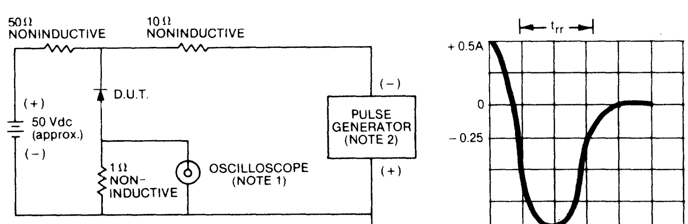


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

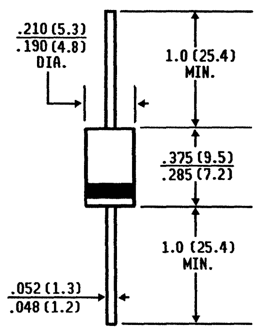
BY396P THRU BY399P

SOFT RECOVERY, FAST SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 100 to 800 Volts* ***CURRENT** - 3.0 Amperes*

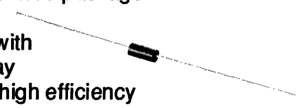
FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Void-free molded plastic package
- 3.0 Ampere operation at T_A=50°C with no thermal runaway



- Fast switching for high efficiency
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color Band denotes end
Mounting Position: Any
Weight: .04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*BY396P*	*BY397P*	*BY398P*	*BY399P*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	100	200	400	800	Volts
Maximum RMS Voltage	V_{RMS}	70	140	280	560	Volts
Maximum DC Blocking Voltage	V_{DC}	100	200	400	800	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=50°C	$I_{(AV)}$	3.0				Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}	100.0				Amps
Maximum Repetitive Peak Forward Surge (NOTE 1)	I_{FRM}	10.0				Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	1.25				Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 500.0				µA
Maximum Reverse Recovery Time (NOTE 3) T_J=25°C	T_{RR}	500.0				nS
Maximum Forward Recovery Time 100mA T_J=25°C	T_{FR}	1.0				µS
Typical Junction Capacitance (NOTE 2)	C_J	28.0				pF
Typical Thermal Resistance (NOTE 4)	$R_{\theta JA}$	15.0				°C/W
Operating Junction Temperature Range	T_J	-50 to +125				°C
Storage Temperature Range	T_{STG}	-50 to +150				°C

NOTES:
1. Repetitive Peak Forward Surge Current at f<15KHz.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
3. Reverse Recovery Test Conditions: I_F=10mA, I_R=10mA, Irr=1.0mA.
4. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths with both leads to heat sink.

FIG. 1 — FORWARD CURRENT DERATING CURVE

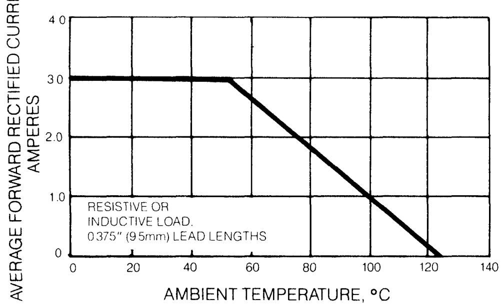


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

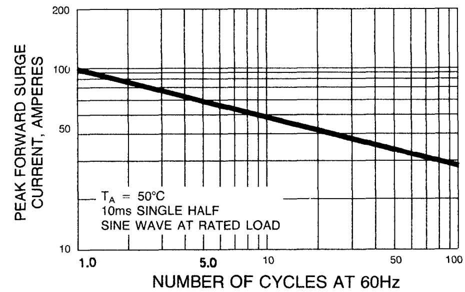


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

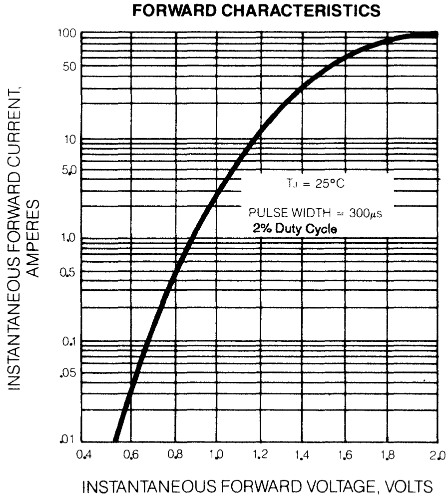


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

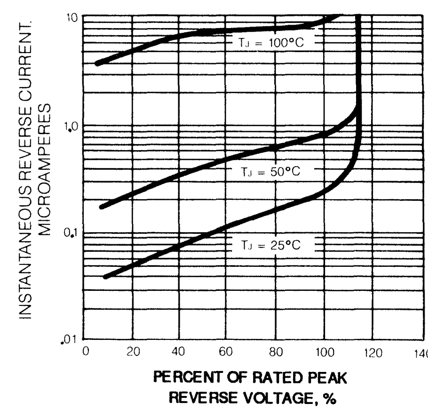
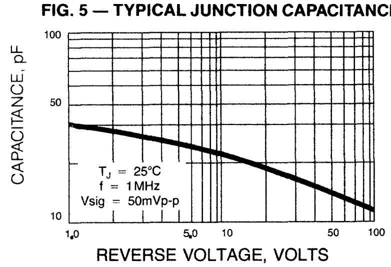


FIG. 5 — TYPICAL JUNCTION CAPACITANCE



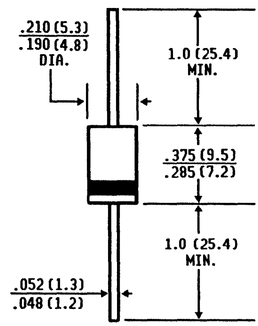
BY500-100 THRU BY500-800

SOFT RECOVERY, FAST SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 100 to 800 Volts* ***CURRENT** - 5.0 Amperes*

FEATURES

DO-201AD



Dimensions in inches and (millimeters)

- High surge current capability
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Fast switching for high efficiency
- High current operation at T_L=45°C
- Void-free molded plastic package
- High temperature soldering guaranteed: 250°C/10 seconds /.375", (9.5mm) lead lengths at 5 lbs., (2.3kg) tension
- Especially designed for applications such as Switch Mode Power Supplies, Inverters, Converters, TV Scanning, Ultrasonic-Systems, Speed controlled DC Motors, Low RF Interference and Free Wheeling Rectifiers

MECHANICAL DATA

Case: JEDEC DO-201AD molded plastic
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color Band denotes end
Mounting Position: Any
Weight: .04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	BY500-100	BY500-200	BY500-400	BY500-600	BY500-800	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_L=45°C	$I_{(AV)}$			5.0			Amps
Peak Forward Surge Current 10ms single half sine-wave superimposed on rated load at T_A=25°C	I_{FSM}			200.0			Amps
Maximum Repetitive Peak Forward Surge	I_{FRM}			10.0			Amps
Maximum Instantaneous Forward Voltage at 5.0A	V_F			1.35			Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R			10.0 1.0			µA mA
Maximum Reverse Recovery Time (NOTE 3) T_J=25°C	T_{RR}			200.0			nS
Maximum Reverse Recovery Current (NOTE 3)	$I_{RM(REC)}$			2.0			Amps
Typical Junction Capacitance T_J=25°C (NOTE 2)	C_J			28.0			pF
Typical Thermal Resistance (NOTE 1)	$R_{\theta JA}$			15.0			°C/W
Operating Junction Temperature Range	T_J			-50 to +125			°C
Storage Temperature Range	T_{STG}			-50 to +150			°C

NOTES:
1. Thermal Resistance from Junction to Ambient at 375",(9.5mm) lead lengths with both leads to heat sink.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.
3. Reverse Recovery Test Conditions: I_F=1.0A, V_R=30V, di/dt=50A/µs.

FIG. 1 — FORWARD CURRENT DERATING CURVE

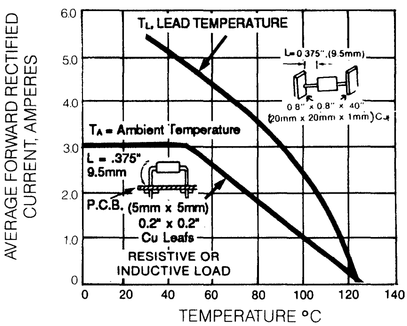


Fig. 2 —TYPICAL REVERSE CHARACTERISTICS

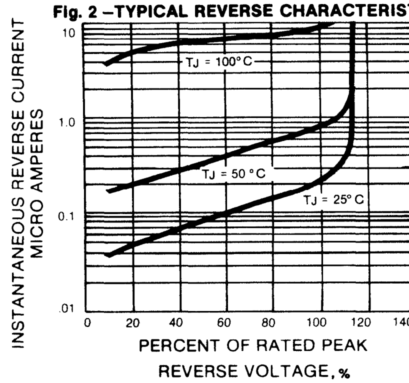


FIG. 4 — MAXIMUM PEAK FORWARD SURGE CURRENT

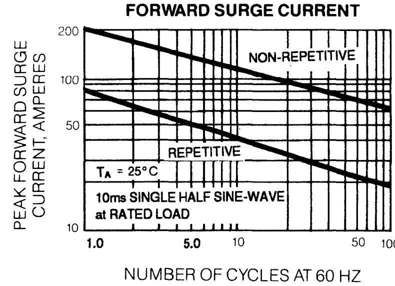


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

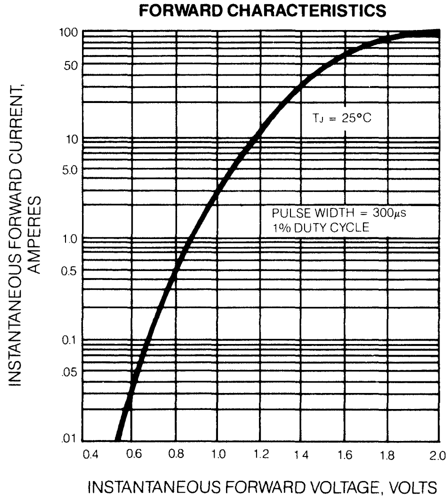
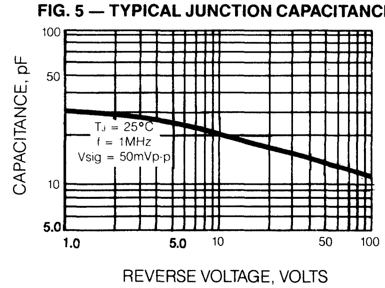


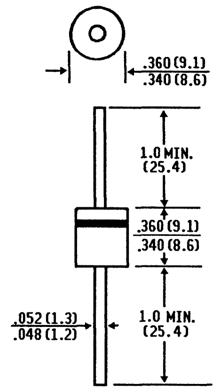
FIG. 5 — TYPICAL JUNCTION CAPACITANCE



GI820 THRU GI828

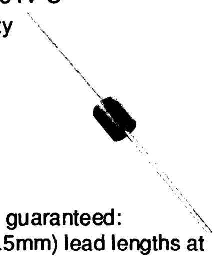
HIGH CURRENT FAST SWITCHING PLASTIC RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 5.0 Amperes*



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High surge current capability
- High current operation
- Fast switching for high efficiency
- Diffused junction
- Completely insulated case
- Uniform molded body
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: Void-free molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color Band denotes cathode

Mounting Position: Any

Weight: 0.07 ounce, 2.1grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	GI820	GI821	GI822	GI824	GI826	GI828	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Non-repetitive Peak Reverse Voltage	V_{RSM}	75	150	250	450	650	880	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	5.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0						Amps
Maximum Instantaneous Forward Voltage at 5.0A at 15.7A T_J=150°C	V_F	1.10 1.05						Volts
Maximum Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 1.0						µA mA
Typical Junction Capacitance T_J=25°C (NOTE 3)	C_J	300.0						pF
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	200.0						nS
Maximum Reverse Recovery Current (NOTE 1)	$I_{RM(REC)}$	2.0						Amps
Typical Thermal Resistance (NOTE 2)	$R\theta JA$	10.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-50 to +150						°C

NOTES:

1. Reverse Recovery Test Conditions: I_F=1.0A, V_R= 30V, di/dt = 50A/µs.
2. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, with both leads to heat sink.
3. Measured at 1 MHz and applied reverse voltage of 4.0 volts.

FIG. 1 — FORWARD CURRENT DERATING CURVE

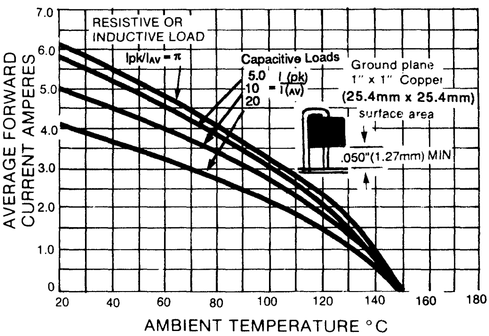


FIG. 2 — FORWARD CURRENT DERATING CURVE

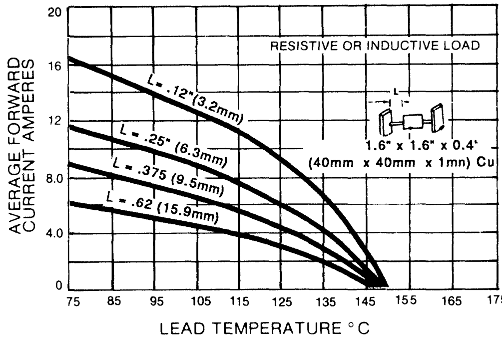


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

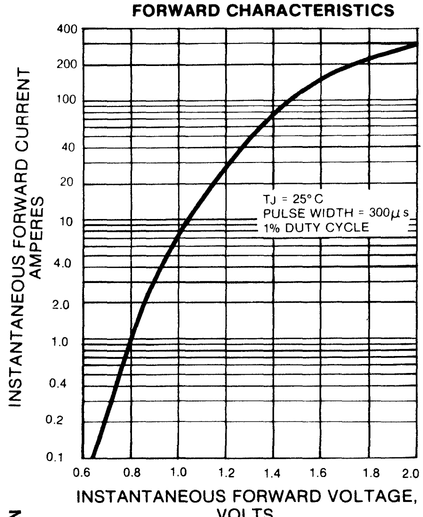


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

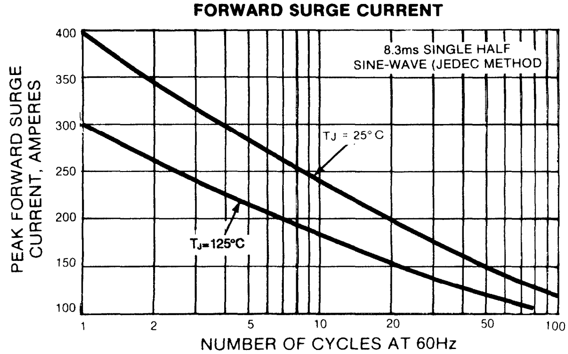


FIG. 5 — TYPICAL THERMAL RESISTANCE

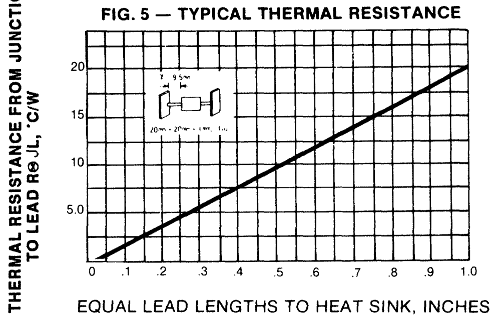
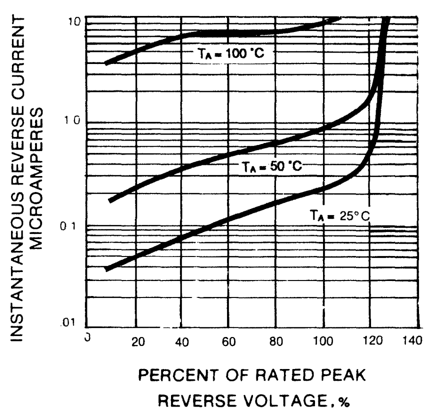


FIG. 6 — TYPICAL REVERSE CHARACTERISTICS



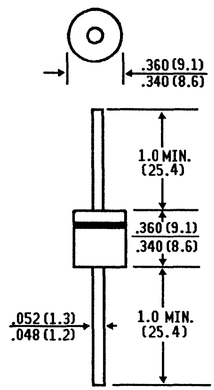
GI General Instrument

SRP600A THRU SRP600K

HIGH CURRENT SOFT RECOVERY FAST-SWITCHING PLASTIC RECTIFIER

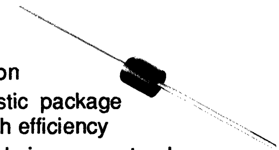
***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 6.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High surge current capability
- High Current Operation
- Void-free molded plastic package
- Fast switching for high efficiency
- High temperature soldering guaranteed: 250°C/10 seconds/.375",(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Void-free molded plastic

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Mounting Position: Any

Weight: 0.07 ounce, 2.1grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*SRP 600A*	*SRP 600B*	*SRP 600D*	*SRP 600G*	*SRP 600J*	*SRP 600K*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead lengths at T_A=55°C	$I_{(AV)}$	6.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0						Amps
Maximum Instantaneous Forward Voltage at 6.0A	V_F	1.3						Volts
Maximum DC Reverse Current T_A= 25°C at Rated DC Blocking Voltage T_A= 100°C	I_R	10.0 1.0						µA mA
Maximum Reverse Recovery Time (NOTE 1) T_J= 25°C	T_{RR}	100	100	150	150	200	200	nS
Typical Junction Capacitance (NOTE 2) T_J= 25°C	C_J	300.0						pF
Typical Thermal Resistance (NOTE 3)	$R\theta JA$	10.0						°C/W
Operating Junction Temperature Range	TJ	-50 to +125						°C
Storage Temperature Range	T_{STG}	-50 to +150						°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lengths, with both leads to heat sink.

FIG. 1 — FORWARD CURRENT DERATING CURVE

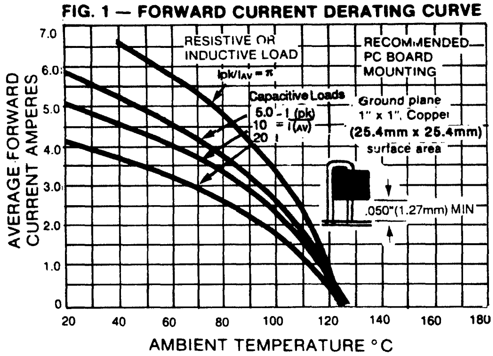


FIG. 2 — FORWARD CURRENT DERATING CURVE

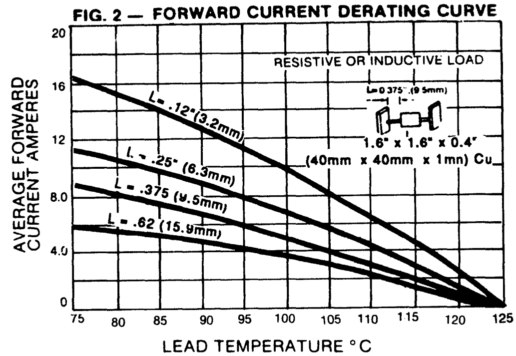


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

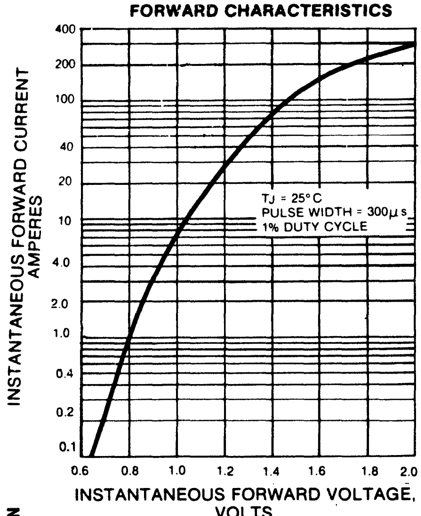


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

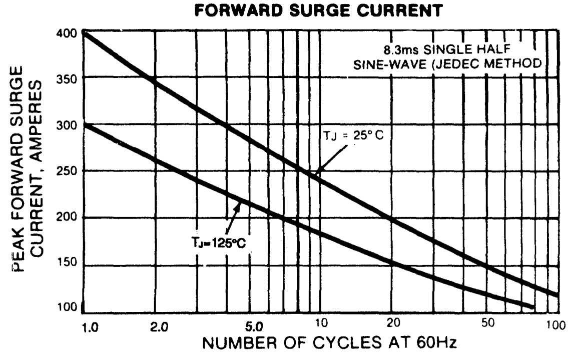


FIG. 5 — TYPICAL THERMAL RESISTANCE

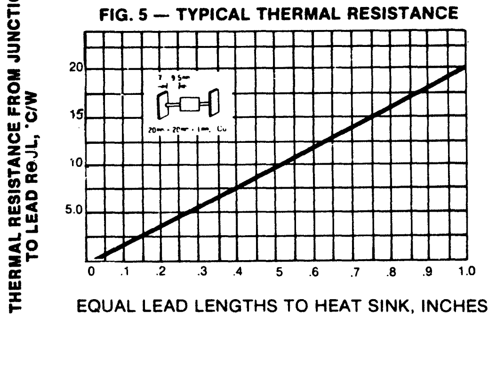
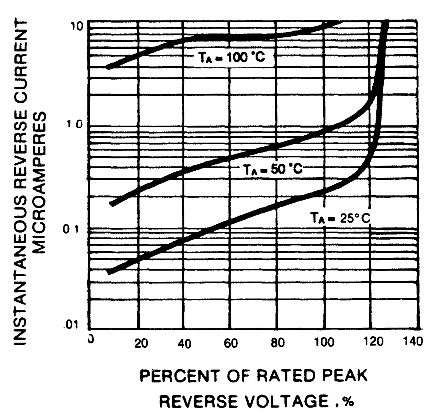


FIG. 6 — TYPICAL REVERSE CHARACTERISTICS



General Instrument

FULL-WAVE BRIDGE RECTIFIERS

0.5 AMPERE TO 35.0 AMPERES
50 VOLTS TO 1000 VOLTS

General Instrument

BRIDGE RECTIFIERS

0.9 to 35 Amperes   50 Volts to 1000 Volts

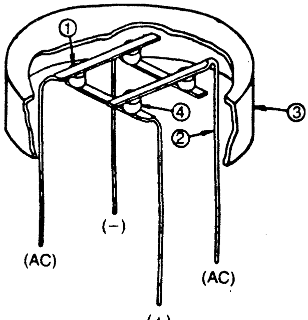


Fig. 1 Round Bridge

ITEM DESCRIPTION
1. Solder Preforms
2. Formed Copper Leads
3. Plastic Case
4. Glass Passivated Chip (GPP)

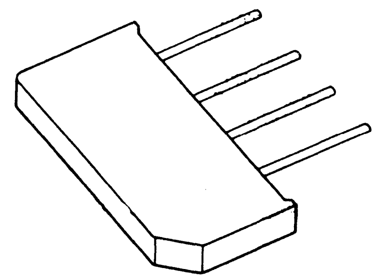


Fig. 2 IN-LINE Bridge

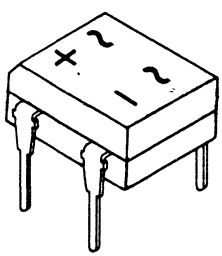


Fig. 3 DUAL-IN-LINE Bridge

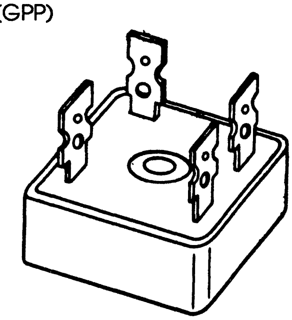


Fig. 4 Chassis Mounted Bridge

FAMILIES OF GENERAL INSTRUMENT BRIDGE RECTIFIERS

All types of rectifier cells, which are produced by General Instrument, are available in bridge configurations, molded in various plastic packages.

The basic types of packages are:
Round Plastic Package (Fig. 1)
IN-LINE Plastic Package (Fig. 2)
DUAL-IN-LINE Plastic Package (Fig. 3)
Square Plastic Package for Chassis Mounting (Fig. 4)

These bridge families are available with different plated terminals such as wire leads or Faston terminals.

FAMILIES OF GENERAL INSTRUMENT BRIDGE RECTIFIERS

Dual-In-Line Single Phase Bridge Rectifiers0.9 to 1.0 AMPERE

Types:
DF005M thru DF10M
EDF1AM thru EDF1DM
B40C80DM thru B380C800DM

Features:
- *Surge Overload Rating 50 Amperes Peak*
- *Ideal for Printed Circuit Board*
- *Reliable Low Cost Construction*
- *Tinned Copper Leads Solderable to MIL-STD-750, Method 2026*
- *Glass Passivated Chip Junctions*
- *Plastic Package has Underwriters Laboratory Flammability Classification 94V-O*
- *All bridge series are UL recognized under component index, file number E54214*

Miniature Single-Phase Bridge Rectifiers1.5 to 2.0 AMPERES

Types:
W005G thru W10G
2W005G thru 2W10G
B40C800G thru B250C800G
B40C1000G thru B380C10000G
B40C1500G thru B380C1500G

Features:
- *Surge Overload Rating 50 and 60 Amperes Peak*
- *Ideal for Printed Circuit Board*
- *Reliable Low Cost Construction*
- *Leads are Solderable to MIL-STD-750,Method 2026*
- *Plastic Package has Underwriters Laboratory Flammability Classification 94V-O*
- *All bridge series are UL recognized under component index, file number E54214*
- *All series have glass passivated chip junctions*

In-Line Single Phase Bridge Rectifiers1.0 to 8.0 AMPERES

Types:
KBP005M thru KBP10M
2KBP005M thru 2KBP10M
GBU4A thru GBU4M
GBL005 thru GBL10
GBU6A thru GBU6M
GBU8A thru GBU8M
KBL005 thru KBL10
KBU4A thru KBU4M
KBU6A thru KBU6M
KBU8A thru KBU8M
3N249 thru 3N252
3N253 thru 3N259

Features:
- *Surge Overload Rating from 50 to 300 Amperes Peak*
- *Ideal for Printed Circuit Board*
- *Reliable Low Cost Construction utilizing molded Plastic Leads are Solderable to MIL-STD-750,Method 2026*
- *Plastic Package has Underwriters Laboratory Flammability Classification 94V-O*
- *All bridge series are UL recognized under component index file number E54214*
- *All series have glass passivated chip junctions*

High Current Single Phase Bridge Rectifiers3.0 to 35.0 AMPERES

Types:
GBPC1005 thru GBPC110
GBPC6005 thru GBPC610
GBPC12005 thru GBPC1210
GBPC15005 thru GBPC1510
GBPC25005 thru GBPC2510
GBPC35005 thru GBPC3510

Features:
- *High Capability of Surge Overload Rating*
- *Insulated Case for Maximum Heat Dissipation*
- *Low Forward Voltage Drop*
- *Copper Leads or Faston Terminals, versions for GBPC12,15, 25 & 35 series only*
- *Simple Installation thru Screw hole for NBR6 Screw*
- *Leads are Solderable to MIL-STD-750,Method 2026*
- *Plastic Package has Underwriters Laboratory Flammability Classification 94V-O*
- *All bridge series are UL recognized under component index, file number E54214*
- *All bridges have glass passivated chip junctions*

QUICK GUIDE TO BRIDGE RECTIFIERS

IO(A)	1.0	1.5	1.5	1.0	2.0	2.0	2.0	4.0	4.0	4.0	4.0	6.0	6.0	8.0	8.0
@TA(C)	40	25	50	75	25	50	55	40	50	100TC	100TC	100TC	100TC	100TC	100TC
SURGE(A)	50	50	50	30	60	60	60	150	200	150	200	175	250	200	300
V_R=50(V)	DF005M	W005G	KBP005M	3N246	2W005G	2KBP005M	3N253	GBL005	KBL005	GBU4A	KBU4A	GBU6A	KBU6A	GBU8A	KBU8A
V_R=100(V)	DF01M	W01G	KBP01M	3N247	2W01G	2KBP01M	3N254	GBL01	KBL01	GBU4B	KBU4B	GBU6B	KBU6B	GBU8B	KBU8B
V_R=200(V)	DF02M	W02M	KBP02M	3N248	2W02G	2KBP02M	3N255	GBL02	KBL02	GBU4D	KBU4D	GBU6D	KBU6D	GBU8D	KBU8D
V_R=400(V)	DF04M	W04G	KBP04M	3N249	2W04G	2KBP04M	3N256	GBL04	KBL04	GBU4G	KBU4G	GBU6G	KBU6G	GBU8G	KBU8G
V_R=600(V)	DF06M	W06G	KBP06M	3N250	2W06G	2KBP06M	3N257	GBL06	KBL06	GBU4J	KBU4J	GBU6J	KBU6J	GBU8J	KBU8J
V_R=800(V)	DF08M	W08G	KBP08M	3N251	2W08G	2KBP08M	3N258	GBL08	KBL08	GBU4K	KBU4K	GBU6K	KBU6K	GBU8K	KBU8K
V_R=1000(V)	DF10M	W10G	KBP10M	KBP10M	3N252	2W10G	2KBP10M	3N259	GBL10	KBL10	GBU4M	KBU4M	KBU6M	GBU8M	KBU8M

QUICK GUIDE TO BRIDGE RECTIFIERS

I_O(A)	3.0	6.0	12	15	25	35	I_O(A)
@T_C(C)	50	100	55	55	55	50	@T_A(°C)
SURGE(A)	60	175	200	300	300	400	SURGE(a)
V_R=50(V)	GBPC1005	GBPC6005	GBPC12005	GBPC15005	GBPC25005	GBPC3550	VR=50(V)
V_R=100(V)	GBPC101	GBPC601	GBPC1201	GBPC1501	GBPC2501	GBPC3501	VR=50(V)
V_R=200(V)	GBPC102	GBPC602	GBPC1202	GBPC1502	GBPC2502	GBPC3502	VR=50(V)
V_R=400(V)	GBPC104	GBPC604	GBPC1204	GBPC1504	GBPC2504	GBPC3504	VR=400(V)
V_R=600(V)	GBPC106	GBPC606	GBPC1206	GBPC1506	GBPC2506	GBPC3506	VR=600(V)
V_R=800(V)	GBPC108	GBPC608	GBPC1208	GBPC1508	GBPC2508	GBPC3508	VR=800(V)
V_R=1000(V)	GBPC110	GBPC610	GBPC1210	GBPC1510	GBPC2510	GBPC3510	VR=1000(V)

1)G Indicates Glass Passivated Chip Junctions
2) DM Indicates Dual-Inline Package (IC-Leads)

QUICK GUIDE TO BRIDGE RECTIFIERS

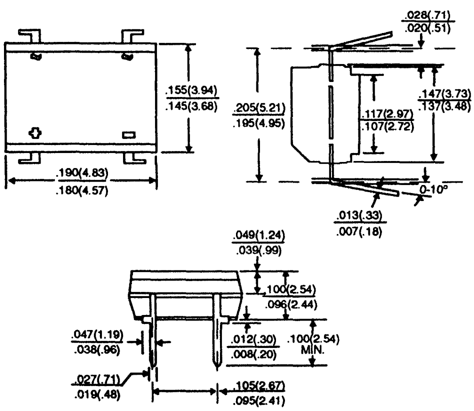
I_O(A)	0.8	1.0	1.5
@TA(C)	45	45	45
SURGE(A)	45	45	45
VRMS=40(V)	B40C800[1][2]	B40C1000[1]	B40C1500[1]
VRMS=80(V)	B80C8001)2)	B80C10001)	B80C15001)
VRMS=125(V)	B125C800[1][2]	B125C1000[1]	B250C1500[1]
VRMS=250(V)	B250C800[1][2]	B250C1000[1]	B250C1500[1]
VRMS=380(V)	B380C800[1][2]	B380C1000[1]	B380C1500[1]

1)G Indicates Glass Passivated Chip Junctions
2) DM Indicates Dual-Inline Package (IC-Leads)

MB2M THRU MB6M

MINIATURE GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***Voltage** - 200 to 600 Volts* ***Current** - 0.5 Amperes*



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Recognition 94V-O
- Glass passivation chip junctions

- High surge overload rating: 30 amperes peak
- Saves space on printed circuit board
- High temperature soldering guaranteed: 260°C/10 seconds at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded Plastic

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Polarity: Polarity symbols marked on body

Weight: 0.078 ounce, 0.23 grams

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, Resistive or inductive load.

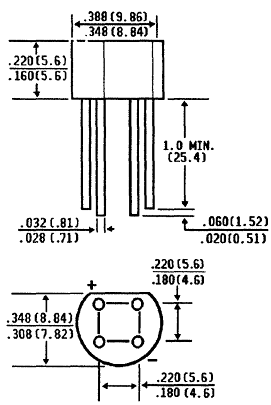
	SYMBOLS	MB2M	MB4M	MB6M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	200	400	600	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C - on Glass-Epoxy P.C.B.	$I_{(AV)}$		0.5		Amps
Peak Forward Surge Current 8.3m sec Single Half Sine-Wave superimposed on Rated Load (JEDEC Method)	I_{FSM}		30.0		Amps
Rating for Fusing (t<8.35ms)	I^2t		3.8		A^2s
Maximum Instantaneous Forward Voltage Drop per Element at 0.4A	V_F		1.0		Volts
Maximum Reverse Current at T_A=25°C Rated DC Blocking Voltage per element T_A=125°C	I_R		5.0 500		Ω0μA
Typical Junction Capacitance per element (NOTE 1)	C_J		25.0		pf
Typical Thermal Resistance (NOTE 2)	$R_{\theta JL}$ $R_{\theta JA}$		20.0 75.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}		-55 to +150		°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
2. Thermal Resistance from Junction to Lead and/or Ambient, P.C. board mounted on .047 in^2 ($12mm^2$) copper pads.

B40C 800G THRU B380C 800G

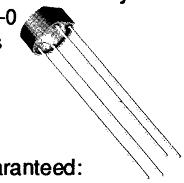
MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

Voltage *- 65 to 600 Volts* ***Current*** *- 0.9 Amperes*



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junctions
- High case dielectric strength
- Typical I_R less than 0.1 μA
- High overload surge current
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic
Terminals: Plated Leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 50 Hz or 60 Hz, resistive or inductive load.

	SYMBOLS	B40 C800G	B80 C800G	B125 C800G	B250 C800G	B380 C800G	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS Input Voltage R + C-Load	V_{RMS}	40	80	125	250	380	Volts
Maximum Average Forward Output Current for free air operation at T_A=45°C R + L-Load C-Load	$I_{(AV)}$			0.9 0.8			Amps
Maximum DC Blocking Voltage	V_{DC}	65	125	200	400	600	Volts
Maximum Repetitive Peak Reverse Voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum Peak Working Voltage	V_{RWM}	90	180	300	600	900	Volts
Maximum Non-Repetitve Peak Voltage	V_{RSM}	100	200	350	600	1000	Volts
Maximum Repetive Peak Forward Surge Current	I_{FRM}			10.0			Amps
Peak Forward Surge Current Single Sine wave on rated load at T_J=125°C	I_{FSM}			45.0			Amps
Rating for Fusing at T_J=125°C (t<100ms)	I^2t			10.0			A^2sec
Minimum Series Resistor C-Load @V_{RMS} = ±10%	Rt	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum Load Capacitance +50% -10%	C_L	5000	2500	1000	500	200	μF
Maximum Instantaneous Forward Voltage Drop per leg at 0.9A	V_F			1.0			Volts
Maximum Reverse Current at rated Repetitive Peak Voltage per leg T_A=25°C	I_R			10.0			μA
Typical Thermal Resistance (NOTE 1)	$R\Theta JA$			36.0			C/W
Operating Junction Temperature Range	T_J			-40 to +125			°C
Storage Temperature Range	T_{STG}			-40 to +125			°C

NOTES:

1. Thermal Resistance from Junction to Ambient mounted on P.C Board at .375" (9.5mm) Lead Lengths with 0.2" x 0.2" (5.5mm x 5.5mm) Copper Pads.

FIG .1 - DERATING CURVE FOR OUTPUT RECTIFIED CURRENT FOR B40C 800G...B12C 800G

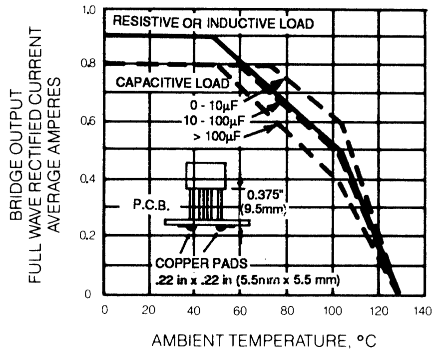


FIG. 2 - DERATING CURVES FOR OUTPUT RECTIFIED CURRENT B250C 800G...B380C 800G

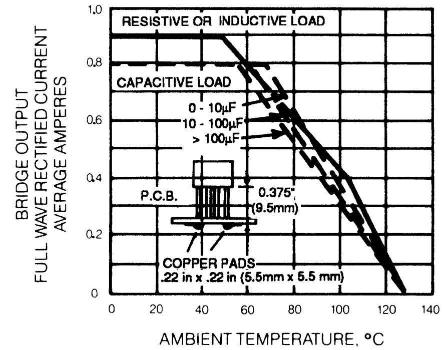


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

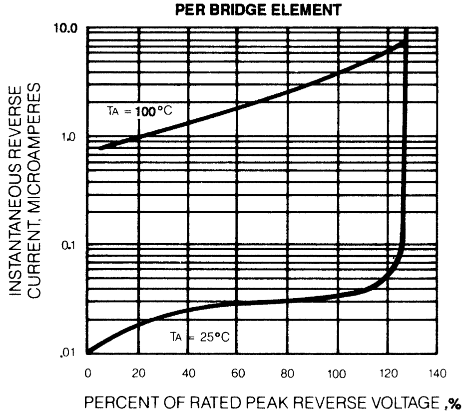


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

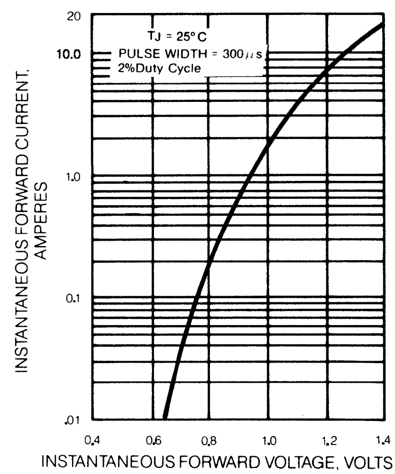


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD CURRENT PER BRIDGE ELEMENT

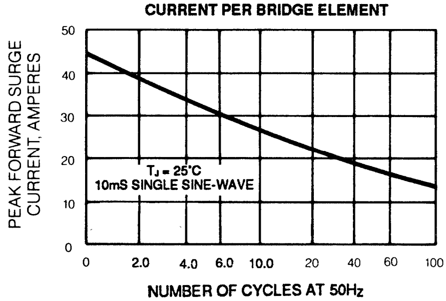
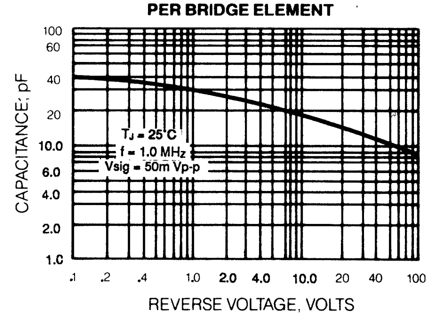


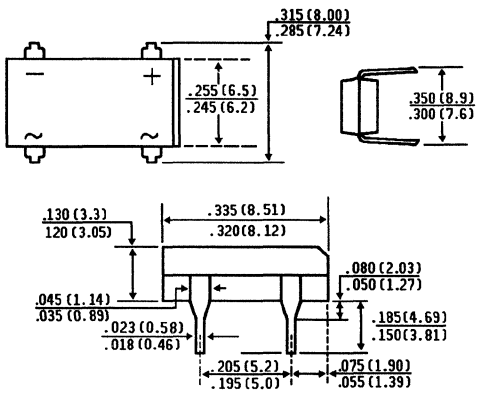
FIG. 6 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



B40C 800DM THRU B380 C800DM

MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

Voltage - 65 to 600 Volts ***Current*** - 0.9 Amperes



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Glass passivated chip junctions
- Surge overload rating of 45 Amperes peak
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C / 10 seconds at 5 lbs., (2.3kg) tension

MECHANICAL DATA

Case: Molded plastic
Terminals: Plated Leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Mounting Position: Any
Weight: 0.04 ounce, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
50 Hz or 60 Hz, resistive or inductive load.

	SYMBOLS	B40 C800DM	B80 C800DM	B125 C800DM	B250 C800DM	B380 C800DM	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS Input Voltage R + C-Load	V_{RMS}	40	80	125	250	380	Volts
Maximum Average Forward Output Current for free air operation at T_A=45°C R + L-Load / C-Load	$I_{(AV)}$			0.9 / 0.8			Amps
Maximum DC Blocking Voltage	V_{DC}	65	125	200	400	600	Volts
Maximum Repetitive Peak Reverse Voltage	V_{RRM}	90	180	300	600	900	Volts
Maximum Peak Working Voltage	V_{RWM}	90	180	300	600	900	Volts
Maximum Non-Repetitve Peak Voltage	V_{RSM}	100	200	350	650	1000	Volts
Maximum Repetive Peak Forward Surge Current	I_{FRM}			10.0			Amps
Peak Forward Surge Current Single Sine wave on rated load at T_J=125°C	I_{FSM}			45.0			Amps
Rating for Fusing at T_J=125C (t<100ms)	I^2t			10.0			A^2sec
Minimum Series Resistor C-Load @ V_{RMS} = ±10%	Rt	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum Load Capacitance +50% -10%	CL	5000	2500	1000	500	200	µF
Maximum Instantaneous Forward Voltage Drop per leg at 0.9A	V_F			1.0			Volts
Maximum Reverse Current at rated Repetitive Peak Voltage per leg T_A= 25°C	I_R			10.0			µA
Typical Thermal Resistance (NOTE 1)	RθJA			40.0			°C/W
Operating Junction Temperature Range	T_J			-40 to +125			°C
Storage Temperature Range	T_{STG}			-40 to +150			°C

NOTES:
1. Thermal Resistance from Junction to Ambient mounted on P.C Board 0.5" x 0.5" (13mm x 13mm) Copper pads.

FIG 1 - DERARTING CURVE FOR OUTPUT RECTIFIED CURRENT B40C 800DM...B125C 800DM

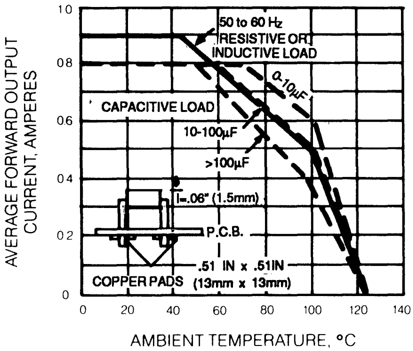


FIG.2 - DERATING CURVE FOR OUTPUT RECTIFIED CURRENT B40C 800DM...B125C 800DM

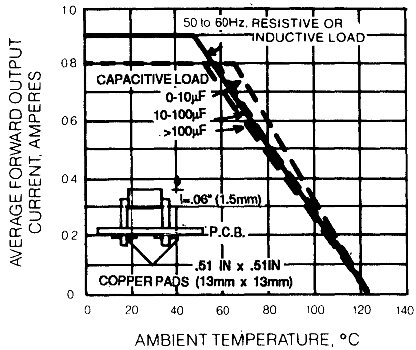


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

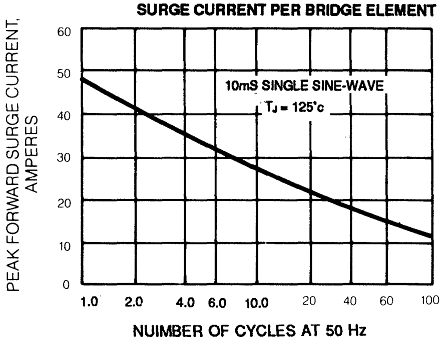


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

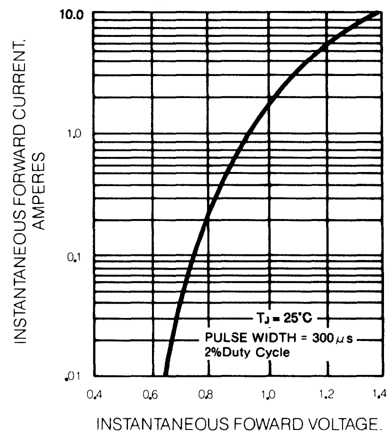


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

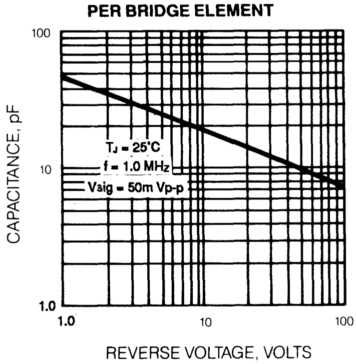
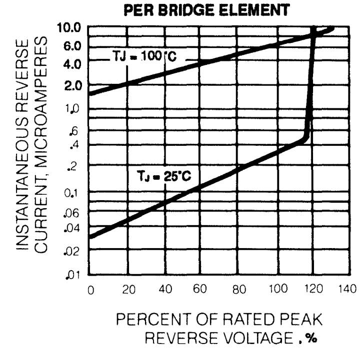


FIG. 6 — TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT



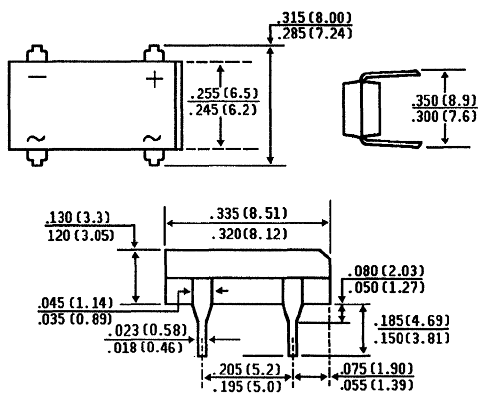
GI General Instrument

DF005M THRU DF10M

MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

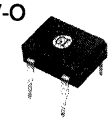
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.0 Ampere*

FEATURES



Dimensions in inches and (millimeters)

- This series is UL recognized under component index, file number E54214
- Plastic material used carries Underwriters Laboratory flammability recognition 94V-O
- Glass passivated chip junctions
- Surge overload rating of 50 Amperes peak
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C /10 seconds at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated Lead solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Weight: 0.04 ounce, 1.0 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.

	SYMBOLS	DF 005M	DF 01M	DF 02M	DF 04M	DF 06M	DF 08M	DF 10M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Rating for fusing (t<8.35ms)	I^2t	10.0							A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 1.0A	V_F	1.1							Volts
Maximum Reverse Current at Rated DC Blocking Voltage per leg T_A=25°C	I_R	5.0							μA
T_A=125°C		500.0							
Typical Junction Capacitance per leg (NOTE 1)	C_J	25.0							pF
Typical Thermal Resistance (NOTE 2)	$R_{\theta JA}$	40.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Thermal Resistance from Junction to Ambient mounted on P.C. Board with 0.5" x 0.5" (13mmx13mm) Copper Pads.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

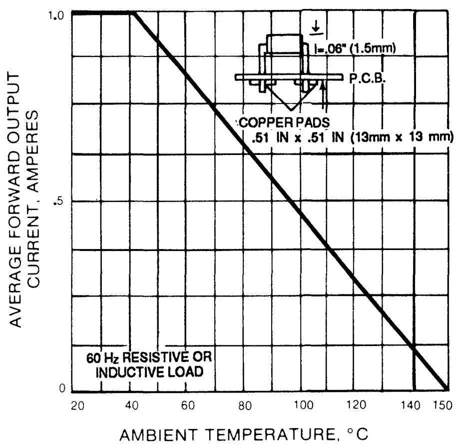


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

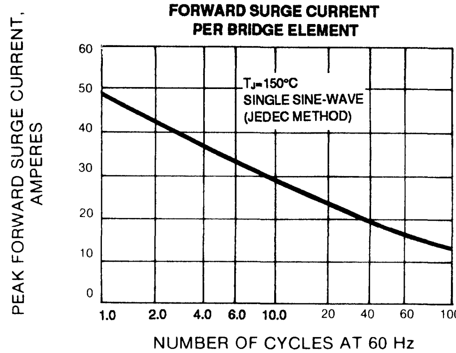


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

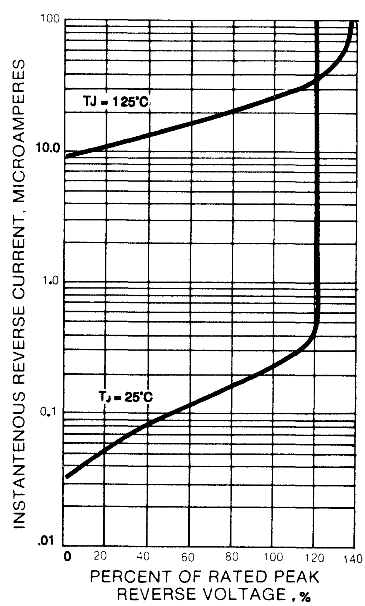


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

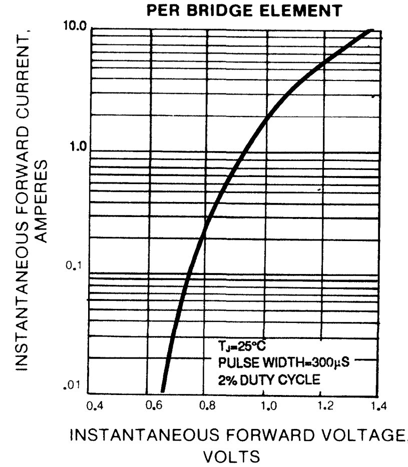
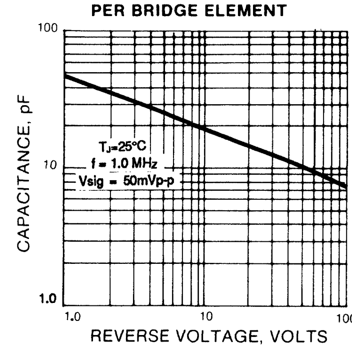


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

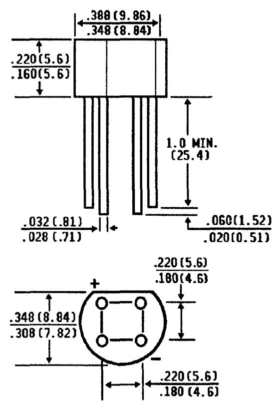


B40C 1000G THRU B380C 1000G

MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

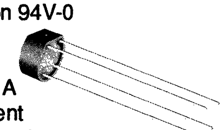
***Voltage** - 65 to 600 Volts* ***Current** - 1.0 Ampere*

FEATURES



Dimensions in inches and (millimeters)

- Glass passivated chip junctions
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High case dielectric strength
- Typical I_R less than 0.1 μ A
- High overload surge current
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated Leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.05 ounce, 1.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 50Hz or 60 Hz, resistive or inductive load.

	SYMBOLS	*B40 C 1000G*	*B80 C 1000G*	*B125 C 1000G*	*B250 C 1000G*	*B380 C 1000G*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS Input Voltage R + C-Load	V_{RMS}	40	80	125	250	380	Volts
Maximum Average Forward Output Current for free air operation at T_A=45°C R + L-Load C-Load	$I_{(AV)}$			1.2 1.0			Amps
Maximum DC Blocking Voltage	V_{DC}	65	125	200	400	600	Volts
Maximum Repetitive Peak Reverse Voltage	V_{RRM}	90	180	300	600	800	Volts
Maximum Peak Working Voltage	V_{RWM}	90	180	300	600	900	Volts
Maximum Non-Repetitve Peak Voltage	V_{RSM}	100	200	350	600	1000	Volts
Maximum Repetive Peak Forward Surge Current	I_{FRM}			10.0			Amps
Peak Forward Surge Current Single Sine wave on rated load (JEDEC Method) at T_J=125°C	I_{FSM}			45.0			Amps
Rating for Fusing at T_J=125C (t<100ms)	I^2t			10.0			A^2sec
Minimum Series Resistor C-Load @ V_{RMS} = ±10%	Rt	1.0	2.0	4.0	8.0	12.0	Ohms
Maximum Load Capacitance +50% -10%	C_L	5000	2500	1000	500	200	μF
Maximum Instantaneous Forward Voltage Drop per leg at 1.0A	V_F			1.0			Volts
Maximum Reverse Current at rated Repetitive Peak Voltage per leg T_A=25°C	I_R			10.0			μA
Typical Thermal Resistance (NOTE 1)	$R\theta JA$			36.0			°C/W
Operating Junction Temperature Range	T_J			-40 to +125			°C
Storage Temperature Range	T_{STG}			-40 to +150			°C

NOTES: 1. Thermal Resistance from Junction to Ambient mounted on P.C Board at .375" (9.5mm) Lead Lengths with 0.2"x0.2" (5.5mm x 5.5mm) Copper Pads.

FIG. 1 - DERATING CURVE OUTPUT REACTIFIED CURRENT B40C 1000G...B125C 1000G

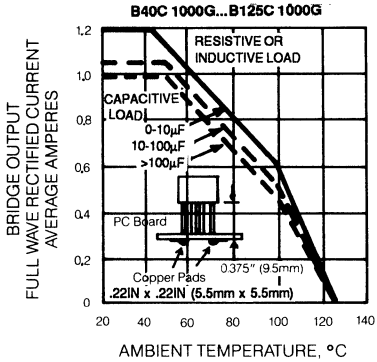


FIG. 2 - DERATING CURVES FOR OUTPUT RECTIFIED CURRENT B40C 1000G...B380C 1000G

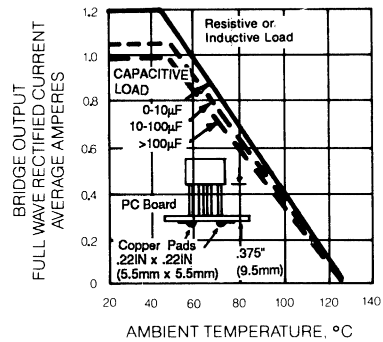


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

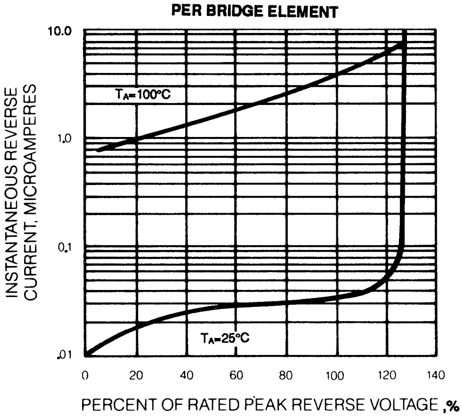


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

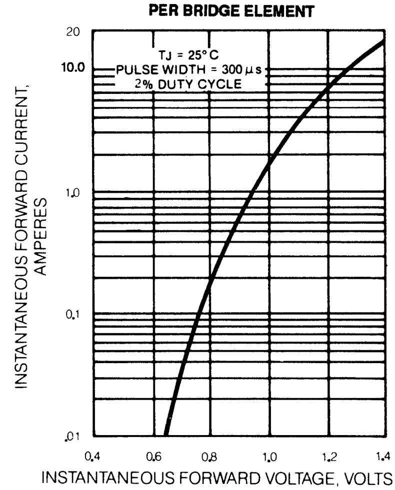


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD CURRENT PER BRIDGE ELEMENT

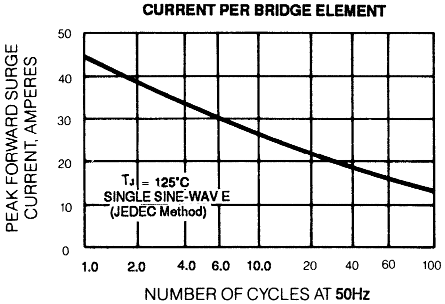
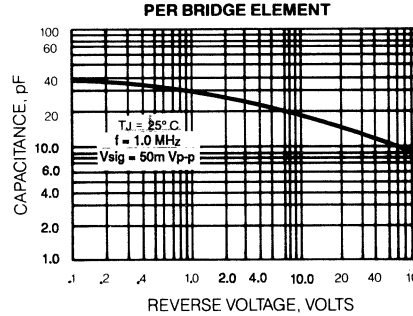


FIG. 6 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

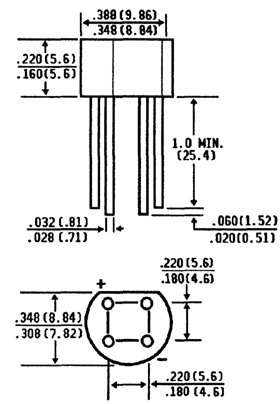


W005G THRU W10G

MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

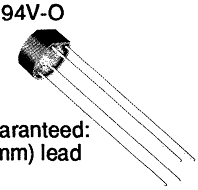
***VOLTAGE** - 50 - 1000 Volts* ***CURRENT** - 1.5 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- This series is UL recognized under component index, file number E54214
- Glass passivated chip junctions
- Plastic material used carries Underwriters Laboratory flammability recognition 94V-O
- High case dielectric strength
- Typical I_R less than 0.1 μ A
- High overload surge capability
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C/10 seconds/.375", (9.5mm) lead length /5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated Leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.

	SYMBOLS	W 005G	W 01G	W 02G	W 04G	W 06G	W 08G	W 10G	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at .375",(9.5mm) lead length at T_A=25°C	$I_{(AV)}$	1.5							Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Rating for fusing (t<8.3ms)	I^2t	10.0							A^2sec
Maximum Instantaneous Forward Voltage Drop per leg at 1.0 Ampere	V_F	1.0							Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A=25°C T_A=125°C	T_J	5.0 500.0							μA
Typical Junction Capacitance per leg (NOTE 1)	C_J	14.0							pF
Typical Thermal Resistance (NOTE 2)	$R\Theta JA$	36.0							°C/W
Operating Junction Temperature Range	T_J	-55 to +150							°C
Storage Temperature Range	T_{STG}	-55 to +150							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Thermal Resistance from Junction to Ambient at .375", 9.5mm lead length P.C. Board mounting.

FIG.1 - DERATING CURVE
OUTPUT RECTIFIED CURRENT

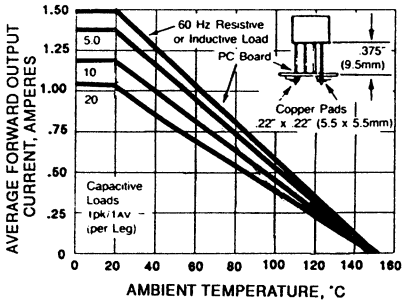


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK
FORWARD SURGE CURRENT
PER BRIDGE ELEMENT

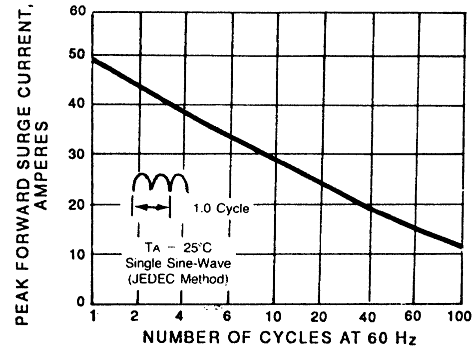


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS
PER BRIDGE ELEMENT

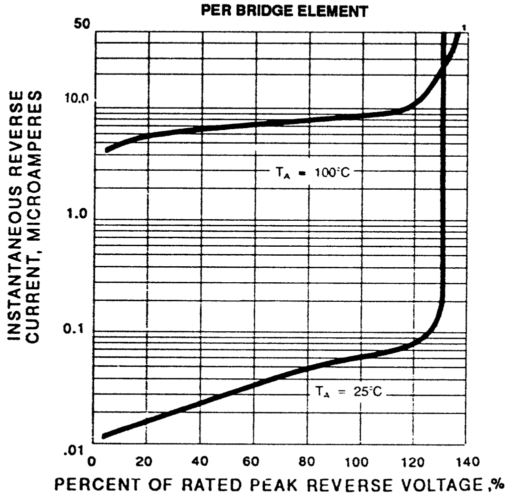


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS
PER BRIDGE ELEMENT

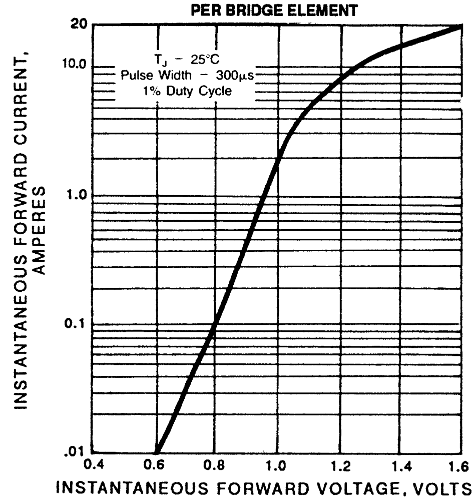


FIG. 5 - TYPICAL JUNCTION CAPACITANCE
PER BRIDGE ELEMENT

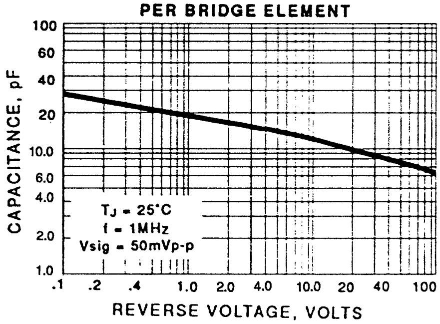
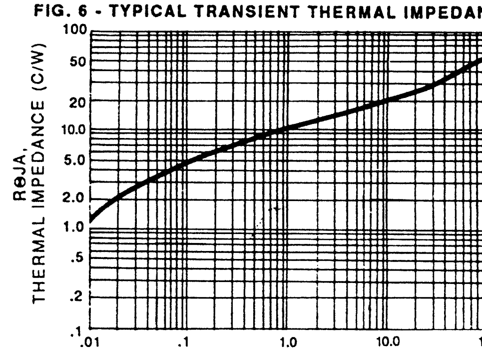


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

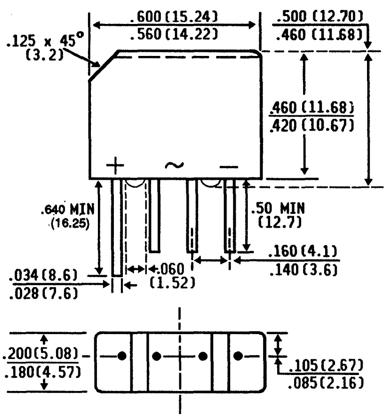


General Instrument

KBP005M THRU KBP10M
3N246 THRU 3N252

MINIATURE GLASS PASSIVATED SINGLE - PHASE RECTIFIER BRIDGE

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.5 Amperes*

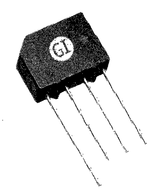


Polarity shown on front side of case: positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory flammability recognition 94V-O
- Glass passivated chip junctions
- Surge overload rating - 30 Amperes peak
- Ideal for printed circuit board
- High temperature soldering guaranteed:260°C /10 seconds at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic

Terminals: Plated Lead solderable per MIL-STD-750, Method 2026

Polarity: Polarity symbols marked on case

Mounting postition: Any

Weight: 0.06 ounce, 1.70 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.

	SYMBOLS	KBP005M 3N246	KBP01M 3N247	KBP02M 3N248	KBP04M 3N249	KBP06M 3N250	KBP08M 3N251	KBP10M 3N252	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
* Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C	$I_{(AV)}$	1.5							Amps
* Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method) T_J=150°C	I_{FSM}	30.0							Amps
Rating for fusing (t<8.35ms)	I^2t	10.0							A^2sec
* Maximum Instantaneous Forward Voltage drop per leg at 1.0A / 1.57A	V_F	1.0 / 1.3							Volts
* Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 / 500.0							µA
Typical Junction Capacitance per leg (NOTE 1)	C_J	15.0							pF
Typical Thermal Resistance (NOTE 2)	$R\theta JA$	28.0							°C/W
*Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150							°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Thermal Resistance from Junction to Ambient mounted on P.C. Board with, .47" x .47" (12mm x12mm) Copper Pads.
* JEDEC Registered Values

FIG. 2 — DERATING CURVE OUTPUT RECTIFIED CURRENT

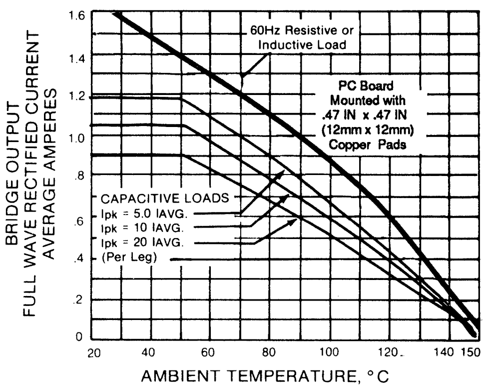


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

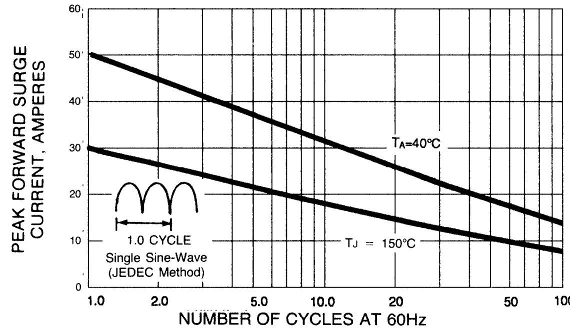


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

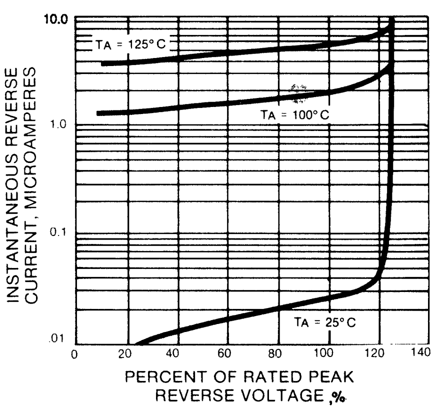


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

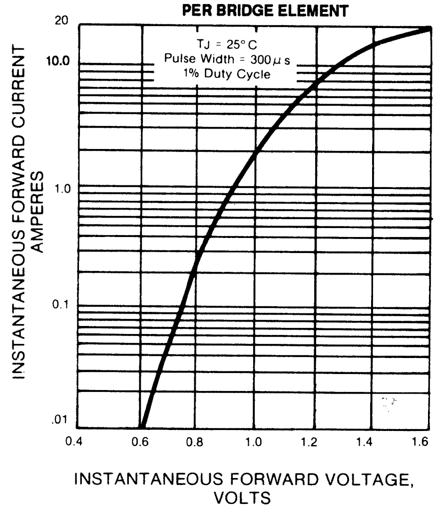
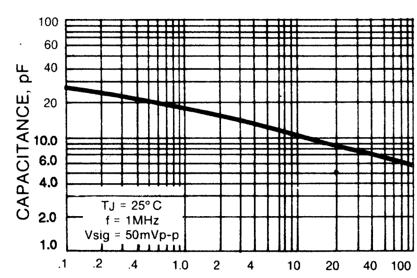


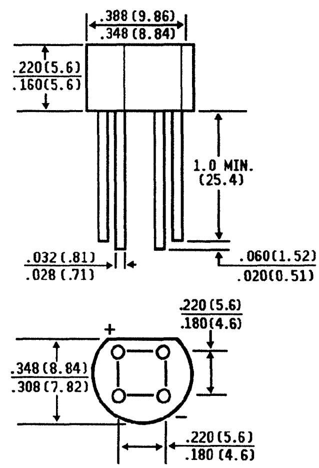
FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



B40C 1500G THRU B380C 1500G

MINIATURE GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

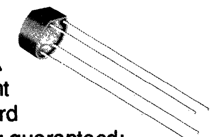
***Voltage** - 65 to 600 Volts* ***Current** - 1.5 Amperes*



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- High case dielectric strength
- Typical I_R less than 0.1 μ A
- High overload surge current
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C/10 seconds/.375", (9.5mm) lead length at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated Leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: 0.04 ounce, 1.1 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 50 Hz or 60 Hz, resistive or inductive load.

	SYMBOLS	*B40 C1500G*	*B80 C1500G*	*B125 C1500G*	*B250 C1500G*	*B380 C1500G*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	65	125	200	400	600	Volts
Maximum RMS Input Voltage R + C-Load	V_{RMS}	40	80	125	250	380	Volts
Maximum Average Forward Output Current for free air operation at T_A=45°C R + L-Load / C-Load	$I_{(AV)}$			1.6 / 1.5			Amps
Maximum DC Blocking Voltage	V_{DC}	65	125	200	400	600	Volts
Maximum Repetitive Peak Reverse Voltage	V_{RRM}	90	180	300	600	800	Volts
Maximum Peak Working Voltage	V_{RWM}	90	180	300	600	800	Volts
Maximum Non-Repetitve Peak Voltage	V_{RSM}	100	200	350	650	1000	Volts
Maximum Repetive Peak Forward Surge Current	I_{FRM}			10.0			Amps
Peak Forward Surge Current Single Sine wave on rated load at T_J=125°C	I_{FSM}			50.0			Amps
Rating for Fusing at T_J=125°C (t<100ms)	I^2t			12.5			A^2sec
Min.Series Resistor C-Load @ V_{RMS} = ±10%	Rt	1.0	2.0	4.0	8.0	12.0	ohms
Maximum Load Capacitance +50% -10%	C_L	5000	2500	1000	500	200	μF
Maximum Instantaneous Forward Voltage Drop per leg at 1.5A	V_F			1.0			Volts
Maximum Reverse Current at rated Repetitive Peak Voltage per leg T_A=25°C	I_R			10.0			μA
Typical Thermal Resistance (NOTE 1)	RΘJA			36.0			°C/W
Operating Junction Temperature Range	T_J			-40 to +125			°C
Storage Temperature Range	T_{STG}			-40 to +150			°C

NOTES: 1. Thermal Resistance from Junction to Ambient mounted on P.C Board at .375" (9.5mm) Lead Lengths with 0.2"x0.2" (5.5mm x 5.5mm) Copper Pads.

FIG. 1 — DERATING CURVE OUTPUT RECTIFIED CURRENT FOR B40C 1500G...B125C 1500G

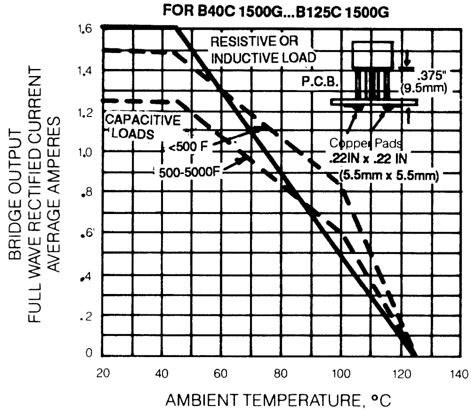


FIG. 2 - DERATING CURVE OUTPUT RECTIFIED CURRENT B250 1500G...B380C 1500G

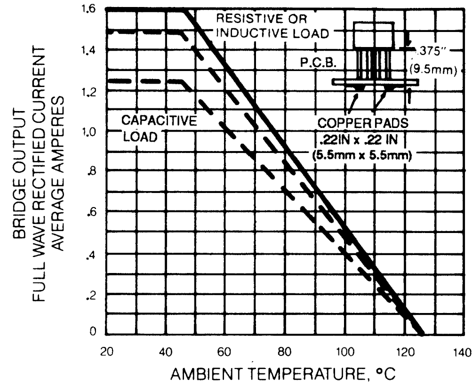


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

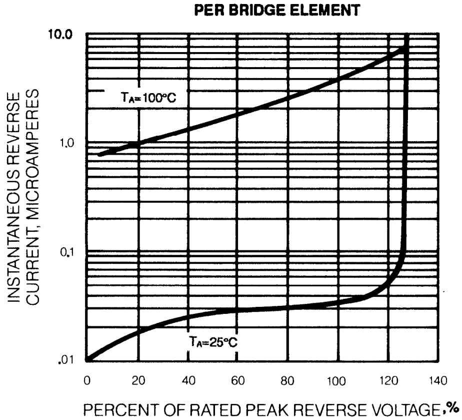


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

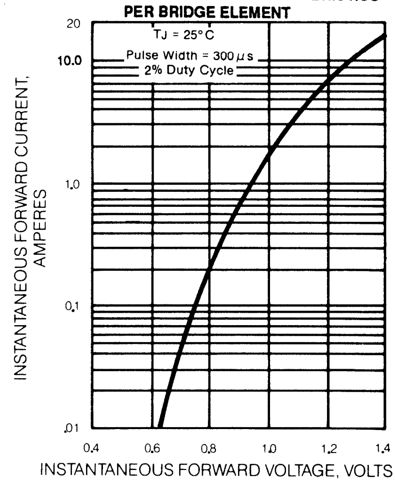


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

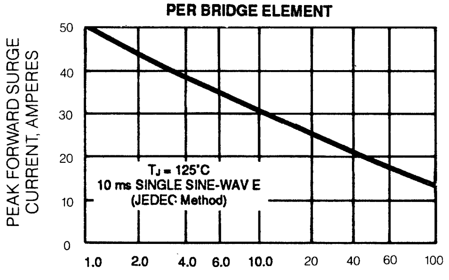
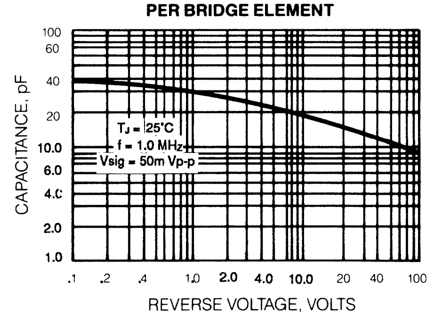


FIG. 6 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

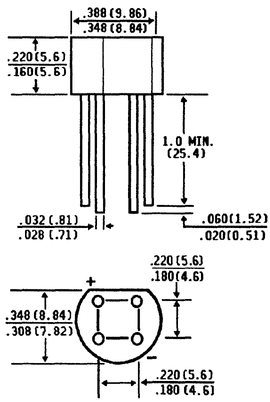


2W005G THRU 2W10G

MINIATURE GLASS PASSIVATED SINGLE- PHASE BRIDGE RECTIFIER

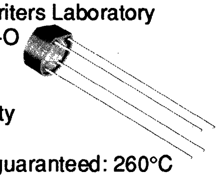
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 2.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- This series is UL recognized under component index, file number E54214
- Glass passivated chip junctions
- Plastic package has Underwriters Laboratory flammability recognition 94V-O
- High case dielectric strength
- Typical I_R less than 0.5 μ A
- High overload surge capability
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C for /10 seconds /.375" (9.5mm) lead lengths/5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic

Terminals: Plated leads, solderable per MIL-STD-750, Method 2026

Mounting Position: Any

Weight: 0.05 ounce, 1.3 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.

	SYMBOLS	*2W 005G*	*2W 01G*	*2W 02G*	*2W 04G*	*2W 06G*	*2W 08G*	*2W 10G*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current .375", (9.5mm) lead length (SEE FIG. 1)	$I_{(AV)}$				2.0				Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				60.0				Amps
Rating for fusing (t<8.3ms)	I^2t				15.0				A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 2.0 Amperes	V_F				1.1				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A=25°C / T_A=125°C	I_R				5.0 / 500.0				μA / μA
Typical Junction Capacitance per leg (NOTE 1)	C_J			40.0			20.0		pF
Typical Thermal Resistance (NOTE 2)	RθJA				40.0				°C/W
Operating Junction Temperature Range	T_J				-55 to + 150				°C
Storage Temperature Range	T_{STG}				-55 to +150				°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
2. Thermal Resistance from Junction to Ambient at .375", 9.5mm lead length for P.C. Board mounting.

FIG. 1 - DERATING CURVE
OUTPUT RECTIFIED CURRENT

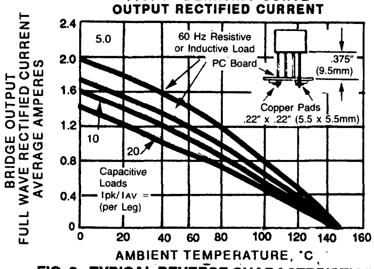


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

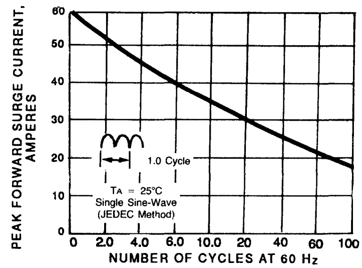


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

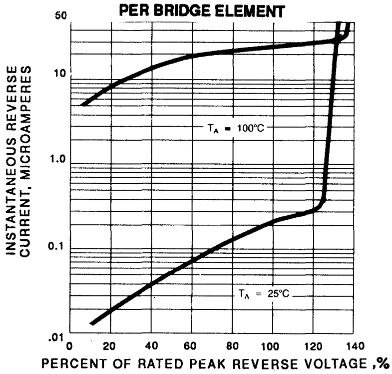


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

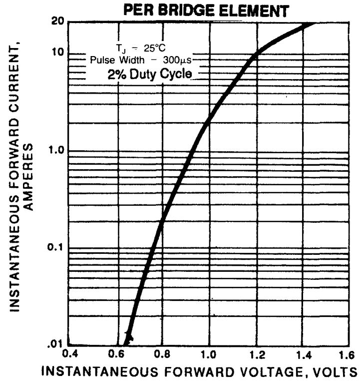


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

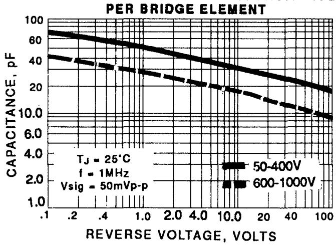
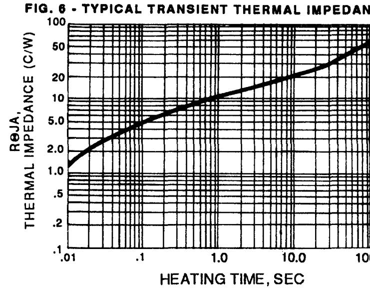


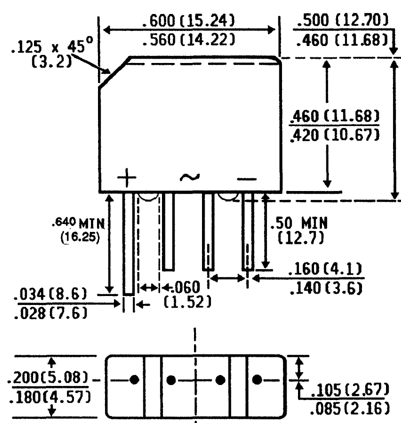
FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



2KBP005M THRU 2KBP10M
3N253 THRU 3N259

GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 2.0 Amperes*

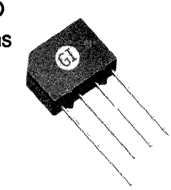


Polarity shown on front side of case: positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory flammability recognition 94V-O
- Glass passivated chip junctions
- Typical I_R less than 0.1 μ A
- Built -in printed circuit board stand-offs
- High case dielectric strength
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C /10 seconds at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting postition: Any
Weight: 0.06 ounce, 1.70 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz Resistive or inductive load.

	SYMBOLS	2KBP 005M 3N253	2KBP 01M 3N254	2KBP 02M 3N255	2KBP 04M 3N256	2KPB 06M 3N257	2KBP 08M 3N258	2KBP 10M 3N259	UNITS
*Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
*Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
*Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
*Maximum Average Forward Output Rectified Current at T_A=55°C	$I_{(AV)}$				2.0				Amps
*Peak Forward Surge Current Single half sine-wave superimposed onrated load (JEDEC Method)	I_{FSM}				60.0				Amps
Rating for fusing (t<8.35ms)	I^2t				15.0				A^2sec
* Maximum Instantaneous Forward Voltage drop per leg at 3.14A	V_F				1.1				Volts
* Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage per leg T_A=125°C	I_R				5.0 500.0				μA
Typical Junction Capacitance per leg (NOTE 1)	C_J				25.0				pF
Typical Thermal Resistance (NOTE 2)	RθJA				30.0				°C/W
*Operating Junction and Storage Temperature Range	T_J,T_{STG}				-55 to +165				°C

NOTES:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.
2. Thermal Resistance from Junction to Ambient mounted on P.C. Board with, .47" x .47" (12mm x12mm) Copper Pads.
* JEDEC Registered Values

FIG.1—DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

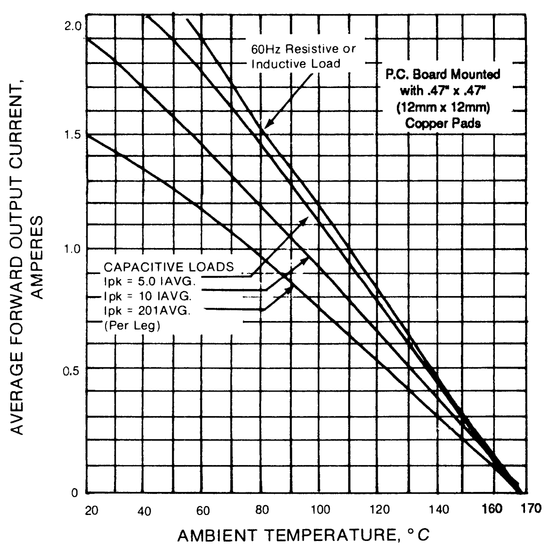


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

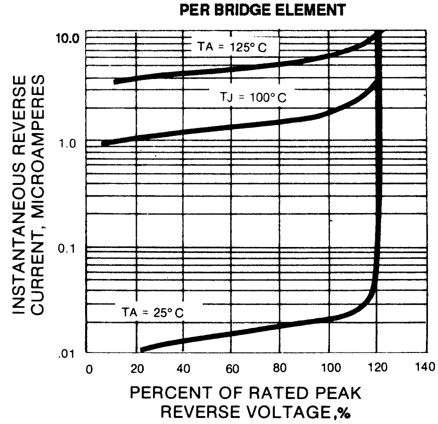


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

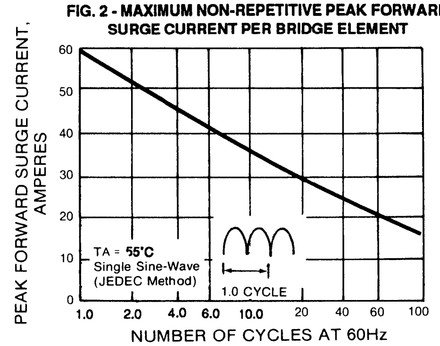


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

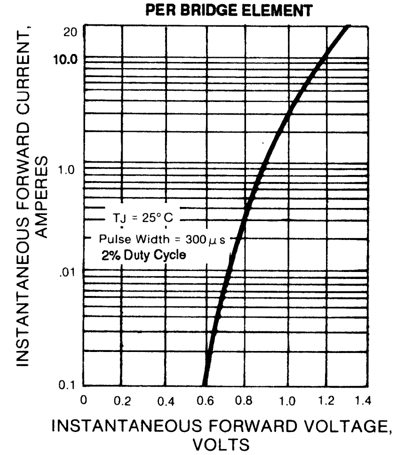
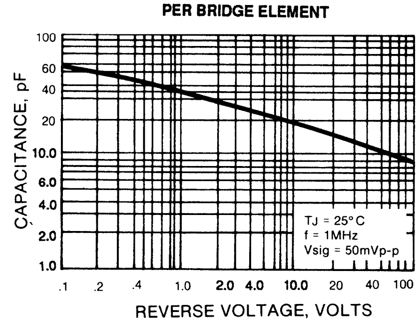


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

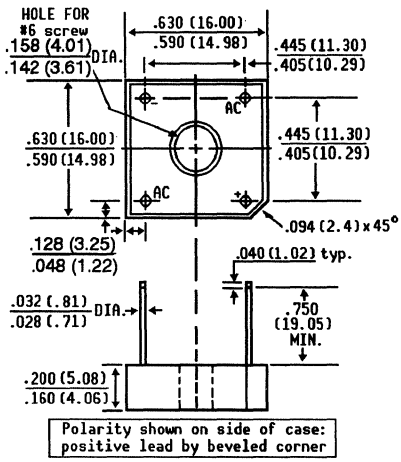


GBPC1005 THRU GBPC110

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

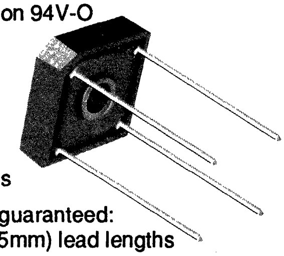
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 3.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- This series is UL recognized under component index, file number E54214
- Glass passivated chip junctions
- Plastic package has underwriters Laboratory flammability recognition 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Typical I_R less than 0.1 µ A
- High surge current capability
- Ideal for printed circuit boards
- High temperature soldering guaranteed: 260°C /10 seconds/ .375" (9.5mm) lead lengths /5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer with number 6.0 screw
Mounting Torque: 5.0 in.-lb. max.
Weight: 0.1 ounces, 2.8 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load. For capacitive load, derate by 20%.

	SYMBOLS	GBPC 1005	GBPC 101	GPBC 102	GBPC 104	GBPC 106	GBPC 108	GBPC 110	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Bridge Input Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C= 60°C (NOTE 1) / T_A= 25°C (NOTE 2)	$I_{(AV)}$				3.0 2.0				Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				60.0				Amps
Rating for fusing (t<8.3ms)	I^2t				15.0				A^2sec
Maximum Instantaneous Forward Voltage Drop per leg at 1.5 Amperes	V_F				1.0				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A= 25°C / T_A=125°C	I_R				5.0 500.0				µA
Typical Junction Capacitance per leg (NOTE 3)	C_J				21.0				pF
Typical Thermal Resistance from Junction to Case (NOTE 1)	$R_{\Theta JC}$				8.0				°C/W
Operating Junction Temperature Range	T_J				-55 to +150				°C
Storage Temperature Range	T_{STG}				-55 to +150				°C

NOTES:
1. Unit mounted on 4.0"x4.0"x.11" thick (10.5 x10.5 x 0.3 cm) Al. plate.
2. Unit mounted on P.C. board at .375" ,9.5mm lead lengths with .5"x.5" (12mmx12mm) Copper pads.
3. Measured at 1 MHz and applied reverse voltage of 4.0 volts.

FIG. 1 - DERATING CURVE
OUTPUT RECTIFIED CURRENT

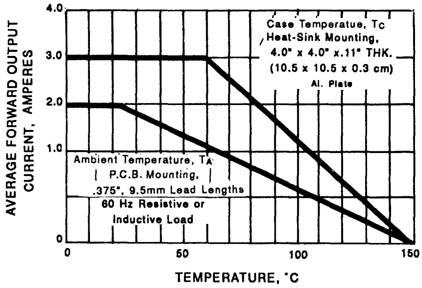


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

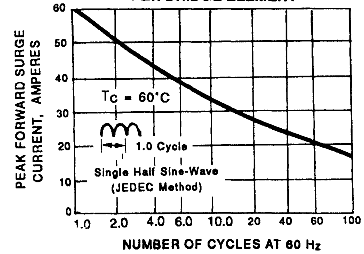


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

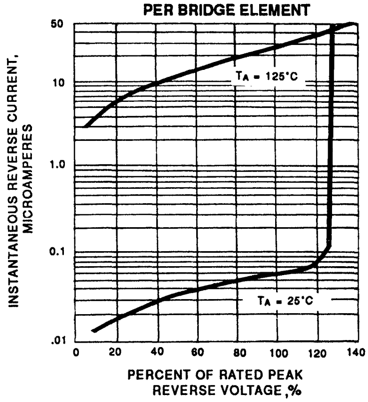


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

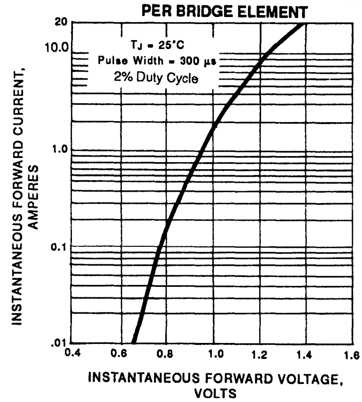


FIG. 5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

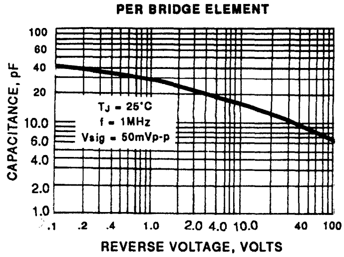
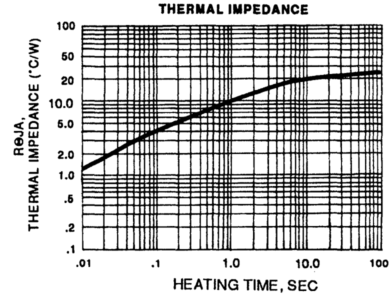


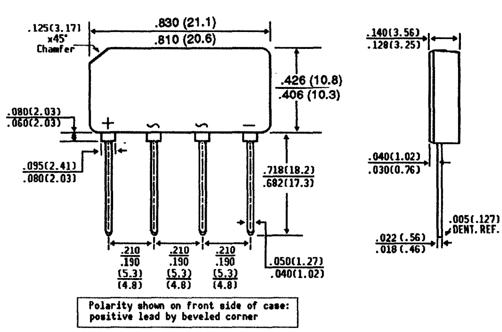
FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



GBL005 THRU GBL10

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

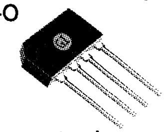
***VOLTAGE** - 50 - 1000 Volts* ***CURRENT** - 4.0 Amperes*



Dimensions in inches
and
(millimeters)

FEATURES

- ◆ This series is UL recognized under component index, file number E54214
- ◆ Glass passivated chip junctions
- ◆ Plastic package has Underwriters Laboratory flammability recognition 94V-O
- ◆ High case dielectric strength
- ◆ Typical I_R less than 0.1 μA
- ◆ High surge capability
- ◆ Ideal for printed circuit board
- ◆ High temperature soldering guaranteed: 260°C/10 seconds/.375"(9.5mm) lead lengths at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Reliable low cost construction utilizing molded plastic technique
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any
Weight: .071 ounces, 2.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz,resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GBL 005	GBL 01	GBL 02	GBL 04	GBL 06	GBL 08	GBL 10	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_A=50°C (NOTE 1) / T_A=40°C (NOTE 2)	$I_{(AV)}$	4.0 / 3.0							Amps
Peak Forward Surge Current, Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	150.0							Amps
Rating for fusing (t<8.3ms)	I^2t	93.0							A^2sec
Maximum Instantaneous Forward Drop per leg at 4.0 Amperes	V_F	1.1							Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A= 25°C / T_A=125°C	I_R	5.0 / 500.0							μA
Typical Junction Capacitance per leg (NOTE 3)	C_J	95.0				40.0			pF
Typical Thermal Resistance from Junction to Ambient (NOTE 1) / (NOTE 2)	$R_{\theta JA}$	10.0 / 22.0							°C/W
Operating Junction Temperature Range	T_J	-55 to +150							°C
Storage Temperature Range	T_{STG}	-55 to +150							°C

NOTES:
1. Unit mounted on 3.0"x3.0"x.11" thick (7.5x7.5x0.3cm) Al. plate.
2. Unit mounted on P.C. Board at .375", 9.5mm lead lengths with .5"x.5" (12mmx12mm) copper pads.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

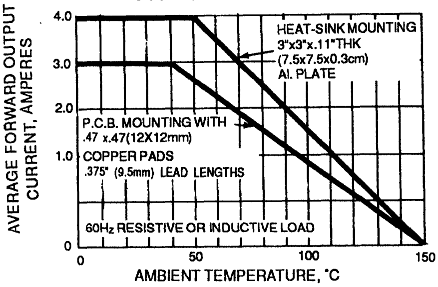


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

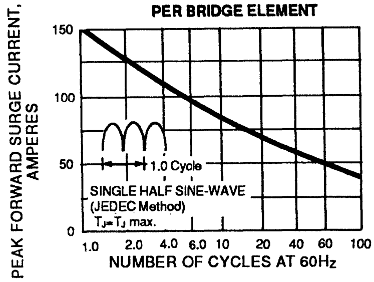


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

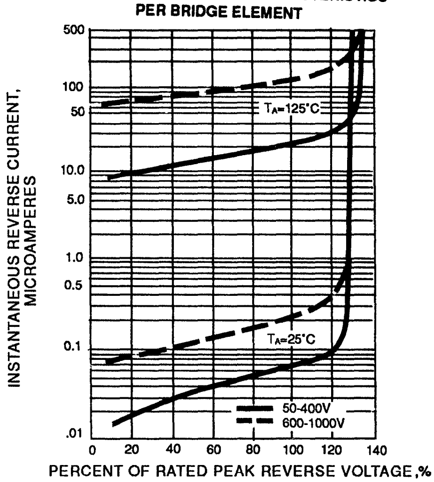


FIG. 4 - TYPICAL FORWARD VOLTAGE CHARACTERISTICS PER BRIDGE ELEMENT

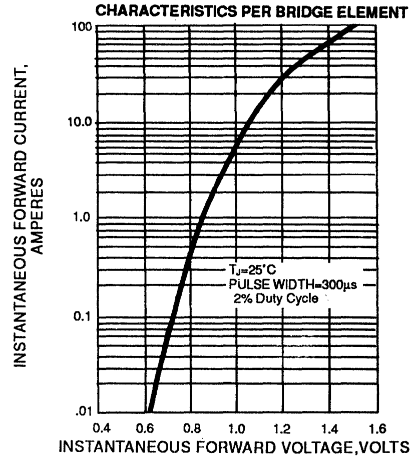


FIG.5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

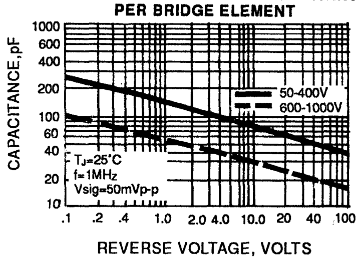
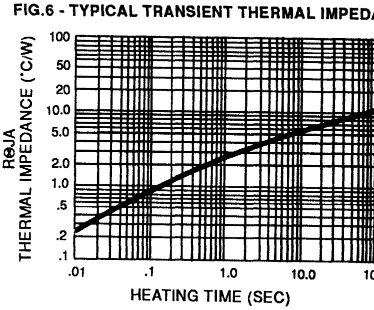


FIG.6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

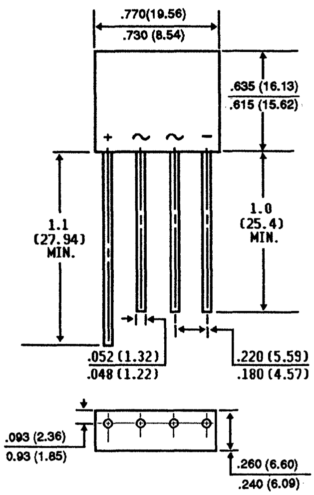


KBL005 THRU KBL10

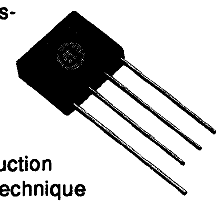
GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 4.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)



- This series is UL recognized under component index, file number E54214
- Plastic material used carries Underwriters Laboratory Flammability Classification 94V-O
- High case dielectric strength of 1500V_{RMS}
- Ideal for printed circuit board
- Reliable low cost construction utilizing molded plastic technique
- Glass passivated chip junctions
- Surge overload rating of 200 Amperes peak
- High temperature soldering guaranteed: 250° C /10 seconds / .375", (9.5mm) lead length / 5lbs., (2.3 kg) tension

MECHANICAL DATA

Case: Reliable low cost construction utilizing molded plastic technique

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Mounting Position: Any

Weight: 0.2 ounce, 5.6 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	KBL 005	KBL 01	KBL 02	KBL 04	KBL 06	KBL 08	KBL 10	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Output Current at T_A=50°C	$I_{(AV)}$	4.0							Amps
Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0							Amps
Maximum Instantaneous Forward Voltage drop per leg at 4.0A	V_F	1.1							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage per leg T_A=125°C	I_R	5.0 1.0							µA mA
Typical Thermal Resistance per leg (NOTE 1)	RθJA	20.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150							°C

NOTES:
1.Thermal Resistance from Junction to Ambient at .375" (9.5mm) lead lenghts on a P.C. Board with .5"x.5" (12mmx12mm) with copper pads.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

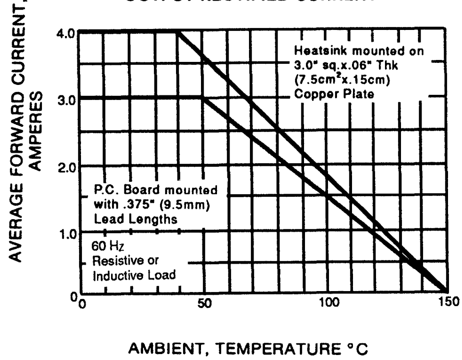


FIG. 3 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

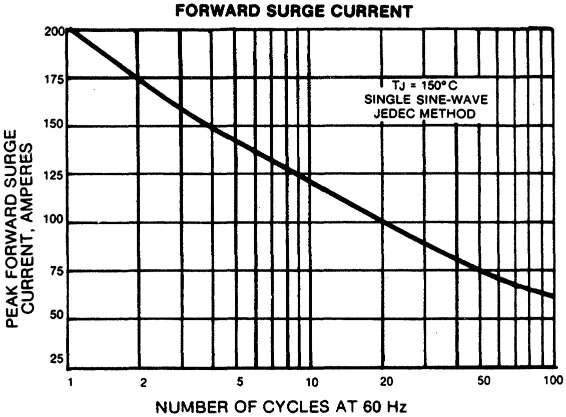


FIG. 2 — TYPCIAL INSTANTANEOUS FORWARD CHARACTERISTICS PER ELEMENT

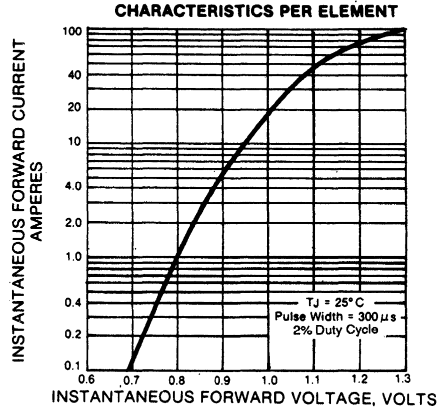


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

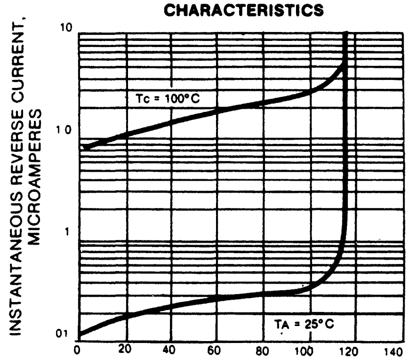
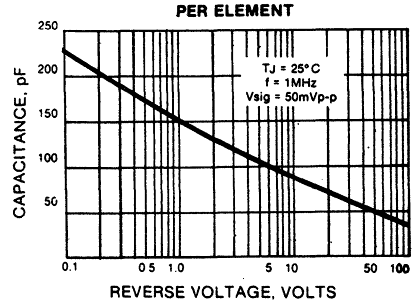


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER ELEMENT

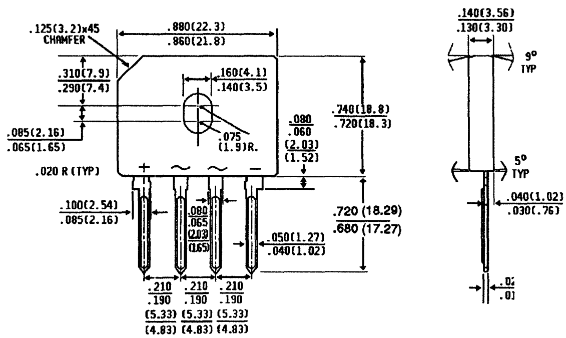


GBU4A THRU GBU4M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

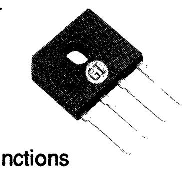
***VOLTAGE** - 50 to 1000 Volts*   ***CURRENT** - 4.0 Amperes*

FEATURES



Polarity shown on front side of case, positive lead by beveled corner

Dimensions in inches and (millimeters)



- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit board mounting
- Glass passivated chip junctions
- High surge overload rating
- High temperature soldering guaranteed: 260°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3kg) tension

MECHANICAL DATA

Case: Reliable low cost construction utilizing molded plastic technique
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 4)
Mounting Torque: 5 in. lb. max.
Weight: 0.015 ounce, 4.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load, 60 Hz. For capacitive load,derate current by 20%.

	SYMBOLS	GBU 4A	GBU 4B	GBU 4D	GBU 4G	GBU 4J	GBU 4K	GBU 4M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=100°C (NOTE 1)	$I_{(AV)}$				4.0				Amps
Maximum Average Forward Rectified Output Current at T_A=40°C (NOTE 2)	$I_{(AV)}$				3.0				Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				150.0				Amps
Rating for fusing (t<8.3ms)	I^2t				93.0				A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 4.0A	V_F				1.0				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_J=25°C	I_R				5.0				µA
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_J=125°C	I_R				500.0				µA
Typical Junction Capacitance per leg (NOTE 3)	C_J		101.0				46.0		pF
Typical Thermal Resistance from Junction to Case (NOTE 1) (per leg)	$R_{\Theta JC}$				2.5				°C/W
Typical Thermal Resistance (per leg) Junction to Ambient (NOTE 2)	$R_{\Theta JA}$				22.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}				-55 to +150				°C

Notes: 1. Unit case mounted on 1.6"x1.6"x0.06" THK (4.0x4.0x0.15cm) Al. Plate.
2. Units mounted on P,C. Board with .5"x.5" (12mmx12mm) copper pads and .375"(9.5mm) lead lengths.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
4. Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with number 6.0 screw.

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

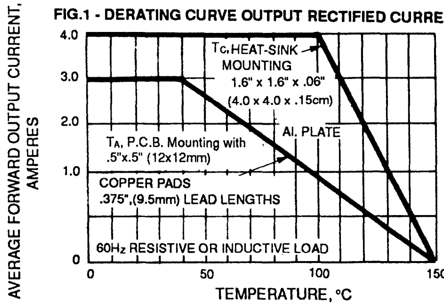


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

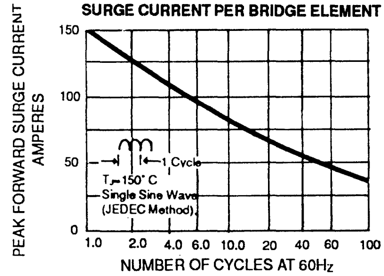


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

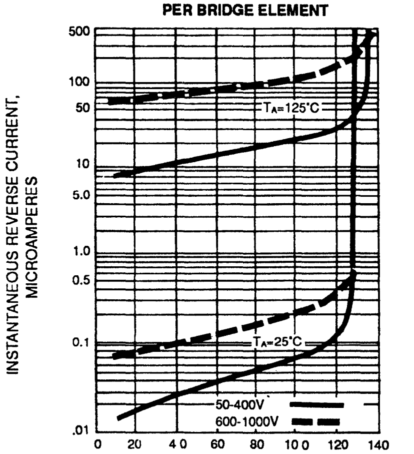


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

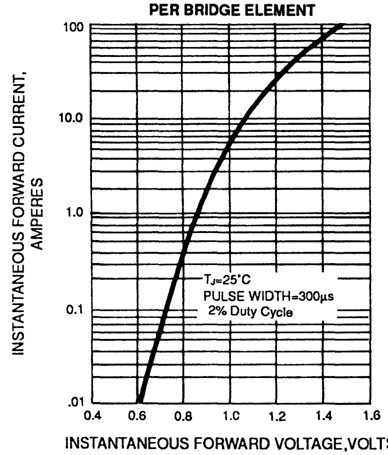


FIG.5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

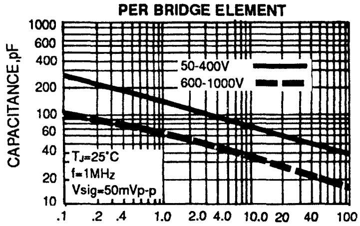
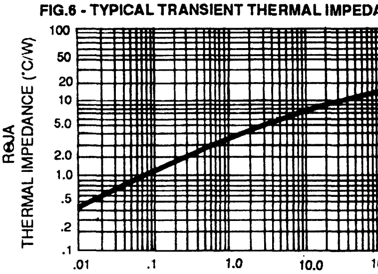


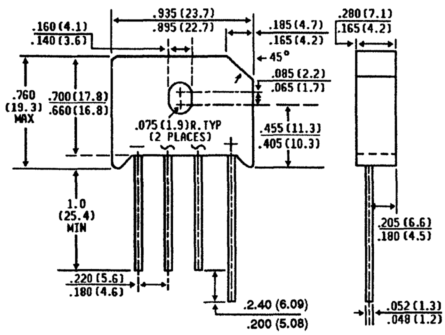
FIG.6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



KBU4A THRU KBU4M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

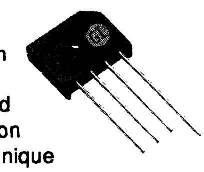
VOLTAGE - 50 to 1000 Volts CURRENT - 4.0 Amperes



Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic material used carries Underwriters Laboratory Flammability Classification 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit board
- Reliable low cost construction utilizing molded plastic technique
- Glass passivated chip junctions
- Surge overload rating of 200 Amperes peak
- High temperature soldering guaranteed: 250°C /10 seconds / .375", (9.5mm) lead length / 5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Reliable low cost construction utilizing molded plastic technique
Terminals: Plated lead solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 3)
Mounting Torgue: 5 in. lb. max.
Weight: 0.3 ounce, 8.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	KBU 4A	KBU 4B	KBU 4D	KBU 4G	KBU 4J	KBU 4K	KBU 4M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=100°C (NOTE 1) / T_A=30°C (NOTE 2)	$I_{(AV)}$	4.0 4.0							Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0							Amps
Maximum Instantaneous Forward Voltage drop per leg at 4.0A	V_F	1.0							Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A=25°C / T_A=125°C	I_R	5.0 1.0							µA mA
Typical Themal Resistance per leg (NOTE 1) / (NOTE 2)	RθJC RθJA	3.3 20.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150							°C

NOTES:
1. Thermal Resistance from Junction to Case with units mounted on a 2.0"x1.6 "x 0.3" THK (5cm. x 4cm. x0.8cm.) Al. Plate.
2. Units mounted on P.C. Board with .5"x.5" (12mmx12mm) copper pads and .375" (9.5mm) lead lengths.
3. Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with number 6 screw.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

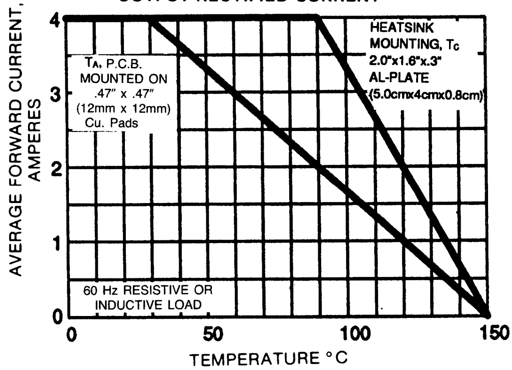


FIG. 3 — MAXIMUN NON-REPETITIVE PEAK FORWARD SURGE CURRENT

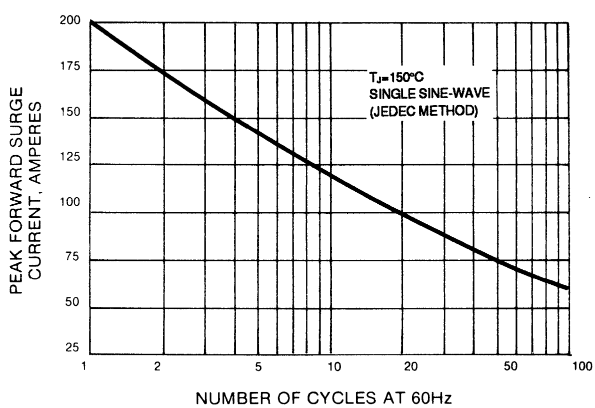


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER ELEMENT

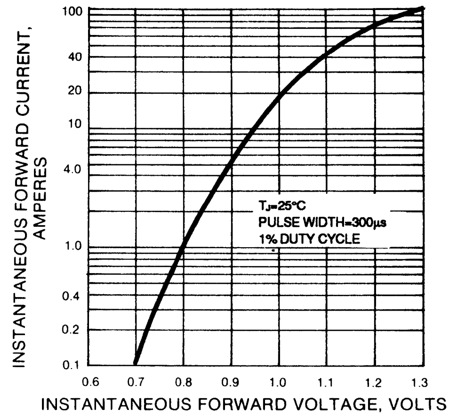


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

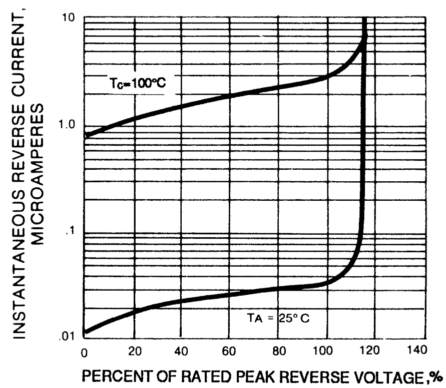
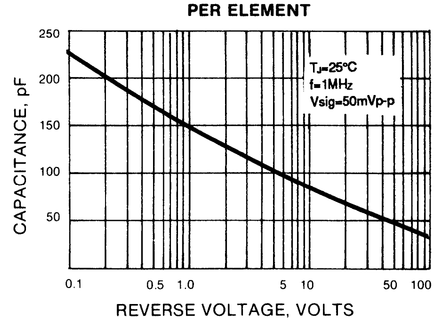


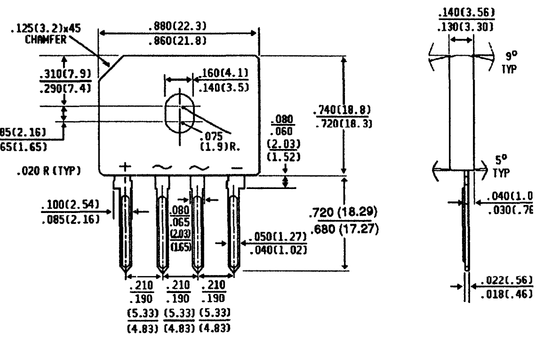
FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER ELEMENT



GBU6A THRU GBU6M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 6.0 Amperes*

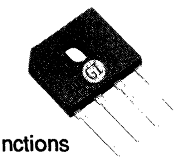


Polarity shown on front side of case, positive lead by beveled corner

Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit board mounting
- Glass passivated chip junctions
- High surge overload rating
- High temperature soldering guaranteed: 260°C/10 seconds/ .375", (9.5mm) lead length/5lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 3)
Mounting Torque: 5 in. lb. max.
Weight: 0.015 ounce, 4.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load, 60 Hz. For capacitive load,derate current by 20%.

	SYMBOLS	GBU *6A*	*6B*	*6D*	*6G*	*6J*	*6K*	*6M*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=100°C (NOTE 1)	$I_{(AV)}$	6.0							Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	175.0							Amps
Rating for fusing (t<8.3ms)	I^2t	127.0							A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 6.0A	V_F	1.0							Volts
Maximum DC Reverse Current at T_J=25°C		5.0							
Rated DC Blocking Voltage per leg T_J=125°C	I_R	500.0							µA
Typical Junction Capacitance per leg (NOTE 2)	C_J	211.0			94.0				pF
Typical Thermal Resistance per leg from Junction to Case (NOTE 1)	RθJC	2.2							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150							°C

Notes:
1. Units case mounted on 2.6"x1.4"x0.06" THK (6.5x3.5x0.15 cm) Al. Plate. heatsink.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
3. Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with number 6.0 screws.

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

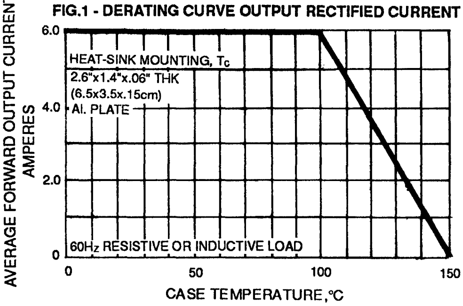


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

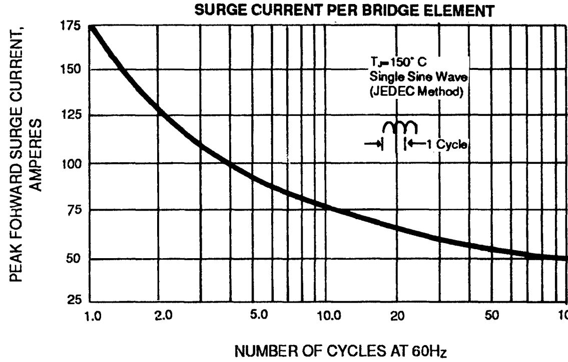


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

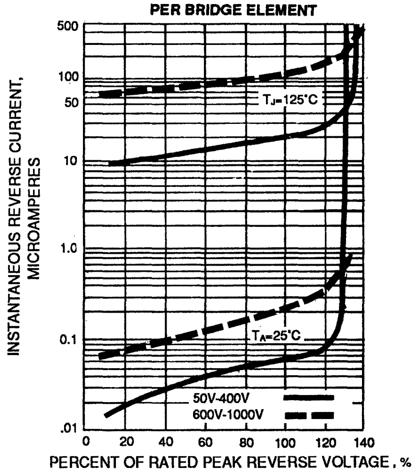


FIG. 4 - TYPICAL FORWARD VOLTAGE CHARACTERISTICS PER BRIDGE ELEMENT

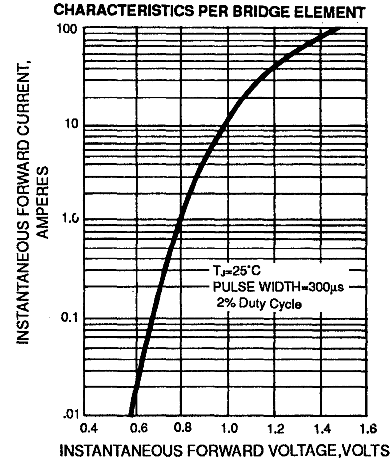


FIG.5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

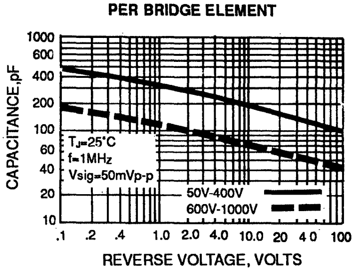
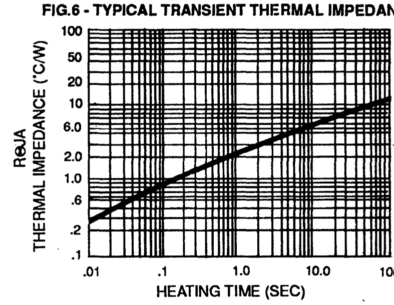


FIG.6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

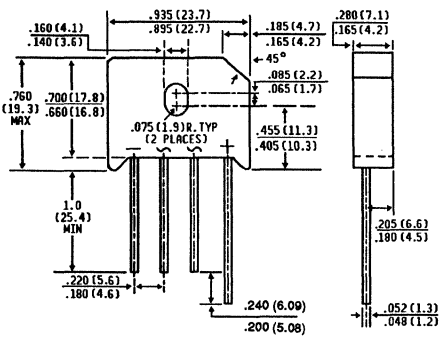


KBU6A THRU KBU6M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIERS

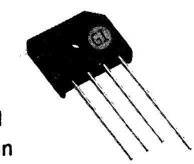
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 6.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- ◆ This series is UL recognized under component index, file number E54214
- ◆ Plastic material used carries Underwriters Laboratory Flammability Classification 94V-O
- ◆ High case dielectric strength of 1500 V_{RMS}
- ◆ Ideal for printed circuit board
- ◆ Reliable low cost construction utilizing molded plastic technique
- ◆ Glass passivated chip junctions
- ◆ Surge overload rating of 250 Amperes peak
- ◆ High temperature soldering guaranteed: 250°C /10 seconds / .375", (9.5mm) lead length / 5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Reliable low cost construction utilizing molded plastic technique

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Mounting Position: Any (NOTE 3)

Mounting Torgue: 5 in. lb. max.

Weight: 0.3 ounce, 8.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	KBU 6A	KBU 6B	KBU 6D	KBU 6G	KBU 6J	KBU 6K	KBU 6M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=100°C / T_A=40°C	$I_{(AV)}$	6.0 / 6.0							Amps
Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	250.0							Amps
Maximum Instantaneous Forward Voltage drop per leg at 6.0A	V_F	1.0							Volts
Maximum DC Reverse Current T_A=25°C	I_R	5.0							µA
at Rated DC Blocking Voltage per leg T_A=125°C		1.0							mA
Typical Thermal Resistance per leg (NOTE 1)	$R_{\theta JC}$	4.7							°C/W
(NOTE 2)	$R_{\theta JA}$	18.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150							°C

NOTES:

1. Thermal Resistance from Junction to Case with units mounted on a 2.6"x1.4x.06" THK (6.5cm. x 3.5cm. x.15cm.) Al. Plate.
2. Thermal Resistance from Junction to Ambient with units in free air, P.C. board mounted on .5"sq.(12mm^2) Cu. pads, .375"(9.5mm) lead lengths.
3. Recommended mounted position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with number 6 screw.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

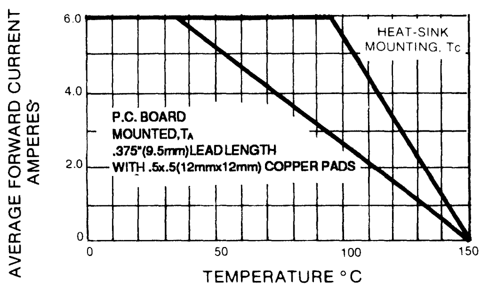


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER ELEMENT

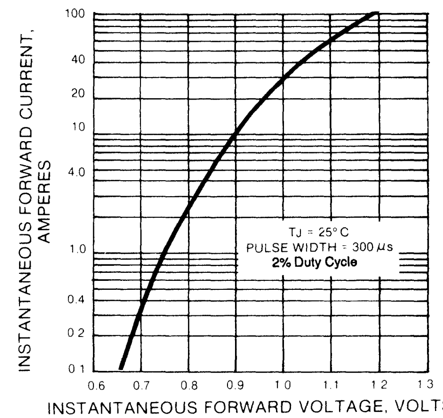


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

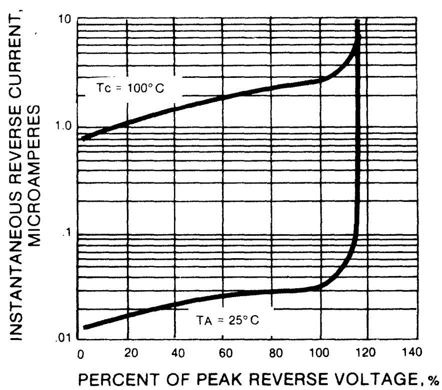


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

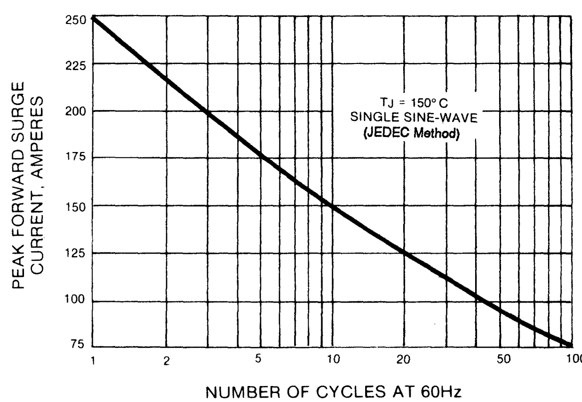
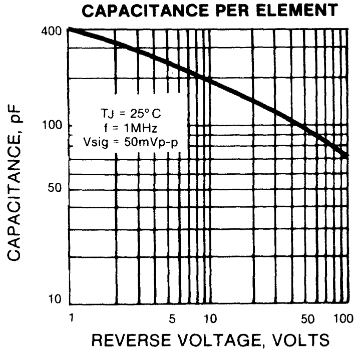


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER ELEMENT

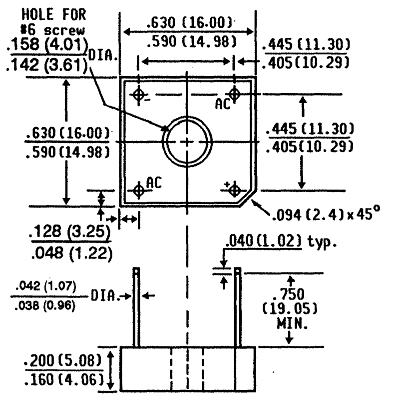


GBPC6005 THRU GBPC610

GLASS PASSIVATED SINGLE - PHASE BRIDGE RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 6.0 Amperes*

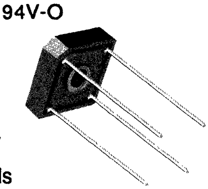
FEATURES



Polarity shown on side of case:
positive lead by beveled corner

Dimensions in inches
and
(millimeters)

- Glass passivated chip junctions
- This series is UL recognized under component index, file number E54214
- Plastic package has carries Underwriters Laboratory flammability recognition 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Typical I_R less than 0.5 μ A
- High surge current capability
- Ideal for printed circuit boards
- High temperature soldering guaranteed: 260°C /10 seconds at 5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Reliable construction utilizing molded plastic technique

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Mounting Position: Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer with number 6.0 screw

Mounting Torque: 5.0 in. - lb. max.

Weight: 0.1 ounces, 2.8 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	GBPC 6005	GBPC 601	GPBC 602	GBPC 604	GBPC 606	GBPC 608	GBPC 610	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Bridge Input Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=50°C (NOTE 1) / T_A=40°C (NOTE 2)	$I_{(AV)}$				6.0 3.0				Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}				175.0				Amps
Rating for fusing (t<8.3ms)	I^2t				127.0				A^2sec
Maximum Instantaneous Forward Voltage Drop per leg at 3.0 Amperes	V_F				1.0				Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A= 25°C / T_A=125°C	I_R				5.0 500.0				μA
Typical Junction Capacitance per leg (NOTE 3)	C_J	186.0				90.0			pF
Typical Thermal Resistance from Junction to Case (NOTE 1)	$R\theta JC$				8.0				°C/W
Operating Junction Temperature Range	T_J				-55 to +150				°C
Storage Temperature Range	T_{STG}				-55 to +150				°C

NOTES: 1. Unit mounted on 5.5"x 6.0"x.11" thick (14x15x0.3 cm) Al. plate.
2. Unit mounted on P.C. board at .375" ,9.5mm lead lengths with .5"x.5"(12mmx12mm) Copper pads.
3. Measured at 1 MHz and applied reverse voltage of 4.0 volts.

FIG. 1 - DERATING CURVE
OUTPUT RECTIFIED CURRENT

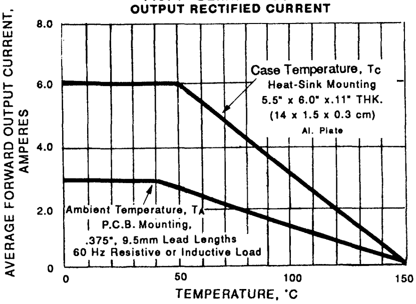


FIG. 2 - MAXIMUM NON-REPETITIVE
PEAK FORWARD SURGE CURRENT

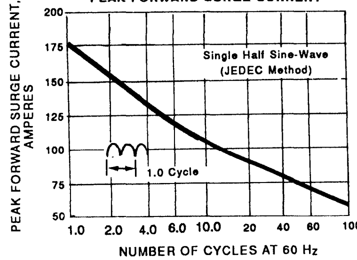


FIG. 3 - TYPICAL
REVERSE CHARACTERISTICS

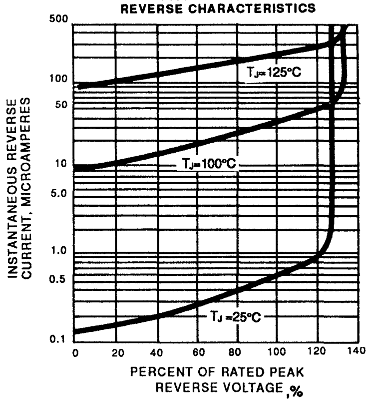


FIG. 4 - TYPICAL FORWARD VOLTAGE
CHARACTERISTICS PER ELEMENT

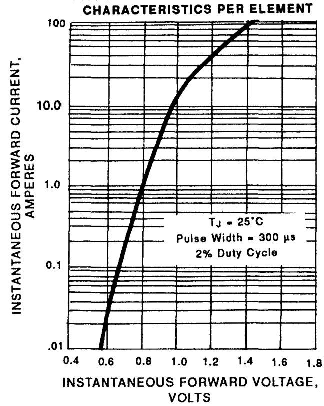


FIG. 5 - TYPICAL JUNCTION CAPACITANCE
PER BRIDGE ELEMENT

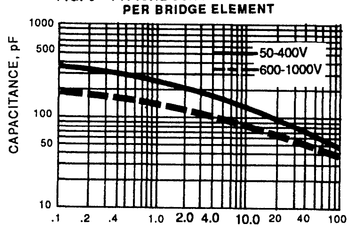
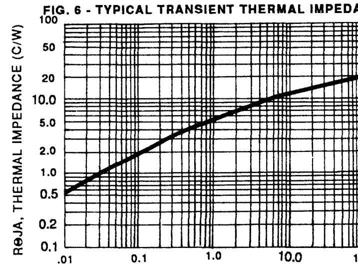


FIG. 6 - TYPICAL TRANSIENT THERMAL IMPEDANCE



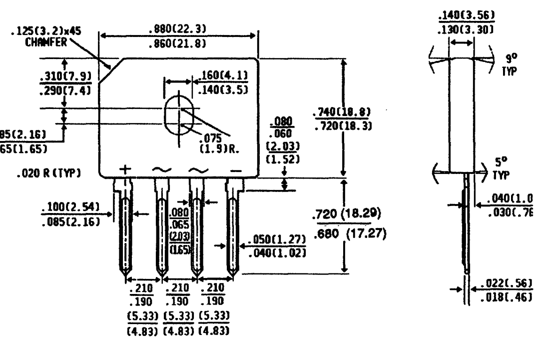
General Instrument

GBU8A THRU GBU8M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 8.0 Amperes*

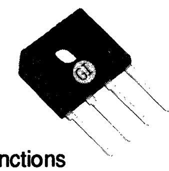
FEATURES



Polarity shown on front side of case, positive lead by beveled corner

Dimensions in inches and (millimeters)

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit board mounting
- Glass passivated chip junctions
- High surge overload rating
- High temperature soldering guaranteed: 260°C/10 seconds/ .375", (9.5mm) lead length/5lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Mounting Position: Any (NOTE 3)
Mounting Torque: 5 in.-lb. max.
Weight: 0.015 ounce, 4.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load, 60 Hz. For capacitive load,derate current by 20%.

	SYMBOLS	GBU 8A	8B	8D	8G	8J	8K	8M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=100°C (NOTE 1)	$I_{(AV)}$	8.0							Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	200.0							Amps
Rating for fusing (t<8.3ms)	I^2t	166.0							A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 8.0A	V_F	1.0							Volts
Maximum DC Reverse Current at T_J=25°C		5.0							
Rated DC Blocking Voltage per leg T_J=125°C	I_R	500.0							µA
Typical Junction Capacitance (NOTE 2)	C_J	211.0				94.0			pF
Typical Thermal Resistance per leg (NOTE 1)	$R_{\theta JC}$	2.2							
(NOTE 4)	$R_{\theta JA}$	21.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150							°C

NOTES:
1. Units case mounted on 3.2"x3.2"x.12" THK (8.2 x8.2 x 0.3cm.) Al. Plate. heatsink.
2. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
3. Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with number 6.0 screws.
4. Units mounted in free air, no heat sink on P.C. board, .5 sq (12mm^2) Cu Pads, .375" (9.5mm) lead length.

FIG.1 - DERATING CURVE OUTPUT RECTIFIED CURRENT

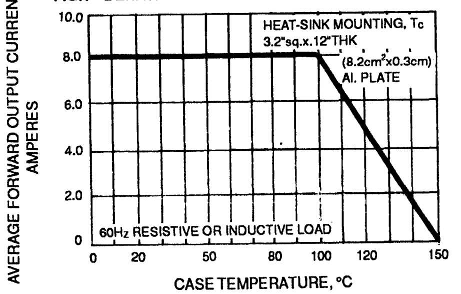


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

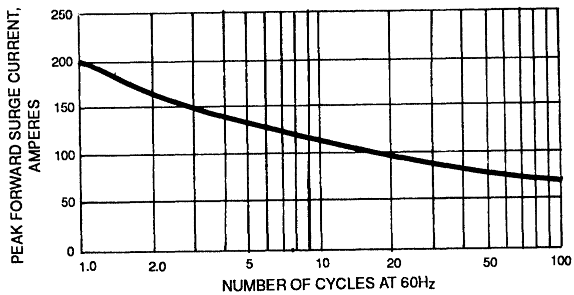


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

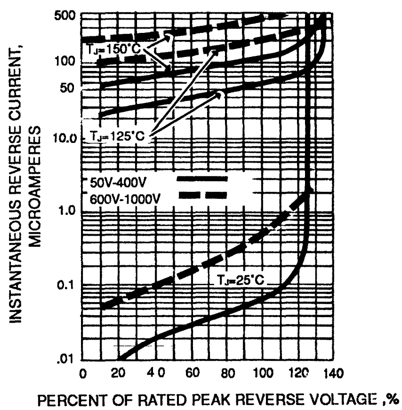


FIG. 4 - TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

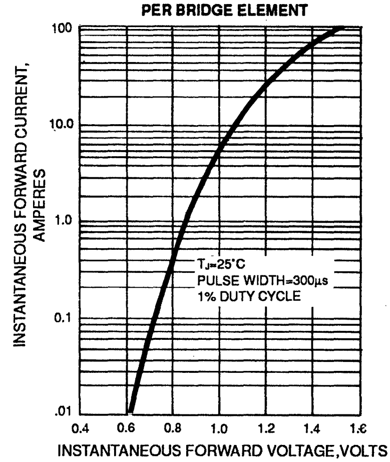


FIG.5 - TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT

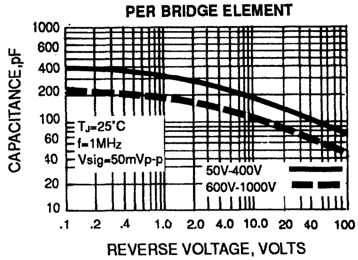
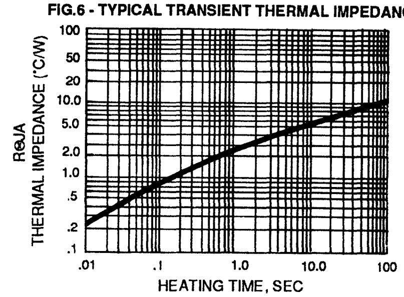


FIG.6 - TYPICAL TRANSIENT THERMAL IMPEDANCE

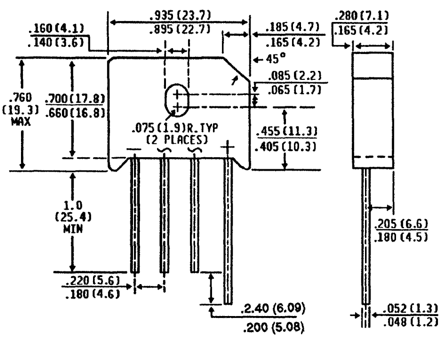


KBU8A THRU KBU8M

GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

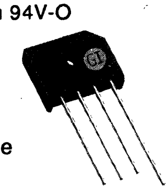
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 8.0 Amperes*

FEATURES



Dimensions in inches and (millimeters)

- This series is UL recognized under component index, file number E54214
- Plastic material used carries Underwriters Laboratory Flammability Classification 94V-O
- High case dielectric strength of 1500 V_{RMS}
- Ideal for printed circuit board
- Reliable low cost construction utilizing molded plastic technique
- Glass passivated chip junctions
- Surge overload rating of 300 Amperes peak
- High temperature soldering guaranteed: 250°C /10 seconds / .375", (9.5mm) lead length / 5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Reliable low cost construction utilizing molded plastic technique

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Mounting Position: Any (NOTE 3)

Mounting Torgue: 5 in. lb. max.

Weight: 0.3 ounce, 8.0 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	KBU 8A	KBU 8B	KBU 8D	KBU 8G	KBU 8J	KBU 8K	KBU 8M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=100°C (NOTE 1) / T_A=45°C (NOTE 2)	$I_{(AV)}$	8.0 6.0							Amps
Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	300.0							Amps
Maximum Instantaneous Forward Voltage drop per leg at 8.0A	V_F	1.0							Volts
Maximum DC Reverse Current at Rated DC Blocking Voltage per leg T_A=25°C / T_A=125°C	I_R	10.0 1.0							µA mA
Typical Thermal Resistance per leg (NOTE 1) / (NOTE 2)	RθJC RθJA	3.0 18.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150							°C

NOTES:
1. Units mounted on a 3"sq.x .11" THK (7.5cm. sq.x0.3cm.) Al. Plate heatsink.
2. Units mounted in free air, no heatsink, P.C. board at .375" (9.5mm) lead lengths with .5"sq. (12mm^2) copper pads.
3. Recommended mounting position is to bolt down on heatsink with silicone thermal compound for maximum heat transfer with number 6 screw.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

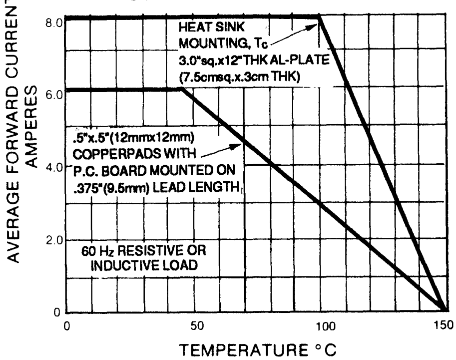


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER ELEMENT

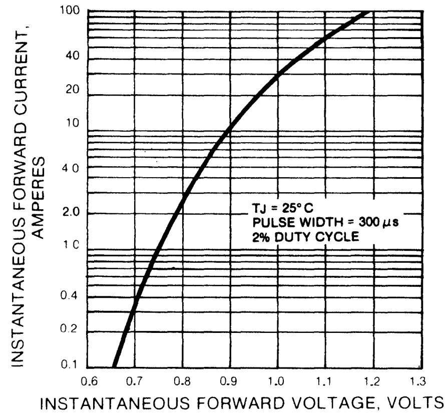


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

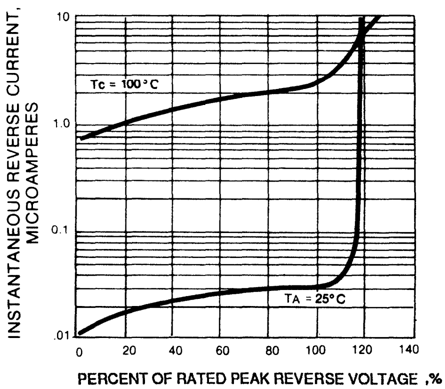


FIG. 4 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

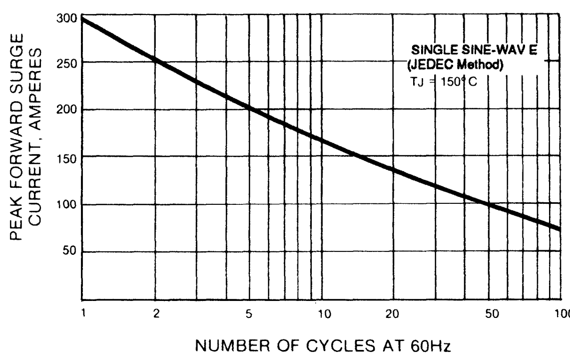
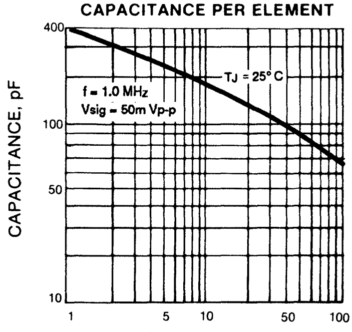


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER ELEMENT

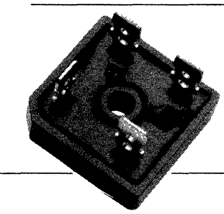


GBPC12,15,25 SERIES

HIGH CURRENT GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

FEATURES

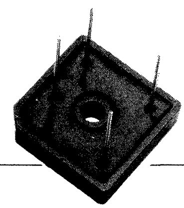
GBPC STANDARD



- This series is UL recognized under component index, file number E54214
- The plastic package has Underwriters Laboratory flammability recognition 94V-O
- Integrally molded heatsink provide very low thermal resistance for maximum heat dissipation
- Universal 3-way terminals; snap-on, wire wrap-around, or P.C. board mounting
- Surge overload ratings to 300 Amperes
- Glass passivated chip junctions
- Typical I_R less than 0.3 μA
- High temperature soldering guaranteed: 260°C /10 seconds at 5lbs., (2.3 kg) tension

MECHANICAL DATA

GBPC-W WIRE LEADS



Case: Molded plastic with heatsink integrally mounted in the bridge encapsulation

Terminals: Either plated .25" (6.35mm). Faston lugs or plated copper leads .040" (1.02mm) diameter. Suffix letter "W" added to indicate leads.(ex. GBPC12005W)

Mounting Position: Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer efficiency with number 10 screw

Polarity: Polarity symbols molded on body

Mounting Torque: 20 in. lb. max. ***Weight:*** .53 ounce 15 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

			GBPC12,15,25						
	SYMBOLS	005	01	02	04	06	08	10	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current (SEE FIG.1) GBPC12	$I_{(AV)}$				12.0				Amps
GBPC15					15.0				
GBPC25					25.0				
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method) GBPC12	I_{FSM}				200.0				Amps
GBPC15					300.0				
GBPC25					300.0				
Rating (non-repetitive, for t greater than 1 ms and less than 8.3 ms) for fusing GBPC12	I^2t				160.0				$Amps^2sec$
GBPC15					375.0				
GBPC25					375.0				
Maximum Instantaneous Forward Voltage drop per leg at GBPC12 I_F=6.0A	V_F				1.1				Volts
GBPC15 I_F=7.5A									
GBPC25 I_F=12.5A									
Maximum Reverse DC Current at Rated DC Blocking Voltage per leg T_A=25°C	I_R				5.0				μA
T_A=125°C					500.0				
RMS Isolation Voltage from case to leads	V_{ISO}				2500.0				Volts
Typical Junction Capacitance per leg (NOTE 2)	C_J				300.0				pF
Typical Thermal Resistance per leg (NOTE 1)	$R\theta JC$				1.9				°C/W
Operating Junction Temperature Range	T_J				-55 to +150				°C
Storage Temperature Range	T_{STG}				-55 to +150				°C

NOTES: 1. Thermal Resistance from Junction to Case per leg.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.

FIG. 1 - MAXIMUM OUTPUT RECTIFIED CURRENT

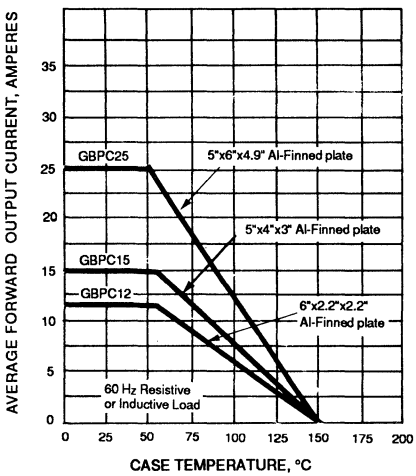


FIG 2 - MAXIMUM OUTPUT RECTIFIED CURRENT

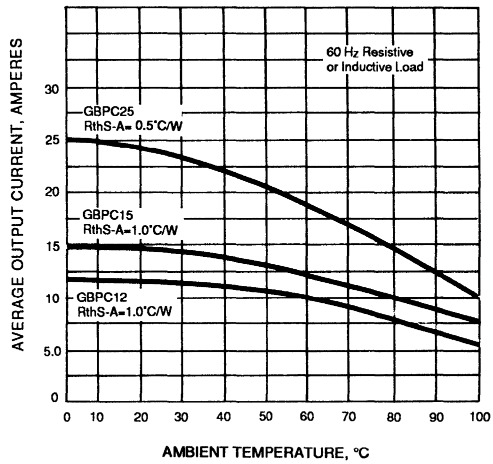


FIG 3 - MAXIMUM POWER DISSIPATION

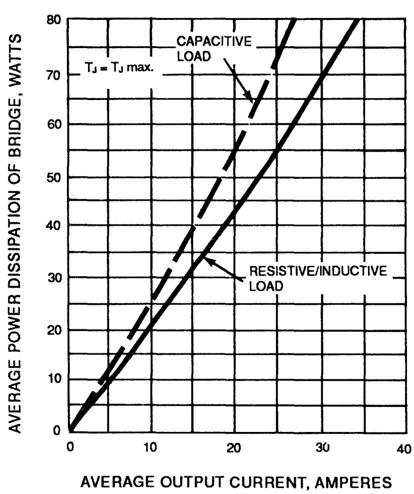


FIG 4 - TYPICAL REVERSE CHARACTERISTICS

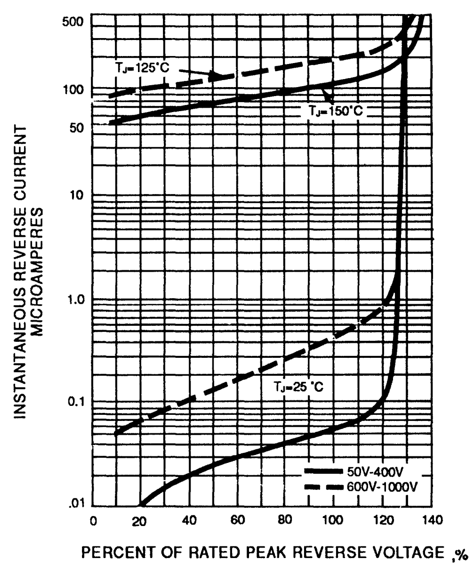


FIG.5- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

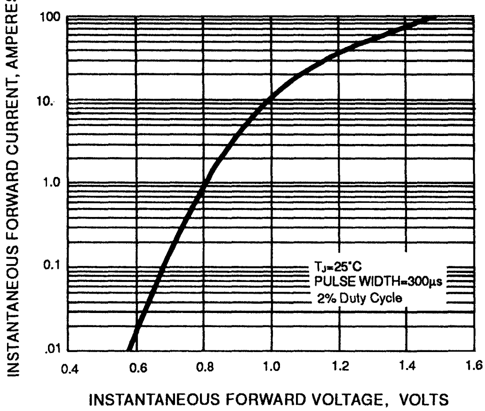


FIG. 6-TYPICAL TRANSIENT THERMAL IMPEDANCE

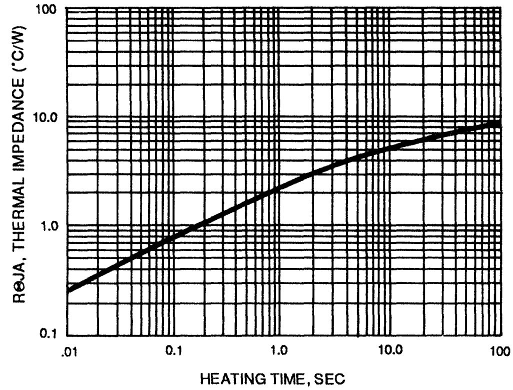


FIG.7-MAXIMUM NON-REPETIVE PEAK FORWARD SURGE CURRENT

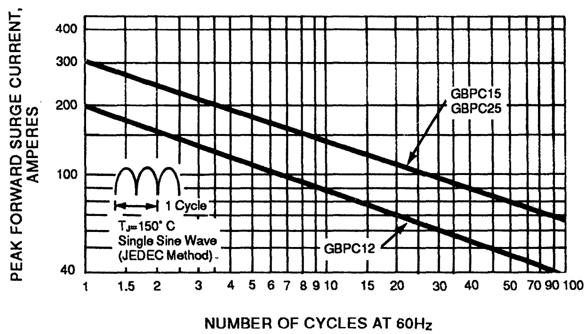
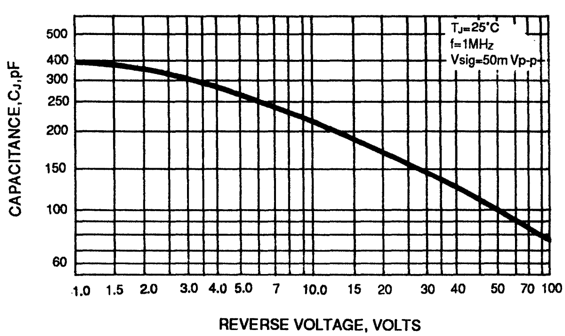
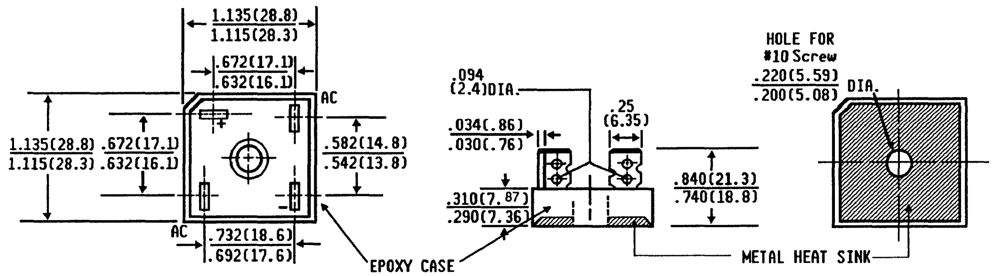


FIG.8-TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



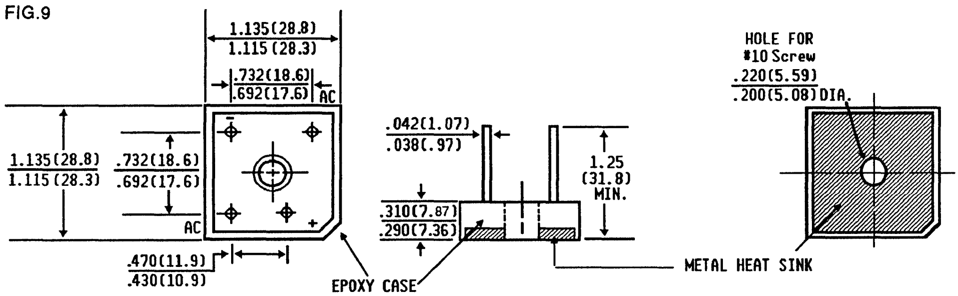
GBPC

FIG.8



GBPC-W

FIG.9



Dimensions in inches and (millimeters)

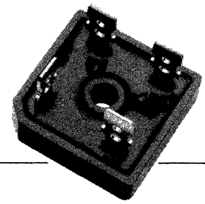
Notes:
1. Corrosion resistant terminals designed with .250 female quick connectors for wrap around or snap-on.
2. A thin film of silicone thermal compound is recommended between the bridge case and mounting surface for improved thermal conduction.
3. Higher dielectric strengths availbable. Consult factory.

GBPC35005 THRU GBPC3510

HIGH CURRENT GLASS PASSIVATED SINGLE-PHASE BRIDGE RECTIFIER

FEATURES

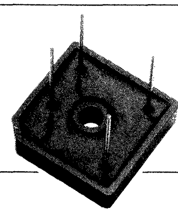
GBPC STANDARD



- This series is UL recognized under component index, file number E54214
- The plastic package has Underwriters Laboratory flammability recognition 94V-O
- Integrally molded heatsink provide very low thermal resistance for maximum heat dissipation
- Universal 3-way terminals; snap-on, wire wrap -around, or P.C. board mounting
- Surge overload ratings to 400 Amperes
- Glass passivated chip junctions
- Typical I_R less than 0.3 μ A
- High temperature soldering guaranteed: 260°C/10 seconds at 5lbs., (2.3 kg) tension

MECHANICAL DATA

GBPC-W WIRE LEADS



Case: Molded plastic with heatsink integrally mounted in the bridge encapsulation
Terminals: Either nickel plated .25" (6.35mm) Faston lugs or plated copper leads .040" (1.02mm) diameter. Suffix letter "W" added to indicate leads.(ex. GBPC3510W)
Mounting Position: Bolt down on heat-sink with silicone thermal compound between bridge and mounting surface for maximum heat transfer efficiency with number 10 screw
Polarity: Polarity symbols molded on body
Mounting Torque: 20 in.- lb. max. ***Weight:*** .53 ounce, 15 grams

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GBPC35 005	01	02	04	06	08	10	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Output Current at T_C=50°C (NOTE 1)	$I_{(AV)}$	35.0							Amps
Peak Forward Surge Current Single sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	400.0							Amps
Rating (non-repetitive, for t greater than 1 ms and less than 8.3 ms) for fusing	I^2t	660.0							$Amps^2Sec$
Maximum Instantaneous Forward Voltage drop per leg at 17.5 Amps	V_F	1.1							Volts
Maximum DC Reverse Leakage Current T_A=25°C at Rated DC Blocking Voltage per leg T_A=125°C	I_R	5.0 500.0							μA
RMS Isolation Voltage from case to leads	V_{ISO}	2500.0							Volts
Typical Junction Capacitance per leg (NOTE 2)	C_J	300.0							pF
Typical Thermal Resistance from Junction to Case per leg (NOTE 1)	$R_{\theta JC}$	1.4							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150							°C

NOTES: 1. Bridge mounted on a 9"x3.5"x4.6"(22.9x8.9x11.7cm) Al-Finned Heatsink.
2. Measured at 1 MHz and applied reverse voltage of 4.0 volts.

FIG. 1 - MAXIMUM OUTPUT RECTIFIED CURRENT

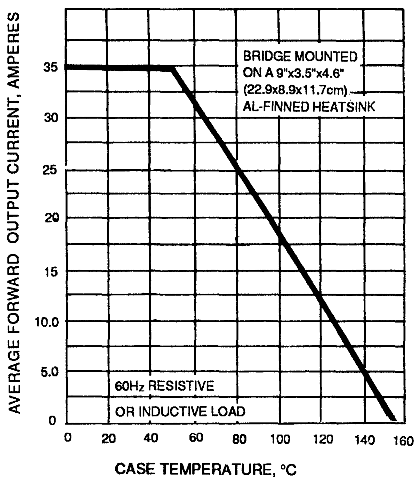


FIG 2 - MAXIMUM OUTPUT RECTIFIED CURRENT

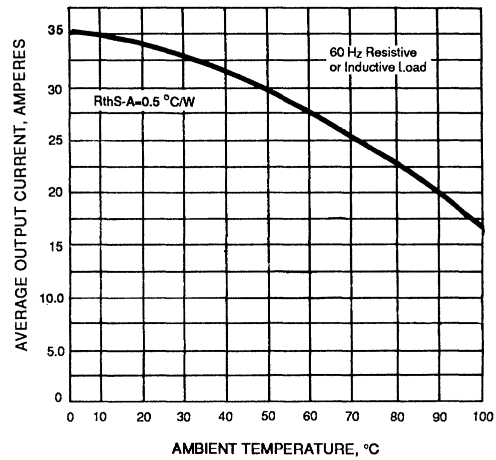


FIG 3 - MAXIMUM POWER DISSIPATION

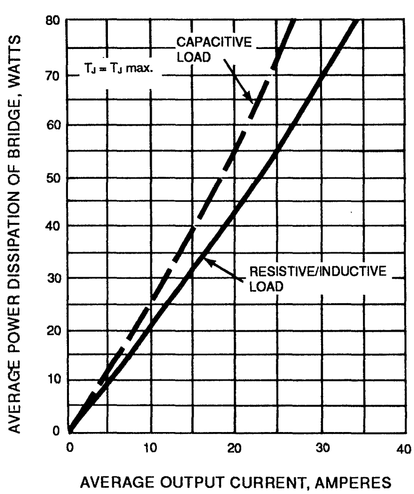


FIG 4 - TYPICAL REVERSE CHARACTERISTICS

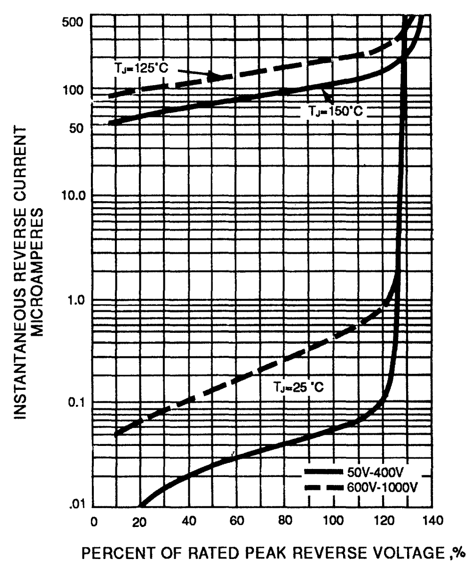


FIG.5- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

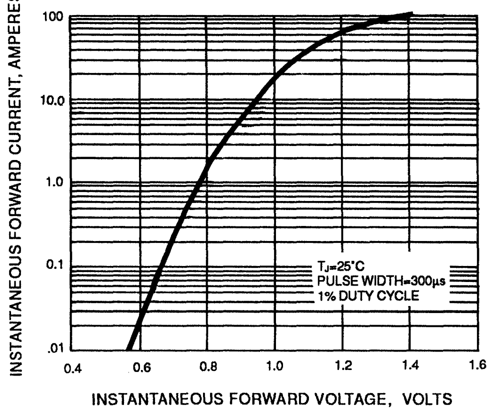


FIG. 6-TYPICAL TRANSIENT THERMAL IMPEDANCE

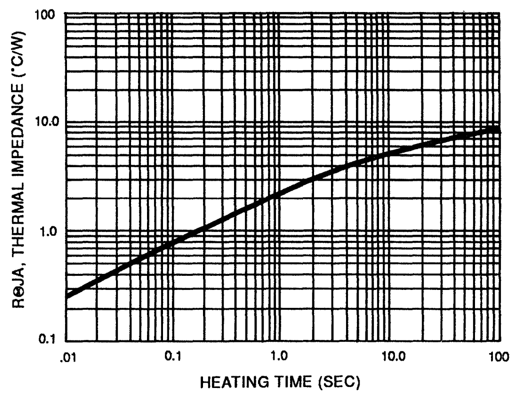


FIG.7-MAXIMUM NON-REPETIVE PEAK FORWARD SURGE CURRENT

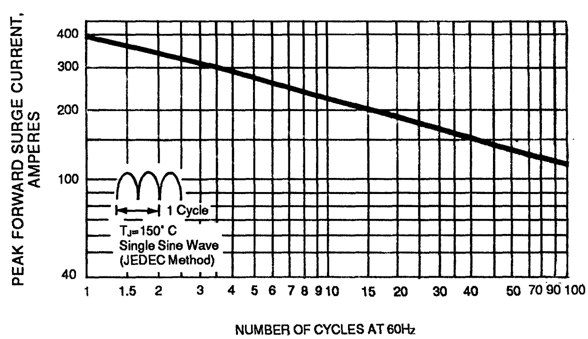
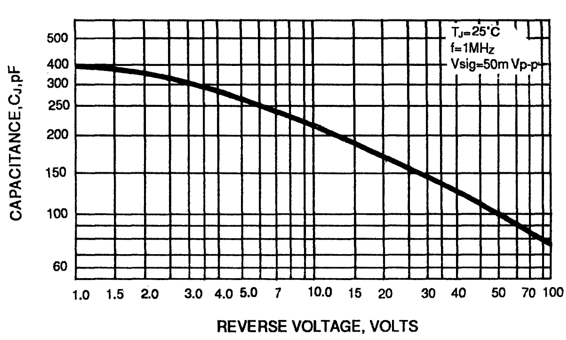


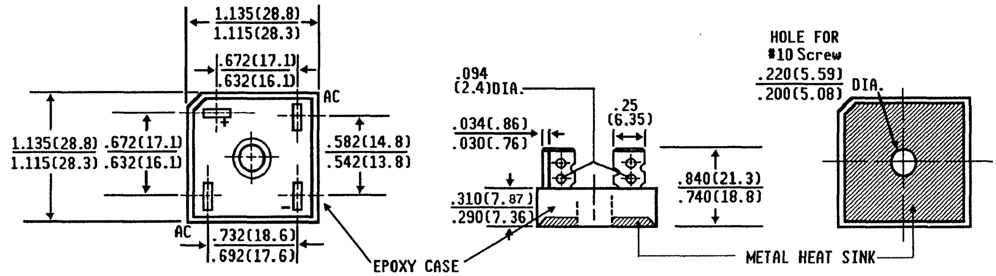
FIG.8-TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



General Instrument

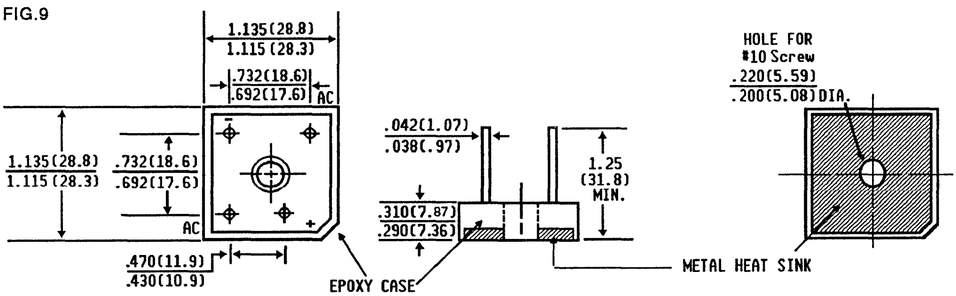
GBPC

FIG.8



GBPC-W

FIG.9



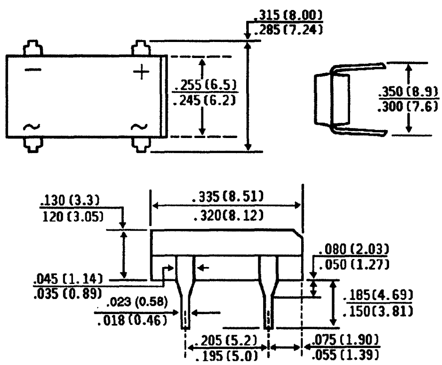
Dimensions in inches and (millimeters)

Notes:
1. Corrosion resistant terminals designed with .250 female quick connectors for wrap around or snap-on.
2. A thin film of silicone thermal compound is recommended between the bridge case and mounting surface for improved thermal conduction.
3. Higher dielectric strengths availbable. Consult factory.

EDF1AM THRU EDF1DM

MINIATURE GLASS PASSIVATED FAST EFFICIENT BRIDGE RECITIFIER

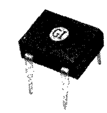
***VOLTAGE** - 50 to 200 Volts* ***CURRENT** - 1.0 Ampere*



Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory flammability recognition 94V-O
- Glass passivated chip junctions
- High Surge overload rating - 50 amperes peak
- Ideal for printed circuit board
- High temperature soldering guaranteed: 265°C /10 seconds at 5 lbs., (2.3kg) tension
- Superfast recovery times for high efficiency



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Weight: 0.04 ounce, 1.0 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*EDF1AM*	*EDF1BM*	*EDF1CM*	*EDF1DM*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	106	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C	$I_{(AV)}$	1.0				Amps
Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
Rating for fusing (t<8.35ms)	I^2t	10.0				A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 1.0A	V_F	1.05				Volts
Maximum Reverse Current at Rated DC Blocking Voltage T_A=25°C	I_R	5.0				µA
T_A=125°C		1.0				mA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0				nS
Typical Thermal Resistance (NOTE 2)	RθJA	40.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=.25A.
2. Thermal Resistance from Junction to Ambient mounted on P.C. Board with, .51"sq. (13mm sq.) Copper Pads.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

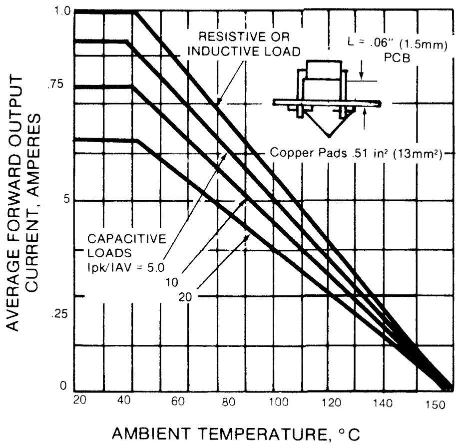


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

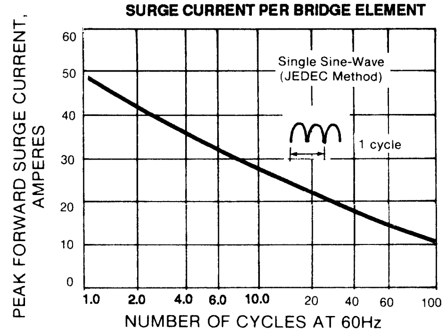


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

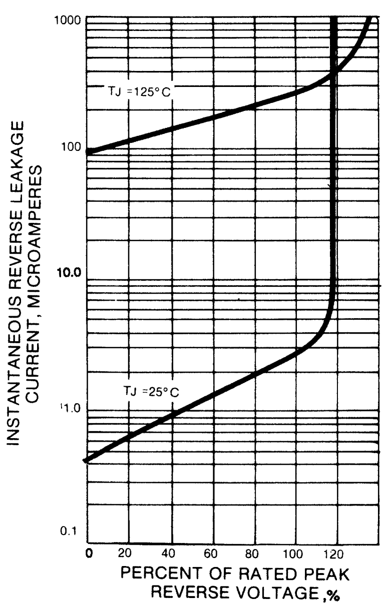


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

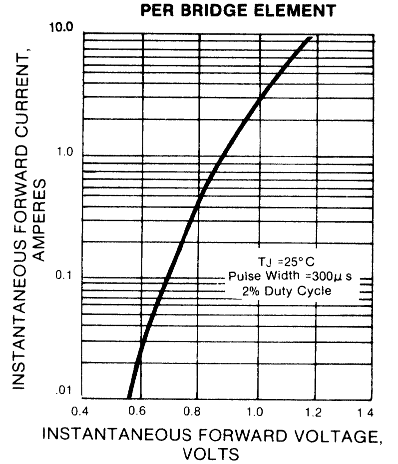
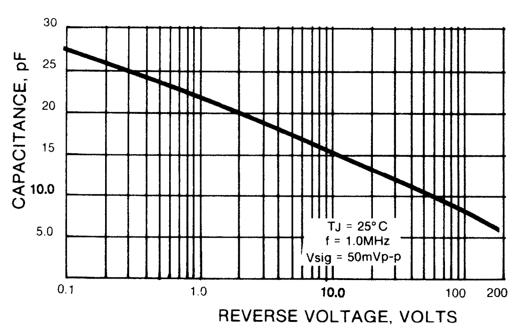


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



SURFACE MOUNT BRIDGE RECTIFIER

0.5 AMPERE TO 1.0 AMPERE
50 VOLTS TO 1000 VOLTS

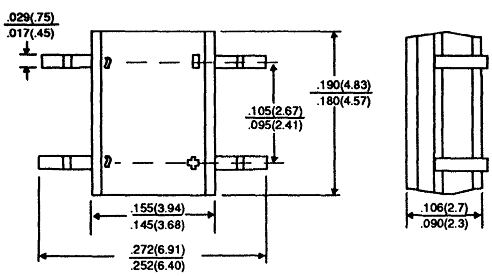
SEE
NEW
ISOLATED
PACKAGES

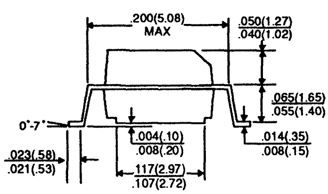
• • • • • • P • R • E • L • I • M • I • N • A • R • Y • • • • • •

MB2S THRU MB6S

MINIATURE GLASS PASSIVATED SINGLE-PHASE SURFACE MOUNT BRIDGE RECTIFIER

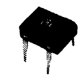
***VOLTAGE** - 200 to 600 Volts* ***CURRENT** - 0.5 Amperes*





Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Recognition 94V-O
- Glass passivation chip junctions
- High surge overload rating: 30 amperes peak
- Saves space on printed circuit board
- High temperature soldering guaranteed:260°C/10 seconds at 5 lbs. (2.3kg) tension

MECHANICAL DATA

Case: Molded Plastic over passivated junctions

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Polarity: Polarity symbols marked on body

Weight: .0078 ounce, 0.22 gram

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.

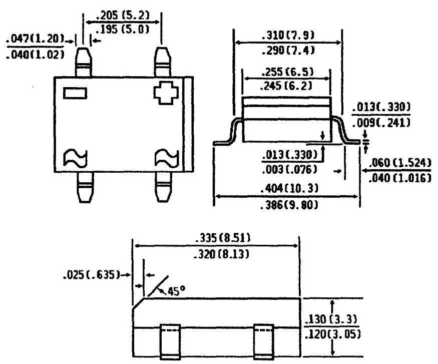
	SYMBOLS	*MB2S*	*MB4S*	*MB6S*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	200	400	600	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C - on Glass-Epoxy P.C.B. - on Ceramic P.C.B.	$I_{(AV)}$		0.5 0.8		Amps
Peak Forward Surge Current 8.3m sec Single Half Sine-Wave superimposed on Rated Load (JEDEC Method)	I_{FSM}		30.0		Amps
Rating for Fusing (t<8.35ms)	I^2t		3.8		A^2s
Maximum Instantaneous Forward Voltage Drop per Element at 0.4A	V_F		1.0		Volts
Maximum DC Reverse Current at T_A=25°C Rated DC Blocking Voltage per element T_A=125°C	I_R		5.0 500		µA
Typical Junction Capacitance per element (NOTE 1)	C_J		25.0		pF
Typical Thermal Resistance (NOTE 2)	$R\theta JL$ $R\theta JA$		20.0 75.0		°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}		-55 to +150		°C

NOTES: 1. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
2. Thermal Resistance from Junction to Lead and /or Ambient, P.C. board mounted on .047 in.^{2} (12mm^2) copper pads.

DF005S THRU DF10S

MINIATURE GLASS PASSIVATED SINGLE - PHASE SURFACE MOUNT BRIDGE RECTIFIER

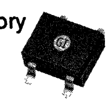
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.0 Ampere*



Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory flammability recognition 94V-O
- Glass passivated chip junctions
- High Surge overload rating - 50 amperes peak
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C /10 seconds at 5 lbs., (2.3kg) tension



MECHANICAL DATA

Case: Molded Plastic

Terminals: Plated leads solderable per MIL-STD-750, Method 2026

Polarity: Polarity symbols marked on body

Weight: 0.04 ounce, 1.0 gram

Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*DF0 05S*	*DF 01S*	*DF 02S*	*DF 04S*	*DF 06S*	*DF 08S*	*DF 10S*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C	$I_{(AV)}$	1.0							Amp
Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Rating for fusing (t<8.35ms)	I^2t	10.0							A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 1.0A	V_F	1.1							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage per leg T_A=125°C	I_R	5.0 0.5							μA mA
Typical Junction Capacitance per leg (NOTE 1)	C_J	25.0							pF
Operating Junction Temperature Range	T_J	-55 to +150							°C
Storage Temperature Range	T_{STG}	-55 to +150							°C

NOTE:
1. Measured at 1.0 MHz and applied reverse voltage of 4.0 Volts.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

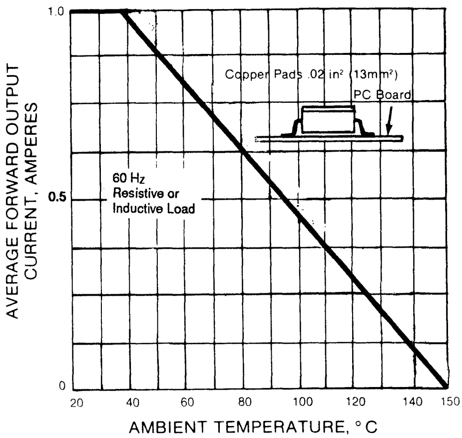


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

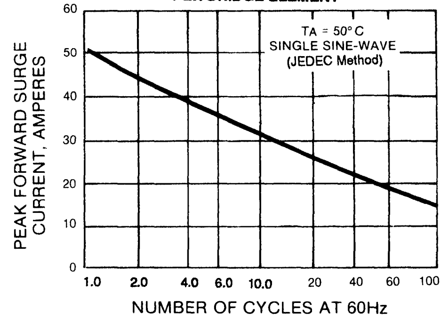


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

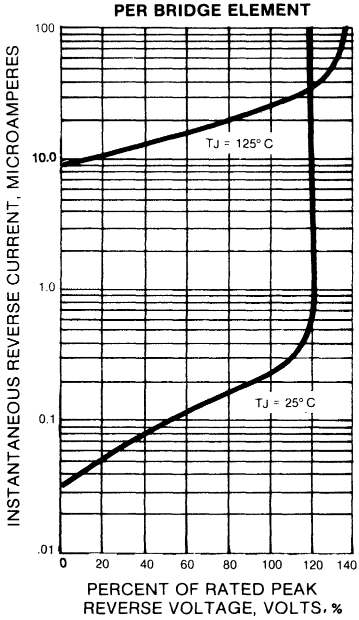


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

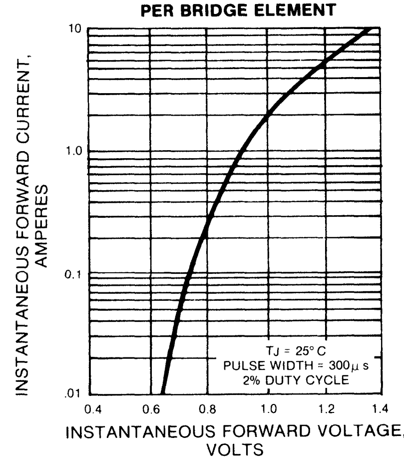
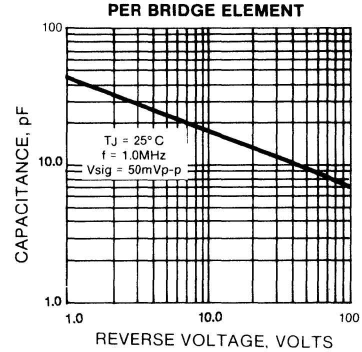


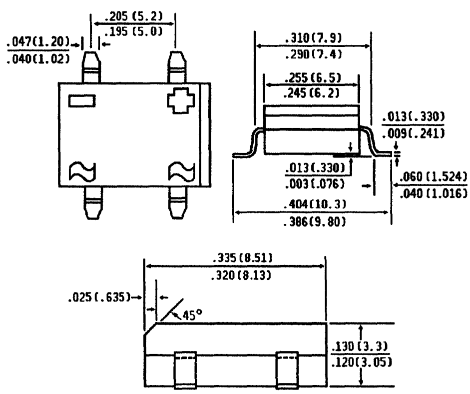
FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



EDF1AS THRU EDF1DS

MINIATURE GLASS PASSIVATED FAST EFFICIENT SURFACE MOUNT BRIDGE RECTIFIER

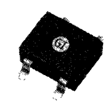
***VOLTAGE** - 50 to 200 Volts* ***CURRENT** - 1.0 Ampere*



Dimensions in inches and (millimeters)

FEATURES

- This series is UL recognized under component index, file number E54214
- Plastic package has Underwriters Laboratory flammability recognition 94V-O
- Glass passivated chip junctions
- High surge overload rating- 50 amperes peak
- Ideal for printed circuit board
- High temperature soldering guaranteed: 260°C /10 seconds at 5 lbs., (2.3kg) tension
- Superfast recovery times for high efficiency



MECHANICAL DATA

Case: Molded plastic
Terminals: Plated leads solderable per MIL-STD-750, Method 2026
Polarity: Polarity symbols marked on body
Weight: 0.04 ounce, 1.0 gram
Mounting Position: Any

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*EDF1AS*	*EDF1BS*	*EDF1CS*	*EDF1DS*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	106	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Output Rectified Current at T_A=40°C	$I_{(AV)}$	1.0				Amps
Peak Forward Surge Current Single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
Rating for fusing (t<8.35ms)	I^2t	10.0				A^2sec
Maximum Instantaneous Forward Voltage drop per leg at 1.0A	V_F	1.05				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 1.0				µA mA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0				nS
Typical Thermal Resistance (NOTE 2)	$R_{\theta JA}$	40.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}=.25A.
2. Thermal Resistance from Junction to Ambient mounted on P.C. Board with, .51"sq. (13mm sq.) Copper Pads.

FIG. 1 — DERATING CURVE FOR OUTPUT RECTIFIED CURRENT

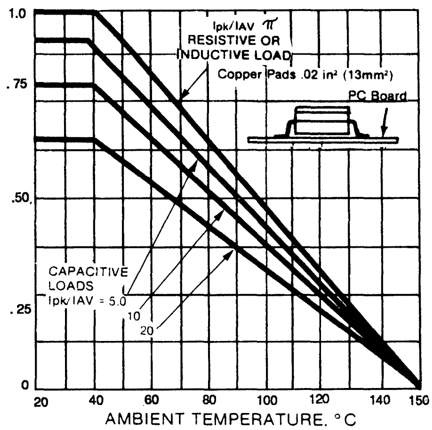


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT PER BRIDGE ELEMENT

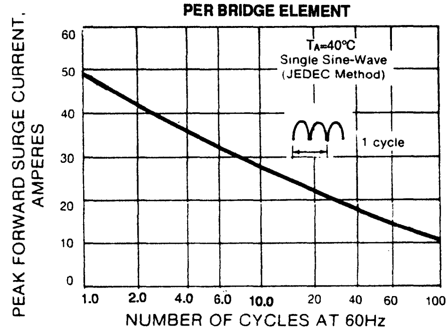


FIG. 3 - TYPICAL REVERSE CHARACTERISTICS PER BRIDGE ELEMENT

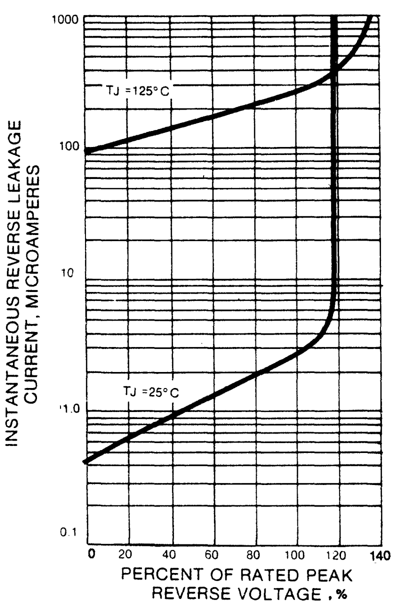


FIG. 4 — TYPICAL FORWARD CHARACTERISTICS PER BRIDGE ELEMENT

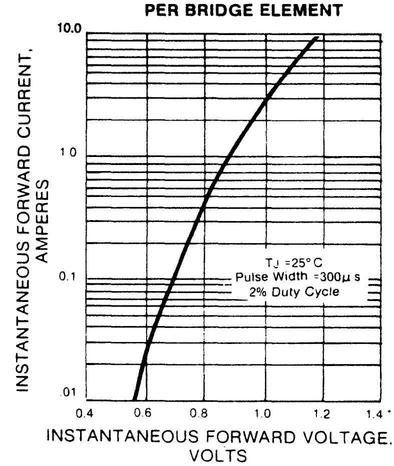
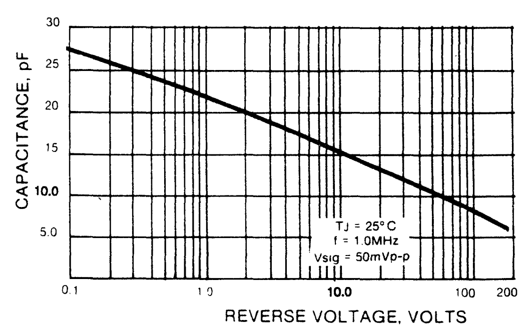


FIG. 5 — TYPICAL JUNCTION CAPACITANCE PER BRIDGE ELEMENT



SURFACE MOUNT SUPERECTIFIERS

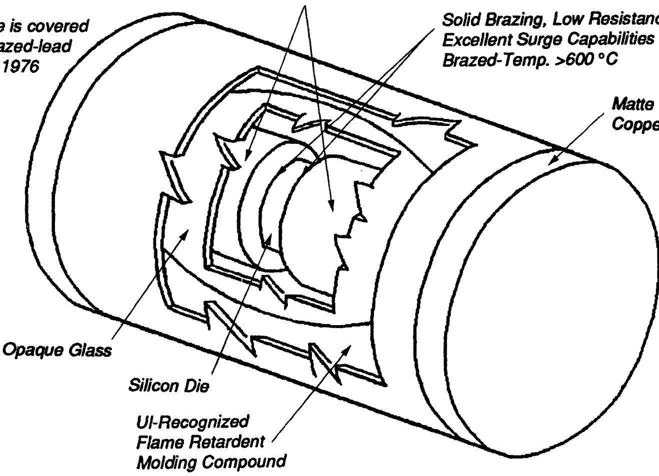
0.5 AMPERE TO 3.0 AMPERES
50 VOLTS TO 1600 VOLTS

GI General Instrument

SUPERECTIFIER® SURFACEMOUNT®

PATENTED*

Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976



Our surface mount SUPERECTIFIER has redefined the concept of time and space. Passivated silicon SUPERECTIFIERs (1N6478-1N6484 and GL41A-GL41Y) are 1.0 Amp. 50-1600 V(BR) leadless, surface mounted devices that provide new space options, from increased surface density to reduced board size.

Component placement speeds can be an order of magnitude higher. Our surface mount SUPERECTIFIERs Feature:

Brazing at greater than 600 Deg C at both terminal and die-eliminates all soft solders.

Exclusive UL recognized flame-retardant epoxy molding compound rated 94V-0, the highest available rating. (hermetically sealed construction.)

No other 1.0 Ampere rectifier of any kind - plastic, glass or metal - can match our surface mount SUPERECTIFIER features.

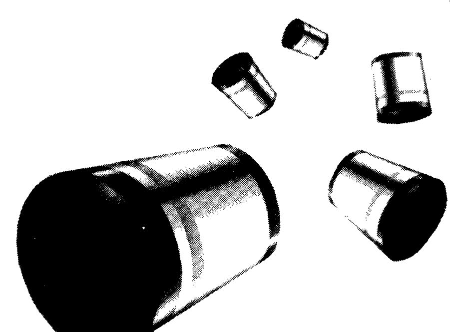
The way we make our surface mount SUPERECTIFIER is what makes them the best.

In eall construction, most other rectifiers rated up to 1.0 ampere are soldered or are only pressure contacted. Our surface mounted SUPERECTIFIER is made into an entirely solid unit with leads and cell brazed at temperatures greater than 600 Deg C. All other rectifiers fail at half that temperature!

Conventional plastic rectifiers use either varnish, silicon rubber or a thin film of silicon oxide to protect the junction. Our surface mount SUPERECTIFIER uses a patented glass passivation to seal its junction hermetically.

In device encapsulation, our surface mount SUPERECTIFIER uses a flame-RETARDANT molding compound, rated UL94V-0, the highest rating available. In fact, it is the only plastic rectifier that exceeds environmental standards of MIL-S-19500.

In summary, the General Instrument surface mount SUPERECTIFIER is the world's only rectifier with totally brazed construction, with a patented glass passivated junction, and with flame-retardant molding encapsulation.



GI General Instrument

Surface Mount Superectifiers

Features:

- *High Temperature Metallurgically Bonded*
- *Plastic Package has Underwriters Laboratory Flammability Classification 94V-0*
- *Glass Passivated Junction*
- *Capable of meeting Environmental Standards of MIL-S-19500*
- *High Temperature Soldering guaranteed for all present methods, including wave and vapor reflow soldering*

Types:

1N6478-1N6484.................1.0 Amp. Standard Recovery Time
GL41A-GL41Y....................1.0 Amp. Standard Recovery Time
RGL41A-RGL41M..............1.0 Amp. Standard Recovery Time
EGL41A-EGL41G..............1.0 Amp. Standard Recovery Time
GL34A-GL34J....................5.0 Amp. Standard Recovery Time
RGL34A-RGL34J...............5.0 Amp. Standard Recovery Time
EGL34A-EGL34G..............5.0 Amp. Standard Recovery Time
GF1A-GF1M.......................1.0 Amp. Standard Recovery Time
RGF1A-RGF1M.................1.0 Amp. Standard Recovery Time
EGF1A-EGF1D..................1.0 Amp. Standard Recovery Time

QUICK GUIDE TO SURFACE MOUNT SUPERECTIFIERS

TYPE	1N6478 thru 1N6484	GL41A thru GL41M	RGL41A* thru RGL41M*	EGL41A+ thru EGL41G+	GL34A thru GL34J	RGL34A* thru RGL34J*	EGL34A+ thru EGL34G+
CASE	DO-213AB	DO-213AB	DO-213AB	DO-213AB	DO-213AA	DO-213AA	DO-213AA
Io (A)	1.0	1.0	1.0	1.0	0.5	0.5	0.5
at T_T(°C)	75	75	55	75	75	55	75
V_R=50(V)	1N6478	GL41A	RGL41A	EGL41A	GL34A	RGL34A	EGL34A
V_R= 100(V)	1N6479	GL41B	RGL41B	EGL41B	GL34B	RGL34B	EGL34B
V_R= 150(V)				EGL41C			EGL34C
V_R= 200(V)	1N6480	GL41D	RGL41D	EGL41D	GL34D	RGL34D	EGL34D
V_R= 300(V)				EGL41F			EGL34F
V_R= 400(V)	1N6481	GL41G	RGL41G	EGL41G	GL34G	RGL34G	EGL34G
V_R= 600(V)	1N6482	GL41J	RGL41J		GL34J	RGL34J	
V_R= 800(V)	1N6483	GL41K	RGL41K				
V_R = 1000(V)	1N6484	GL41M	RGL41M				
VR=1300(V)		GL41T					
VR=1600(V)		GL41Y					
SURGE (A)	30	30	30	30	10	10	10
V (V)	1.0	1.1/1.2	1.3	1.0/1.25	1.1	1.3	1.25

* Fast Recovery   + Ultrafast Recovery

QUICK GUIDE TO SURFACE MOUNT SUPERECTIFIERS

(CONT.)

TYPE	GF1A thru GF1M	* RGF1A thru RGF1M	+ EGF1A thru EGF1G
CASE	**DO-214BA	**DO-214BA	**DO-214BA
I_O (A)	1.0	1.0	1.0
at T_L (°C)	125	55	75
V_R=50(V)	GF1A	RGF1A	EGF1A
V_R=100(V)	GF1B	RGF1B	EGF1B
V_R=150(V)			EGF1C
V_R=200(V)	GF1D	RGF1D	EGF1D
V_R=300(V)			
V_R=400(V)	GF1G	RGF1G	
V_R=600(V)	GF1J	RGF1J	
V_R=800(V)	GF1K	RGF1K	
V_R=1000(V)	GF1M	RGF1M	
SURGE (A)	30	30	30
V(V)	1.1/1.2	1.3	1.0/1.25

* Fast Recovery   +Ultrafast Recovery   **Modified

Surface Mount Selector Guide

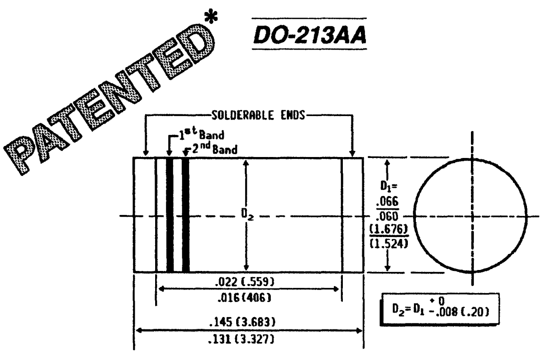
Series	*Type*	*Voltage (V)*	*Current or Power*	*trr (ns)*	*Package*
GL34	Rectifier	50-600	0.5A	---	MELF/DO-213AA
RGL34	Rectifier	50-600	0.5A	150/250	MELF/DO-213AA
EGL34	Rectifier	50-400	0.5A	50	MELF/DO-213AA
1N6478	Rectifier	50-1000	1.0A	---	MELF/DO-213AB
GL41	Rectifier	50-1600	1.0A	---	MELF/DO-213AB
RGL41	Rectifier	50-1000	1.0A	150-500	MELF/DO-213AB
EGL41	Rectifier	50-400	1.0A	50	MELF/DO-213AB
GLL4735	Zener	6.2-91	1.0 Watt	---	MELF/DO-213AB
ZGL41	Zener	100-200	1.0 Watt	---	MELF/DO-213AB
TGL41	TVS	6.8-200	400 Watt Peak	---	MELF/DO-213AB
SGL41	Schottky	20-60	1.0A	---	MELF/DO-213AB
S1	Rectifier	50-600	1.0A	---	SMA/DO-214AC
RS1	Rectifier	50-600	1.0A	150-250	SMA/DO-214AC
ES1	Rectifier	50-200	1.0A	15	SMA/D0-214AC
SS1	Schottky	20-60	1.0A	---	SMA/DO-214AC
SMAJ	TVS	6.8-170V	400 Watt Peak	---	SMA/D0-214AC
GF1	Rectifier	50-1000	1.0A	---	GF1/DO-214BA
RGF1	Rectifier	50-1000	1.0A	150-500	GF1/D0-214BA
EGF1	Rectifier	50-200	1.0A	50	GF1/DO-214BA
S2	Rectifier	50-1000	1.5A	---	SMB/DO214AA
RS2	Rectifier	50-800	1.5A	150-500	SMB/DO214AA
ES2	Rectifier	50-200	2.0A	20	SMB/DO-214AA
SS2	Schottky	20-60	2.0A	---	SMB/DO-214AA
SMBJ,G	TVS	5.0-170	600 Watt Peak	---	SMB/DO-214AA
S3	Rectifier	50-1000	2.5A	---	SMC/DO-214AB
RS3	Rectifier	50-800	2.5A	150-500	SMC/DO-214AB
ES3	Rectifier	50-200	3.0A	20	SMC/DO-214AB
SS3	Schottky	20-60	3.0A	---	SMC/DO-214AB
SMCJ,G	TVS	5.0-170	1500 Watt Peak	---	SMC/DO-214AB

BYM05-50 THRU BYM05-600
GL34A THRU GL34J

SURFACE MOUNT GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 0.5 Amperes*

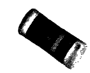
FEATURES



Dimensions in inches and (millimeters)

* *Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plasticpackage has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 450°C/5 seconds at terminals.Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated Terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.036 gram, 0.0014 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

	SYMBOLS	BYM05 -50	-100	-200	-400	-600	UNITS
Standard recovery time device: 1st band is white		GL34A	GL34B	GL34D	GL34G	GL34J	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current at T_T=75°C	$I_{(AV)}$	0.5					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0					Amps
Maximum Instantaneous Forward Voltage at 0.5A	V_F	1.2				1.3	Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0					μA
Maximum Full Load Reverse Current, Full Cycle Average at T_A=75°C	$I_{R(AV)}$	20					μA
Typical Junction Capacitance (NOTE 1)	C_J	7.0					pF
Maximum Thermal Resistance R_{thJL} (NOTE 2) R_{thJA} (NOTE 3)	$R_{\Theta JL}$ $R_{\Theta JA}$	70.0 150.0					°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175					°C
Polarity Color Bands (2nd Band)		Gray	Red	Orange	Yellow	Green	

NOTES: 1. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Thermal resistance junction to terminal, 5.0mm² copper pads to each terminal.
3. Thermal resistance junction to ambient, 5.0mm² copper pads to each terminal.

FIG. 1 — FORWARD CURRENT DERATING CURVE

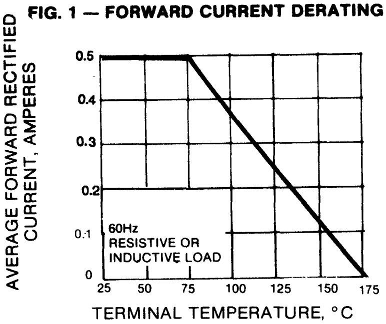


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

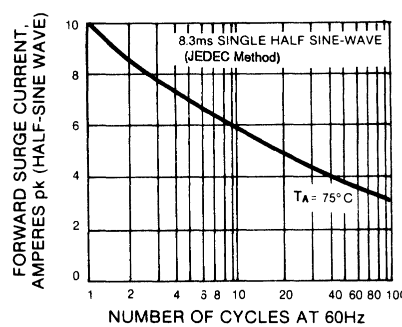


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

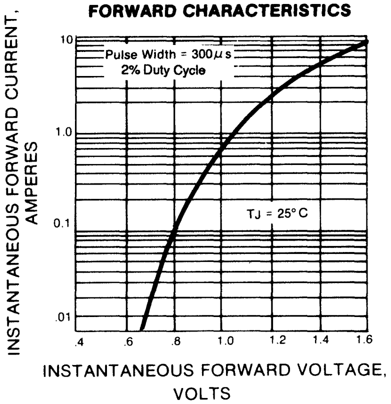


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

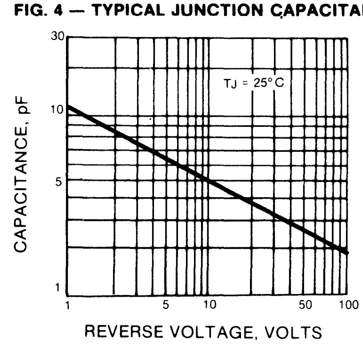
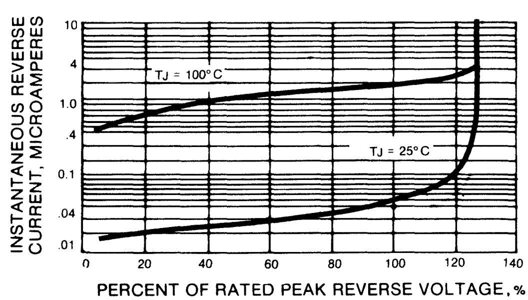


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



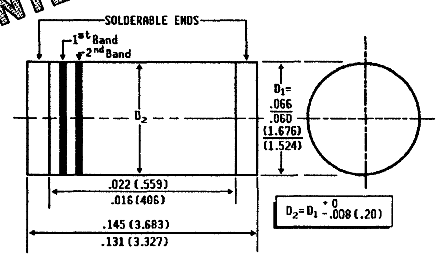
BYM06-50 THRU BYM06-600
RGL34A THRU RGL34J

SURFACE MOUNT GLASS PASSIVATED FAST SWITCHING JUNCTION RECTIFIER

***Voltage** - 50 to 600 Volts* ***Current** - 0.5 Amperes*

PATENTED*

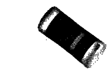
DO-213AA



*Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976

SUPERECTIFIER®

FEATURES



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.036 gram, 0.0014 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	BYM06 -50	-100	-200	-400	-600	UNITS
Fast switching device: 1st band is Red		RGL34A	RGL34B	RGL34D	RGL34G	RGL34J	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current at T_T=55°C	$I_{(AV)}$	0.5					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0					Amps
Maximum Instantaneous Forward Voltage at 0.5A	V_F	1.3					Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0					µA
Maximum Full Load Reverse Current, Full Cycle Average, at T_A=55°C	$I_{R(AV)}$	30.0					µA
Maximum Reverse Recovery Time (NOTE 1) T_A=25°C	T_{RR}	150				250	nS
Typical Junction Capacitance (NOTE 2)	C_J	4.0					pF
Maximum Thermal Resistance (NOTE 3) (NOTE 4)	$R_{\Theta JL}$ $R_{\Theta JA}$	70 150.0					°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175					°C
Polarity Color Bands (2nd Band)		Gray	Red	Orange	Yellow	Green	

NOTES: 1. Reverse Recovery Test Conditions I_F=0.5A, I_R=1.0A, Irr= .25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal resistance from junction to terminal, 5mm² copper pads to each terminal.
4. Thermal resistance from junction to ambient, 5mm² copper pads to each terminal.

FIG. 1 — FORWARD CURRENT DERATING CURVE

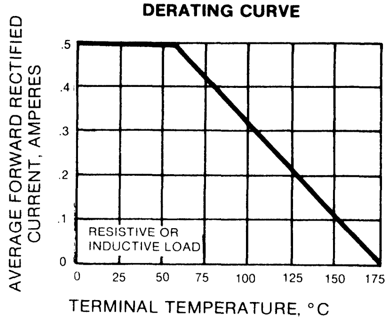


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

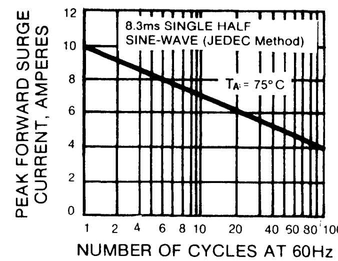


FIG. 3 — TYPICAL REVERSE CHARACTERISTICS

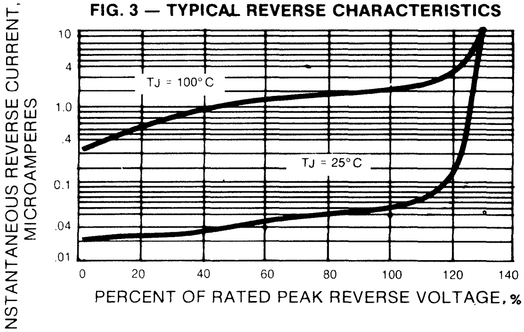


FIG. 4 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

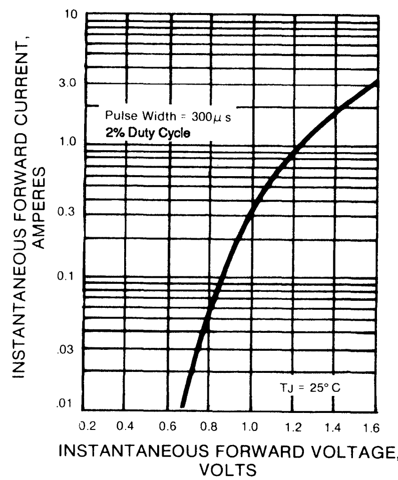


FIG. 5 — TYPICAL JUNCTION CAPACITANCE

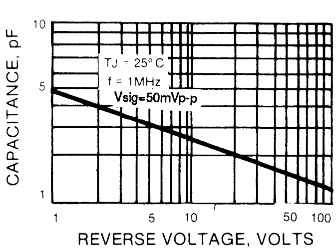
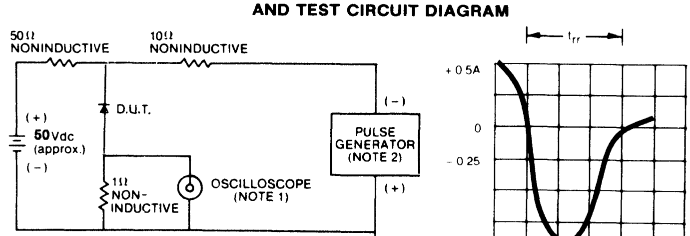


FIG. 6 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max., Input Impedance = 1 megohm, 22pF.
2. Rise Time = 10ns max., Source Impedance = 50 ohms.

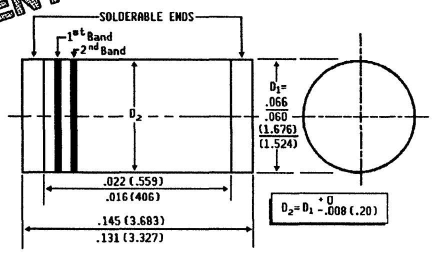
BYM07-50 THRU BYM07-400
EGL34A THRU EGL34G

SURFACE MOUNT GLASS PASSIVATED FAST EFFICIENT JUNCTION RECTIFIER

***Voltage** - 50 to 400 Volts* ***Current** - 0.5 Amperes*

PATENTED*

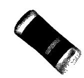
DO-213AA



Dimensions in inches and (millimeters)

**Brazed-lead assembly is covered by Patent No. 3,930,306 of 1976 and glass composition by Patent No. 3,752,701 of 1973*

FEATURES



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Ultrafast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.036 gram, 0.0014 ounce

SUPERECTIFIER®

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

		BYM07						
	SYMBOLS	-50	-100	-150	-200	-300	-400	UNITS
Fast Efficient device: 1st band is Green		EGL34A	EGL34B	EGL34C	EGL34D	EGL34F	EGL34G	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum Average Forward Rectified Current at T_T=75°C	$I_{(AV)}$	0.5						Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	10.0						Amps
Maximum Instantaneous Forward Voltage at 0.5A	V_F	1.25				1.35		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0						μA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50.0						nS
Typical Junction Capacitance (NOTE 2)	C_J	4.0						pF
Maximum Thermal Resistance (NOTE 3) (NOTE4)	$R\Theta JL$ $R\Theta JA$	70.0 150.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175						°C
Polarity Color Bands (2nd Band)		Gray	Red	Pink	Orange	Brown	Yellow	

NOTES: 1. Reverse Recovery Test Conditions: I_F= 0.5A, Ir= 1.0A, Irr = .25A
2. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal resistance from junction to terminal, 5.0mm^2 copper pads to each terminal.
4. Thermal resistance from junction to ambient, 5.0mm^2 copper pads to each terminal.

FIG. 1 — FORWARD CURRENT DERATING CURVE

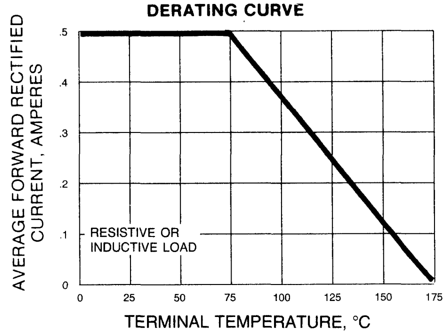


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

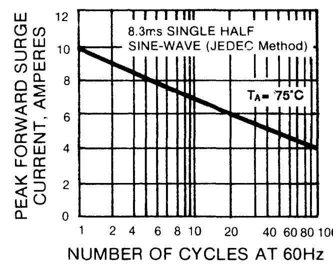


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

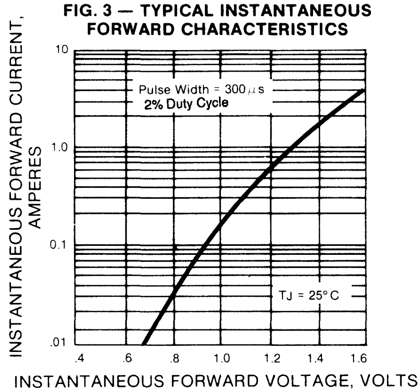


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

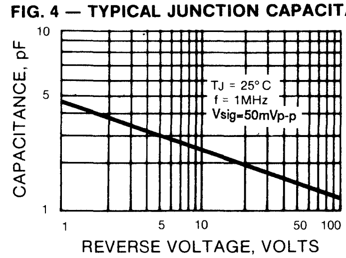
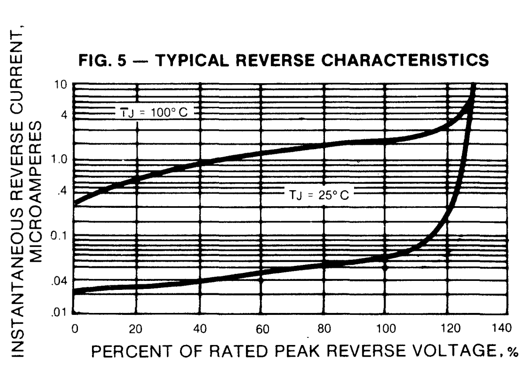


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



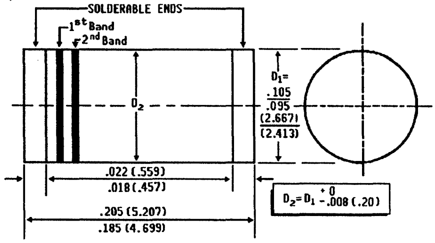
1N6478 THRU 1N6484

SURFACE MOUNT GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-213AB

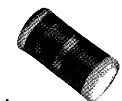


Dimensions in inches and (millimeters)

**Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER®

FEATURES



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.116 gram, 0.0046 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

Standard recovery time device: 1st band is White	SYMBOLS	1N 6478	1N 6479	1N 6480	1N 6481	1N 6482	1N 6483	1N 6484	UNITS
* Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
* Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
* Maximum Average Forward Rectified Current at T_T=75°C	$I_{(AV)}$				1.0				Amps
* Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A=75°C	I_{FSM}				30.0				Amps
* Maximum Instantaneous Forward Voltage at 1.0A T_A=75°C T_A=25°C	V_F				1.0 1.1				Volts
* Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R				10.0 200				μA
* Maximum Full Load Reverse Current, Full Cycle Average at T_A=75°C	$I_{R(AV)}$				100.0				μA
Typical Junction Capacitance (NOTE 1)	C_J				15				pF
* Maximum Thermal Resistance (NOTE 2) (NOTE 3)	$R_{\theta JL}$ $R_{\theta JA}$				20.0 50.0				°C/W
* Operating Junction and Storage Temperature Range	T_J, T_{STG}				-65 to +175				°C
Polarity Color Bands (2nd Band)		Gray	Red	Orange	Yellow	Green	Blue	Violet	

NOTES: 1. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Thermal resistance from junction to terminal, 6.0mm² copper pads to each terminal.
3. Thermal resistance from junction to ambient, 6.0mm² copper pads to each terminal.
* JEDEC Registered Values

FIG. 1 — FORWARD CURRENT DERATING CURVE

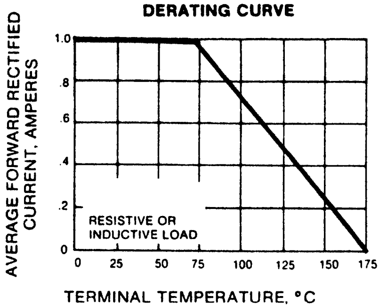


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

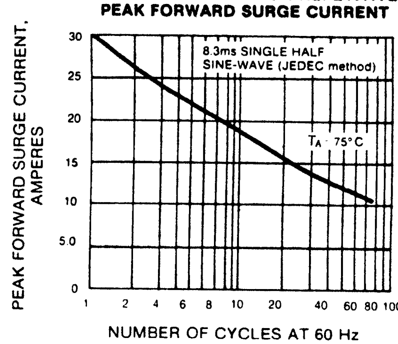


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

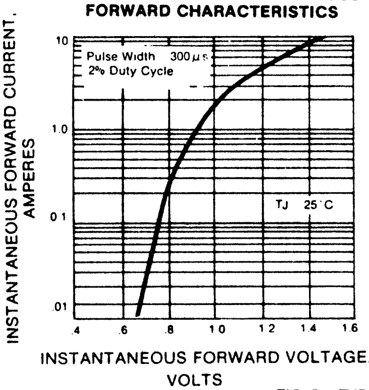


FIG. 4—TYPICAL JUNCTION CAPACITANCE

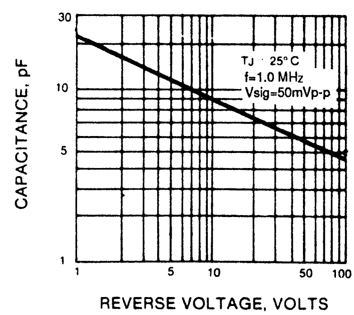
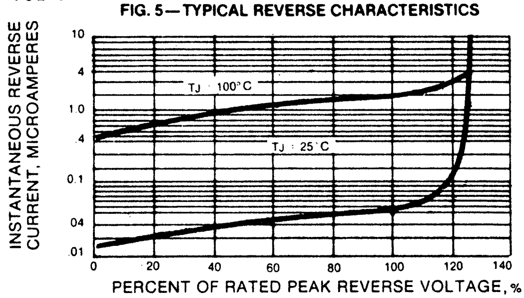


FIG. 5—TYPICAL REVERSE CHARACTERISTICS



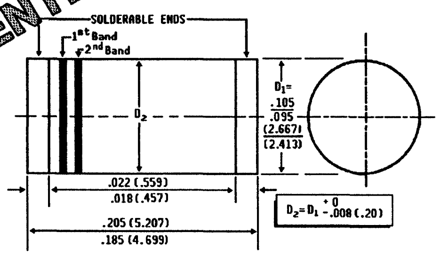
BYM10-50 THRU BYM10-1000
GL41A THRU GL41Y

SURFACE MOUNT GLASS PASSIVATED JUNCTION RECTIFIER

***Voltage** - 50 to 1600 Volts* ***Current** - 1.0 Ampere*

PATENTED*

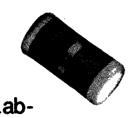
DO-213AB



Dimensions in inches and (millimeters)

***Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976**

FEATURES



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- High temperature soldering guaranteed: 450°C/5 seconds at terminals.Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated Terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.116 gram, 0.0046 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load. For capacitive load, derate current by 20%.

		BYM10				BYM10A					
	SYMBOLS	-50	-100	-200	-400	-600	-800	-1000			UNITS
Standard recovery device: 1st band is White		GL41A	GL41B	GL41D	GL41G	GL41J	GL41K	GL41M	GL41T	GL41Y	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	1300	1600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	910	1120	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	1300	1600	Volts
Maximum Average Forward Rectified Current SEE FIG. 1	$I_{(AV)}$	1.0									Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0									Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.1					1.2				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	10.0 50.0									µA
Maximum Full Load Reverse Current Full Cycle Average at T_A =75°C	$I_{R(AV)}$	30.0									µA
Typical Junction Capacitance (NOTE 1)	C_J	15.0									pF
Maximum Thermal Resistance (NOTE 2) (NOTE 3)	$R_{\Theta JL}$ $R_{\Theta JA}$	30.0 75.0									°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							-65 to +150		°C
Polarity Color Bands (2nd Band)		Gray	Red	Orange	Yellow	Green	Blue	Violet	White	Brown	

NOTES: 1. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Thermal resistance from junction to terminal, 6.0mm^2 copper pads to each terminal.
3. Thermal resistance from junction to ambient, 6.0mm^2 copper pads to each terminal.

FIG. 1 — FORWARD CURRENT DERATING CURVE

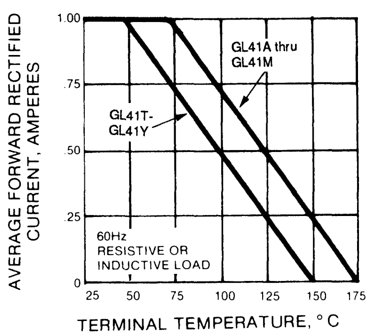


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

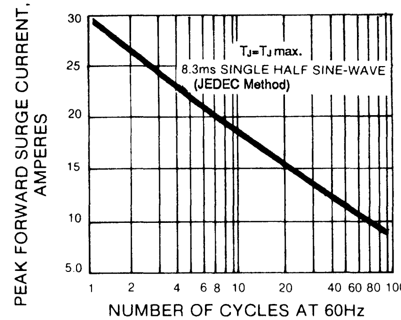


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

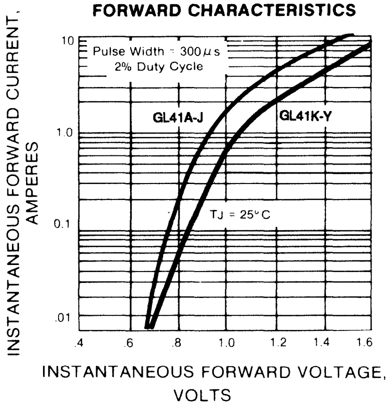


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

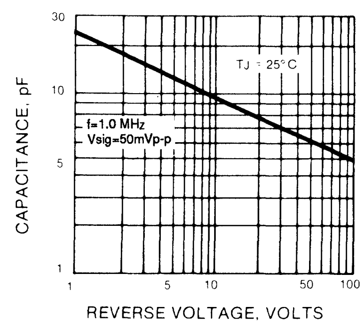
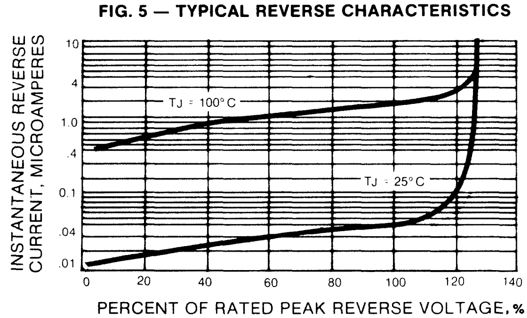


FIG. 5 — TYPICAL REVERSE CHARACTERISTICS



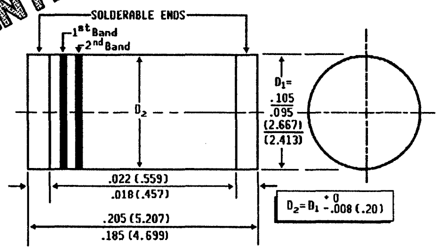
BYM11-50 THRU BYM11-1000
RGL41A THRU RGL41M

SURFACE MOUNT GLASS PASSIVATED FAST SWITCHING JUNCTION RECTIFIER

***Voltage** - 50 to 1000 Volts* ***Current** - 1.0 Amperes*

PATENTED*

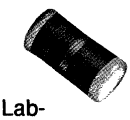
DO-213AB



Dimensions in inches and (millimeters)

**Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976*

FEATURES



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Capable of meeting environmental standards of MIL-S-19500
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 secondsat terminals. Complete device submersible temperature of 260°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Plated Terminals, solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any **Handling Precautions:** None
Weight: 0.116 gram, 0.0046 ounce

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MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.

		BYM11							
	SYMBOLS	-50	-100	-200	-400	-600	-800	-1000	UNITS
Fast switching time device: 1st band is Red		RGL 41A	RGL 41B	RGL 41D	RGL 41G	RGL 41J	RGL 41K	RGL 41M	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_T=55°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.3							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0							µA
Maximum Full Load Reverse Current, Full Cycle Average, at T_A = 55°C	$I_{R(AV)}$	50.0							µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	150				250	500	500	nS
Typical Junction Capacitance (NOTE 4)	C_J	15.0							pF
Maximum Thermal Resistance (NOTE 2) (NOTE 3)	$R_{\Theta JL}$ $R_{\Theta JA}$	30.0 75.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C
Polarity Color Bands (2nd Band)		Gray	Red	Orange	Yellow	Green	Blue	Violet	

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R= 1.0A, Irr=.25A.
2. Thermal resistance from unction to terminal, 6.0mm² copper pads to each terminals.
3. Thermal Resistance from junction to ambient 6.0mm² copper pads to each terminal.
4. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.

FIG. 1 — REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM

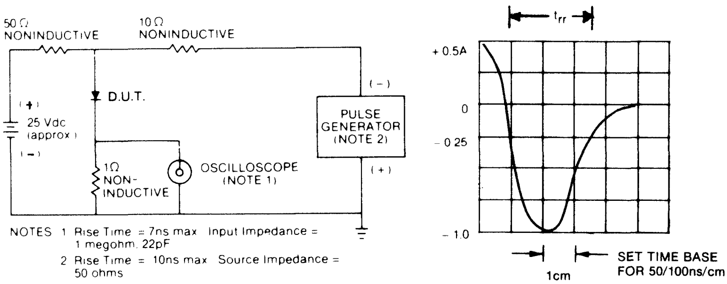


FIG. 2 — FORWARD CURRENT DERATING CURVE

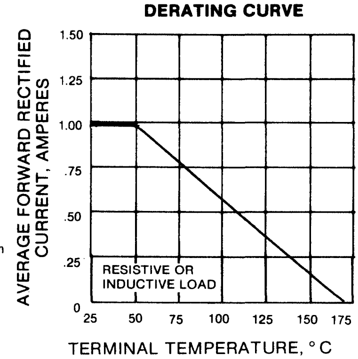


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

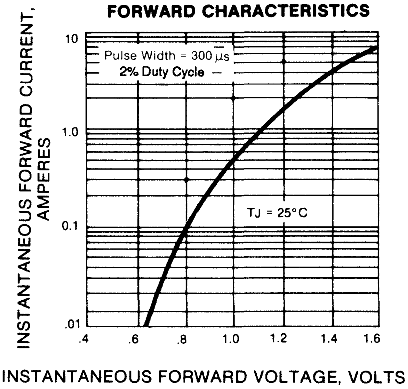


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

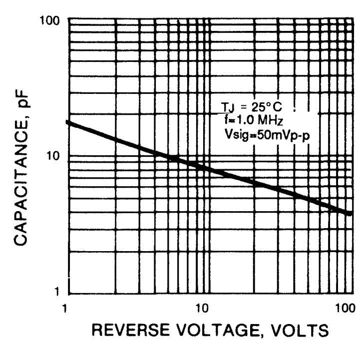


FIG. 5 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

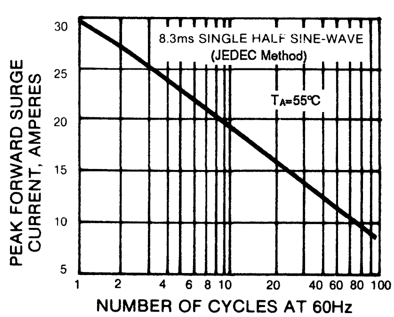
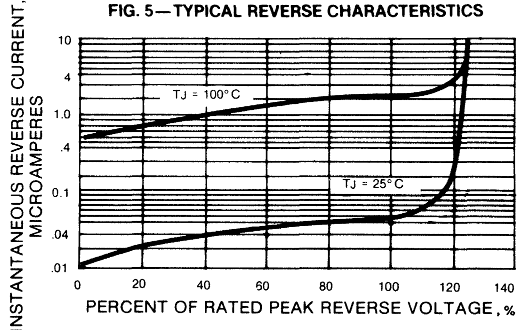


FIG. 5—TYPICAL REVERSE CHARACTERISTICS



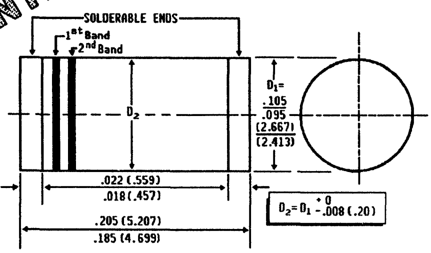
BYM12-50 THRU BYM12-400
EGL41A THRU EGL41G

SURFACE MOUNT GLASS PASSIVATED FAST EFFICIENT JUNCTION RECTIFIER

***Voltage** - 50 to 400 Volts* ***Current** - 1.0 Ampere*

PATENTED*

DO-213AB

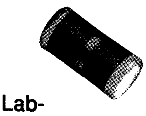


Dimensions in inches and (millimeters)

**Glass-plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976*

SUPERECTIFIER ®

FEATURES



- For surface mounted applications
- High temperature metallurgically bonded
- Glass passivated junction
- Plastic package has Underwriters Laboratory Flammability Classification 94V-0
- Superfast recovery times for high efficiency
- Capable of meeting environmental standards of MIL-S-19500
- Ultra fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/ 5 seconds at terminals. Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: Molded plastic over glass
Terminals: Solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denoted device type 2nd band denotes voltage type
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.116 gram, 0.0046 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

		BYM12						
	SYMBOLS	-50	-100	-150	-200	300	-400	UNITS
Fast efficient devices: 1st band is green		EGL 41A	EGL 41B	EGL 41C	EGL 41D	EGL 41F	EGL 41G	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	300	400	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	210	280	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	300	400	Volts
Maximum Average Forward Rectified Current at Tt=75°C	$I_{(AV)}$	1.0						Amps
Peak Forward Surge Current, 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0						Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.0				1.25		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0						µA
Maximum Reverse Recovery Time (NOTE 1) T_J=25°C	T_{RR}	50						nS
Typical Junction Capacitance (NOTE 2)	C_J	15.0						pF
Maximum Thermal Resistance R_{thJL} (NOTE 3) R_{thJA} (NOTE 4)	RΘJL RΘJA	30.0 60.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175						°C
Polarity Color Bands (2nd Band)		Gray	Red	Pink	Orange	Brown	Yellow	

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, I_{rr}=0.25A.
2. Measured at 1 MHz and applied reverse voltage of 4.0 Volts.
3. Thermal resistance junction to terminal, 6.0mm² copper pads to each terminal.
4. Thermal resistance junction to ambient, 6.0mm² copper pads to each terminal.

FIG. 1 — FORWARD CURRENT DERATING CURVE

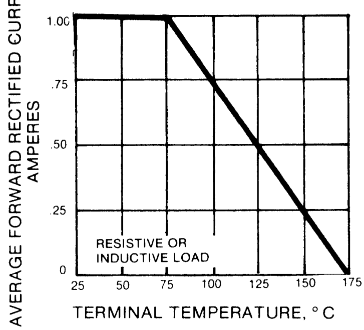


FIG. 2 — MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

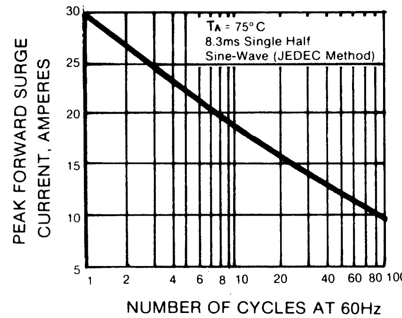


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

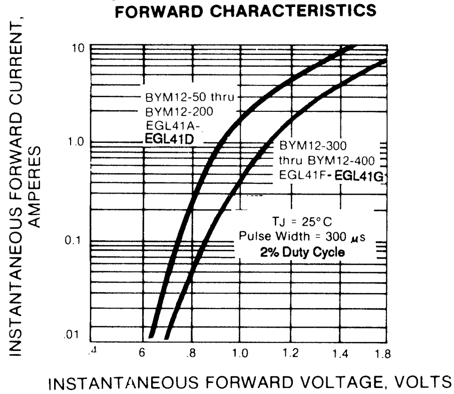


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

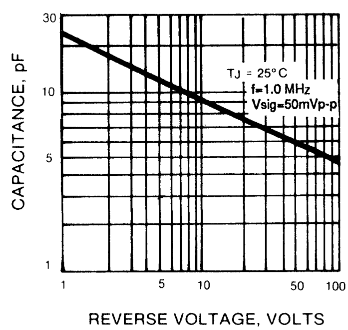
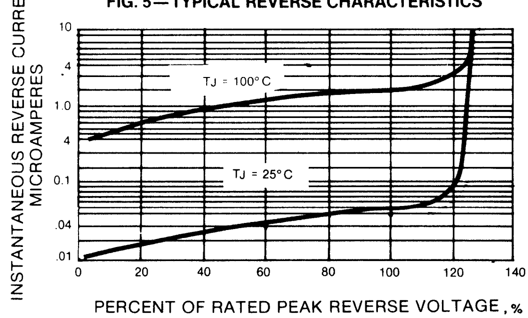


FIG. 5—TYPICAL REVERSE CHARACTERISTICS

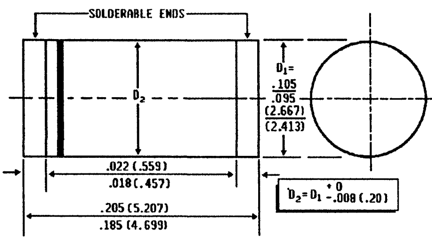


GLL4735 THRU GLL4763

1.0 WATT SURFACE MOUNT GLASS PASSIVATED ZENER

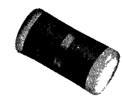
***Voltage** - 6.2-91.0 Volts* ***Power Rating** - 1.0 Watt*

DO-213AB



Dimensions in inches
and
(millimeters)

FEATURES



- Plastic package has Underwriter Labaoratory Flammability Classification 94 V-O
- For surface mounted applications
- Glass passivated chip junction
- Low zener impedance
- Excellent clamping capability
- High temperature soldering guaranteed: 250°C/10 seconds/ at terminals

MECHANICAL DATA

Case: JEDEC DO-213AB Molded plastic over passi vated junction
Terminals: Solder plated, Solderable per MIL-STD-750, Method 2026
Polarity: Red band denotes cathode
Mounting Position: Any ***Handling Precautions:*** None
Weight: 0.116 grams, 0.0046 ounce

Ratings at 25°C ambient temperature unless otherwise specified.
OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE: -55°C to +150°C

Type	*Nominal Zener Voltage at I_{ZT} V_Z Volts	Maximum DC Power Dissiption at T_T=75°C PD Watts	Test Current I_{ZT} mA	Maximum Dynamic Impedence Z_{ZT} at I_{ZT} Ohms	Z_{ZK} at Ohms	I_{ZK} mA	Maximum DC Reverse Leakage Current IR µA	V_R Volts	Maximum Surge Current (NOTE 1) I_{RM} mApk	Maximum Forward Voltage at 200mA V_F Volts
GLL4735	6.2	1.0	41.0	2.0	700	1.0	10.0	3.0	730.0	1.2
GLL4736	6.8	1.0	37.0	3.5	700	1.0	10.0	4.0	660.0	1.2
GLL4737	7.5	1.0	34.0	4.0	700	0.5	10.0	5.0	605.0	1.2
GLL4738	8.2	1.0	31.0	4.5	700	0.5	10.0	6.0	550.0	1.2
GLL4739	9.1	1.0	28.0	5.0	700	0.5	10.0	7.0	500.0	1.2
GLL4740	10	1.0	25.0	7.0	700	0.25	10.0	7.6	454.0	1.2
GLL4741	11	1.0	23.0	8.0	700	0.25	5.0	8.4	414.0	1.2
GLL4742	12	1.0	21.0	9.0	700	0.25	5.0	9.1	380.0	1.2
GLL4743	13	1.0	19.0	10.0	700	0.25	5.0	9.9	344.0	1.2
GLL4744	15	1.0	17.0	14.0	700	0.25	5.0	11.4	305.0	1.2
GLL4745	16	1.0	15.5	16.0	700	0.25	5.0	12.2	285.0	1.2
GLL4746	18	1.0	14.0	20.0	750	0.25	5.0	13.7	250.0	1.2
GLL4747	20	1.0	12.5	22.0	750	0.25	5.0	15.2	225.0	1.2
GLL4748	22	1.0	11.5	23.0	750	0.25	5.0	16.7	205.0	1.2
GLL4749	24	1.0	10.5	25.0	750	0.25	5.0	18.2	190.0	1.2
GLL4750	27	1.0	9.5	35.0	750	0.25	5.0	20.6	170.0	1.2
GLL4751	30	1.0	8.5	40.0	1000	0.25	5.0	22.8	150.0	1.2
GLL4752	33	1.0	7.5	45.0	1000	0.25	5.0	25.1	135.0	1.2
GLL4753	36	1.0	7.0	50.0	1000	0.25	5.0	27.4	125.0	1.2
GLL4754	39	1,0	6.5	60.0	1000	0.25	5.0	29.7	115.0	1.2
GLL4755	43	1.0	6.0	70.0	1500	0.25	5.0	32.7	110.0	1.2
GLL4756	47	1.0	5.5	80.0	1500	0.25	5.0	35.8	95.0	1.2
GLL4757	51	1.0	5.0	95.0	1500	0.25	5.0	38.8	90.0	1.2
GLL4758	56	1.0	4.5	110.0	2000	0.25	5.0	42.6	80.0	1.2
GLL4759	62	1.0	4.0	125.0	2000	0.25	5.0	47.1	70.0	1.2
GLL4760	68	1.0	3.7	150.0	2000	0.25	5.0	51.7	65.0	1.2
GLL4761	75	1.0	3.3	175.0	2000	0.25	5.0	56.0	60.0	1.2
GLL4762	82	1.0	3.0	200.0	3000	0.25	5.0	62.2	55.0	1.2
GLL4763	91	1.0	2.0	250.0	3000	0.25	5.0	69.2	50.0	1.2

*Standard Voltage Tolerance ±10%, Suffix A ±5%

NOTE 1: Surge Current is a non-repetitive, 8.3 mS pulse width square wave or equivalent sine-wave superimposed on I_{ZT} per JEDEC method.

FIG. 1 — MAXIMUM CONTINUOUS POWER DISSIPATION

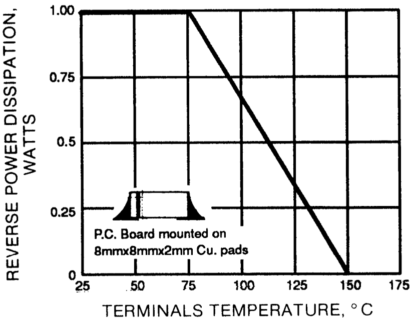


FIGURE 2 — TYPICAL ZENER IMPEDANCE

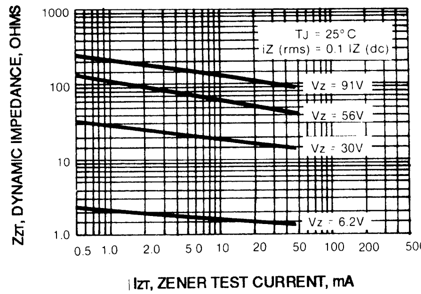


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

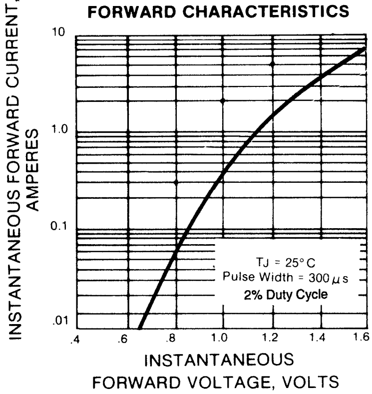


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

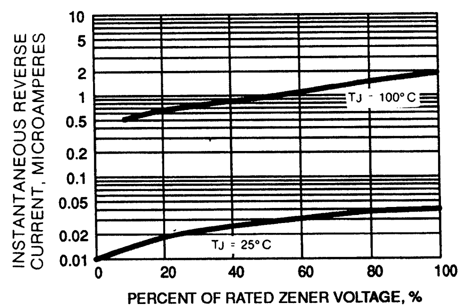
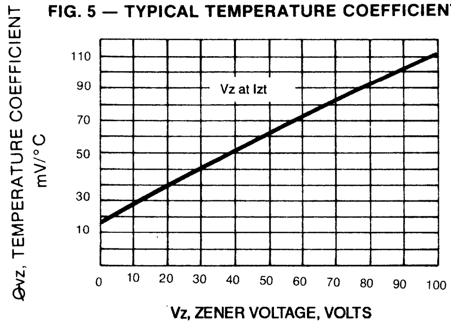


FIG. 5 — TYPICAL TEMPERATURE COEFFICIENTS



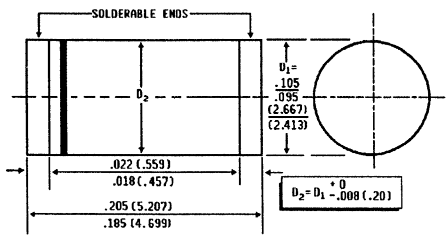
ZGL41-100 THRU ZGL41-200

1.0 WATT SURFACE MOUNT GLASS PASSIVATED ZENER

***Voltage** - 100 - 200 Volts* ***Power Rating** - 1.0 Watt*

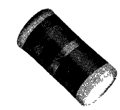
FEATURES

DO-213AB



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Labaoratory Flammability Classification 94 V-O
- For surface mounted applications
- Glass passivated junction
- Low zener impedance
- Excellent clamping capability
- High temperature soldering guaranteed: 250°C/10 seconds/at terminals



MECHANICAL DATA

Case:JEDEC DO-213AB molded plastic over passivated junction

Terminals: Solder plated solderable per MIL-STD-750, Method 2026

Polarity: Red band denotes cathode

Mounting Position: Any

Handling Precautions: None

Weight: 0.116 grams, 0.0046 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

OPERATING JUNCTION AND STORAGE TEMPERATURE RANGE -55°C to +150°C

TYPE	*NOMINAL ZENER VOLTAGE at I_{ZT} VZ	MAXIMUM DC POWER DISSIPATION at T_T=75°C PD	TEST CURRENT I_{ZT}	MAXIMUM DYNAMIC IMPEDANCE Z_{ZT} at I_{ZT}	Z_{ZK} @	IZK	MAXIMUM DC REVERSE LEAKAGE CURRENT I_R at	V_R	MAXIMUM SURGE CURRENT (NOTE1) I_{RM}	MAXIMUM FORWARD VOLTAGE at 200mA V_F
	Volts	Watts	mA	Ohms	Ohms	mA	µA	Volts	mAdc	VOLTS
ZGL41-100	100	1.0	3.7	250	3100	0.25	1.0	76.0	10.0	1.5
ZGL41-110	110	1.0	3.4	300	4000	0.25	1.0	83.6	9.1	1.5
ZGL41-120	120	1.0	3.1	380	4500	0.25	1.0	91.2	8.3	1.5
ZGL41-130	130	1.0	2.9	450	5000	0.25	1.0	98.8	7.7	1.5
ZGL41-140	140	1.0	2.7	525	5500	0.25	1.0	106.4	7.1	1.5
ZGL41-150	150	1.0	2.5	600	6000	0.25	1.0	114	6.7	1.5
ZGL41-160	160	1.0	2.3	700	6500	0.25	1.0	121.6	6.3	1.5
ZGL41-170	170	1.0	2.2	800	6750	0.25	1.0	129.2	5.9	1.5
ZGL41-180	180	1.0	2.1	900	7000	0.25	1.0	136.98	5.6	1.5
ZGL41-190	190	1.0	2.0	1050	7500	0.25	1.0	144.4	5.3	1.5
ZGL41-200	200	1.0	1.9	1200	8000	0.25	1.0	152	5.0	1.5

* Standard Voltgage Tolerance ±10%, Suffix A ±-5%.

NOTE 1: Surge Current is a non-repetitve, 8.3mS pulse width square wave or equivalent sine-wave superimposed on IZT JEDEC Method.

FIG. 1 — MAXIMUM CONTINUOUS POWER DISSIPATION

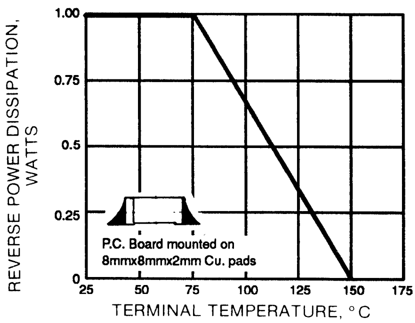


FIG. 2 — TYPICAL ZENER IMPEDANCE

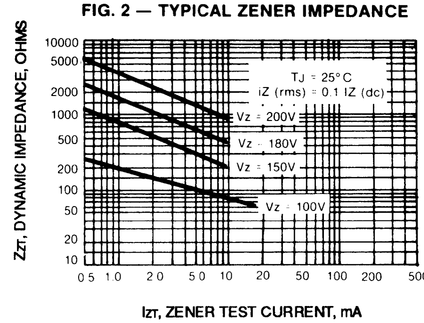


FIG. 3 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

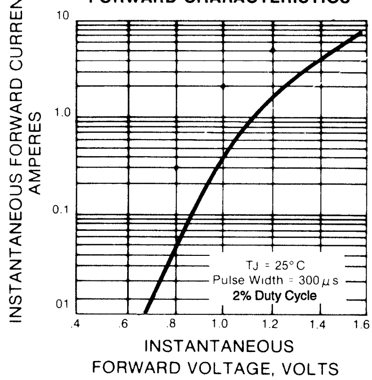


FIG. 4 — TYPICAL REVERSE CHARACTERISTICS

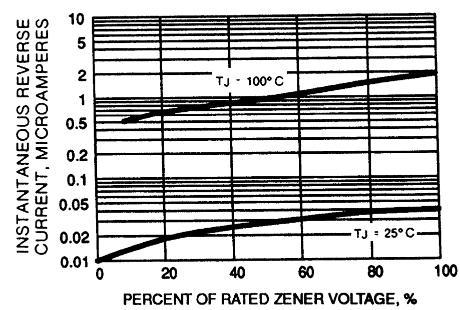
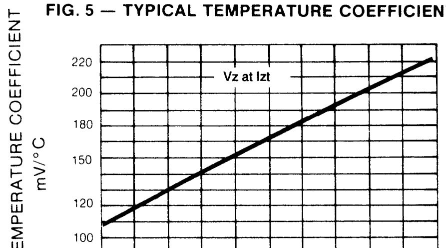


FIG. 5 — TYPICAL TEMPERATURE COEFFICIENTS



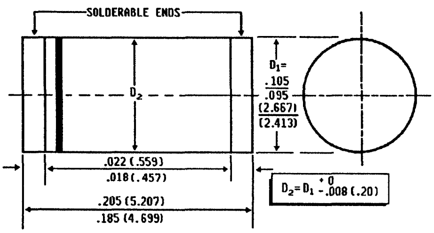
BYM13-20 THRU BYM13-60
SGL41-20 THRU SGL41-60

SURFACE MOUNT SCHOTTKY RECTIFIER

Voltage* - *20 to 60 Volts*   *Current* - *1.0 Ampere

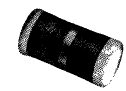
FEATURES

DO-213AB



Dimensions in inches
and
(millimeters)

- For surface mounted applications
- Plastic material used carries Underwriters Laborataory Flammability Classifications 94V-O
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- For use in low voltage, high frequency inverters, free wheeling and polarity protection applications
- High temperature soldering guaranteed: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-213AB molded plastic
Terminals: Solder Plated solderable per MIL-STD-750, Method 2026
Polarity: Two bands indicate cathode
1st band denotes device type 2nd band denotes voltage type
Mounting Position: Any
Handling Precautions: None
Weight: 0.116 gram, 0.0046 ounce

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

		BYM13					
	SYMBOLS	*-20*	*-30*	*-40*	*-50*	*-60*	*UNITS*
Schottky devices: 1st band is orange		SGL41-20	SGL41-30	SGL41-40	SGL41-50	SGL41-60	
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS Voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current (SEE FIG. 1)	$I_{(AV)}$	1.0					Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	.50			.70		Volts
Maximum Reverse Current T_J=25°C at Rated DC Blocking Voltage T_J=100°C	I_R	0.5 10					mA
Typical Junction Capacitance (NOTE 1)	C_J	110.0			80.0		pF
Maximum Thermal Resistance R_{thJL} (NOTE 2) R_{thJA} (NOTE 3)	$R\theta JL$ $R\theta JA$	30.0 75.0					°C/W
Operating Junction Temperature Range	T_J	-55 to +125			-55 to +150		°C
Storage Temperature Range	T_{STG}	-55 to +150					°C
Polarity Color Bands (2nd Band)		Gray	Red	Orange	Yellow	Green	

NOTES:
1. Measured at 1 MHz and applied reverse voltage of 4.0 V_{DC}.
2. Thermal resistance junction to terminal, .024 in^2 (6.0mm^2) copper pads to each terminal.
3. Thermal resistance junction to ambient, .024 in^2 (6.0mm^2) copper pads to each terminal.

FIG. 1 — FORWARD CURRENT DERATING CURVE

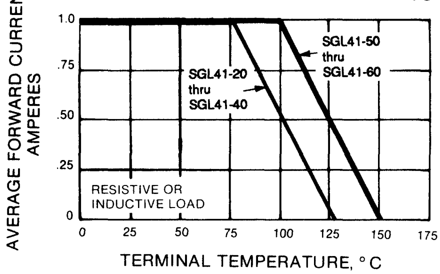


FIG. 2 — TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

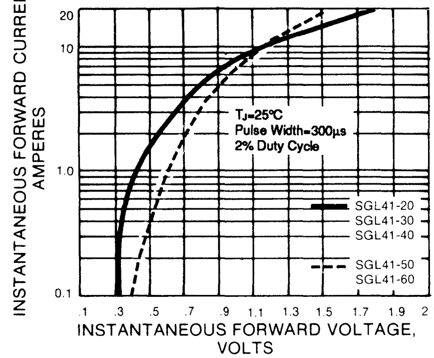


FIG. 3A — TYPICAL REVERSE CHARACTERISTICS

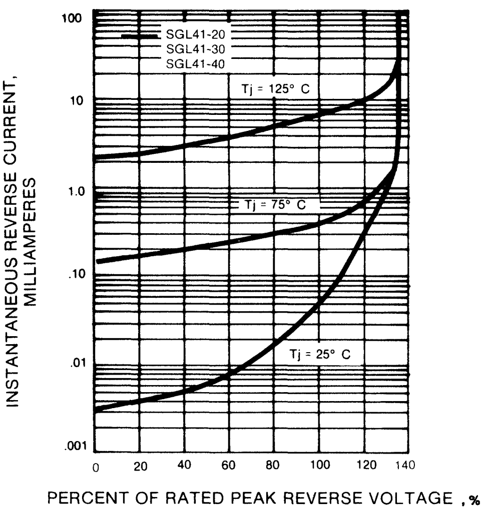


FIG. 3B -- TYPICAL REVERSE CHARACTERISTICS

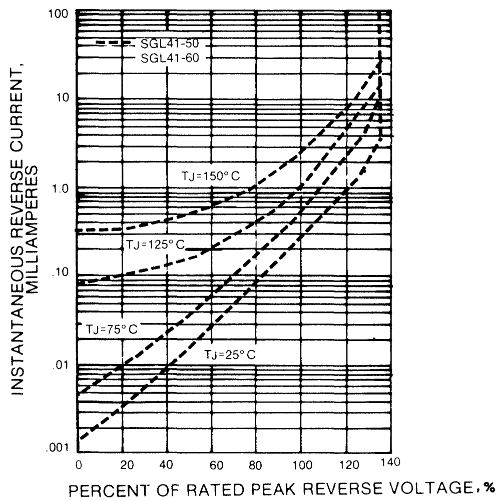


FIG. 4 — TYPICAL JUNCTION CAPACITANCE

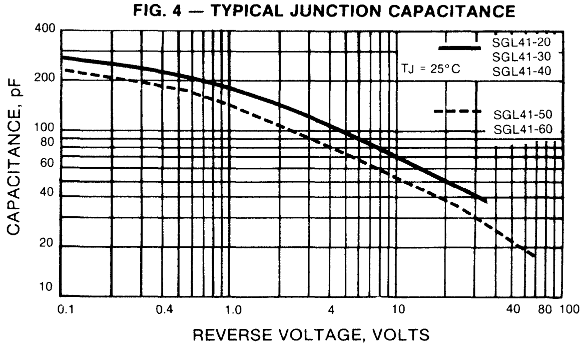
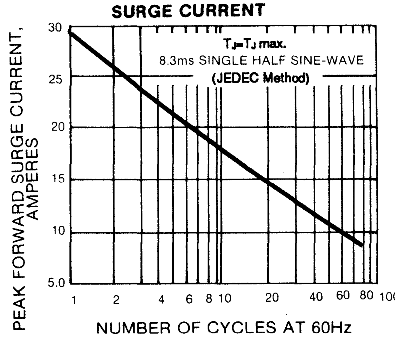


FIG.5—MAXIMUM NON—REPETITIVE SURGE CURRENT



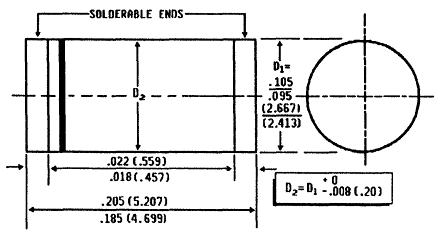
TGL41-6.8 THRU TGL41-200A

SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

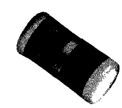
Voltage - *6.8 to 200 Volts* ***400 Watt Peak Pulse Power***

FEATURES

DO-213AB



Dimensions in inches and (millimeters)



- For surface mounted applications
- Plastic material used carries Underwriters Laboratory Flammability Classifications 94V-O
- Glass passivated junction
- Excellent clamping capability
- Low inductance
- Fast response time typically less than 1.0ps from 0 volts to BV for unidirectional and 5,0 NS for bidirectional types
- Repitition Rate (Duty Cycle): 0.01%
- Typical I_D less than 1 μA above 10V
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-213AB Molded plastic over passivated junction

Terminals: Solder Plated solderable per MIL-STD-750, Method 2026

Polarity: Blue bands denotes positive end (cathode) for unidirectional and a Yellow band in the middle for bidirectional types

Mounting Position: Any

Handling Precautions: None

Weight: 0.116 gram, 0.0046 ounce

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For bidirection applications use suffix letters C or CA for types TGL41-6.8 thru TGL41-200A (for ex. TGL41-6.8C, TGL41-200CA). Electrical characteristics apply in both directions

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATINGS	SYMBOL	VALUE	UNITS
Peak Pulse Power Dissipation on 10/1000μs waveform (NOTE 1, FIGURE 1)	P_{PPM}	Minimum 400	Watts
Steady State Power Dissipation at T_T=75°C (NOTE 2)	$P_{M(AV)}$	1.0	Watt
Peak Pulse Current on 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Peak Forward Surge Current, 8.3ms single half Sine-Wave Superimposed on Rated Load for unidirectional only (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum Instantaneous Forward Voltage at 50A (NOTE 3) for unidirectional only	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

NOTES: 1. Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2.
2. Mounted on .31 in2 (8.0 mm 2) copper pads to each terminal, Figure 5.
3. 8.3ms single half sine-wave or equivalent square wave duty cycle=4 pulses per minutes maximum.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

DEVICE	Breakdown Voltage V(BR) Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand-off Voltage VWM (Volts)	Maximum Reverse Leakage at VWM (NOTE 4) ID (mA)	Maximum Peak Pulse Current IPPM (NOTE 2) (Amps)	Maximum Clamping Voltage at IPPM VC(Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (% / °C)
TGL41-6.8	6.12	7.48	10	5.50	1000	37	10.8	0.060
TGL41-6.8A	6.45	7.14	10	5.80	1000	38	10.5	0.060
TGL41-7.5	6.75	8.25	10	6.05	500	34	11.7	0.064
TGL41-7.5A	7.13	7.88	10	6.40	500	35	11.3	0.064
TGL41-8.2	7.38	9.02	10	6.63	200	32	12.5	0.068
TGL41-8.2A	7.79	8.61	10	7.02	200	33	12.1	0.068
TGL41-9.1	8.19	10.0	1.0	7.37	50	29	13.8	0.071
TGL41-9.1A	8.65	9.55	1.0	7.78	50	30	13.4	0.071
TGL41-10	9.00	11.0	1.0	8.10	10	27	15.0	0.076
TGL41-10A	9.50	10.5	1.0	8.55	10	28	14.5	0.076
TGL41-11	9.90	12.1	1.0	8.92	5.0	25	16.2	0.078
TGL41-11A	10.5	11.6	1.0	9.40	5.0	26	15.6	0.078
TGL41-12	10.8	13.2	1.0	9.72	5.0	23	17.3	0.081
TGL41-12A	11.4	12.6	1.0	10.2	5.0	24	16.7	0.081
TGL41-13	11.7	14.3	1.0	10.5	5.0	21	19.0	0.084
TGL41-13A	12.4	13.7	1.0	11.1	5.0	22	18.2	0.084
TGL41-15	13.5	16.5	1.0	12.1	5.0	18.20	22.0	0.087
TGL41-15A	14.3	15.8	1.0	12.8	5.0	18.90	21.2	0.087
TGL41-16	14.4	17.6	1.0	12.9	5.0	17.00	23.5	0.089
TGL41-16A	15.2	16.8	1.0	13.6	5.0	17.80	22.5	0.089
TGL41-18	16.2	19.8	1.0	14.5	5.0	15.10	26.5	0.091
TGL41-18A	17.1	18.9	1.0	15.3	5.0	15.90	25.2	0.091
TGL41-20	18.0	22.0	1.0	16.2	5.0	13.70	29.1	0.093
TGL41-20A	19.0	21.0	1.0	17.1	5.0	14.40	27.7	0.093
TGL41-22	19.8	24.2	1.0	17.8	5.0	12.50	31.9	0.095
TGL41-22A	20.9	23.1	1.0	18.8	5.0	13.10	30.6	0.095
TGL41-24	21.6	26.4	1.0	19.4	5.0	11.50	34.7	0.097
TGL41-24A	22.8	25.2	1.0	20.5	5.0	12.00	33.2	0.097
TGL41-27	24.3	29.7	1.0	21.8	5.0	10.20	39.1	0.099
TGL41-27A	25.7	28.4	1.0	23.1	5.0	10.70	37.5	0.099
TGL41-30	27.0	33.0	1.0	24.3	5.0	9.20	43.5	0.100
TGL41-30A	28.5	31.5	1.0	25.6	5.0	9.70	41.4	0.100
TGL41-33	29.7	36.3	1.0	26.8	5.0	8.40	47.7	0.101
TGL41-33A	31.4	34.7	1.0	28.2	5.0	8.80	45.7	0.101
TGL41-36	32.4	39.6	1.0	29.1	5.0	7.70	52.0	0.102
TGL41-36A	34.2	37.8	1.0	30.8	5.0	8.00	49.9	0.102
TGL41-39	35.1	42.9	1.0	31.6	5.0	7.10	56.4	0.103
TGL41-39A	37.1	41.0	1.0	33.3	5.0	7.40	53.9	0.103
TGL41-43	38.7	47.3	1.0	34.8	5.0	6.50	61.9	0.104
TGL41-43A	40.9	45.2	1.0	36.8	5.0	6.70	59.3	0.104
TGL41-47	42.3	51.7	1.0	38.1	5.0	5.90	67.8	0.104
TGL41-47A	44.7	49.4	1.0	40.2	5.0	6.20	64.8	0.104
TGL41-51	45.9	56.1	1.0	41.3	5.0	5.40	73.5	0.105

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

DEVICE	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM}(NOTE 4) I_D (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Temperature Coefficient of $V_{(BR)}$ (% / °C)
TGL41-51A	48.5	53.6	1.0	43.6	5.0	5.70	70.1	0.105
TGL41-56	50.4	61.6	1.0	45.4	5.0	5.00	80.5	0.106
TGL41-56A	53.2	58.8	1.0	47.8	5.0	5.20	77.0	0.106
TGL41-62	55.8	68.2	1.0	50.2	5.0	4.50	89.0	0.107
TGL41-62A	58.9	65.1	1.0	53.0	5.0	4.70	85.0	0.107
TGL41-68	61.2	74.8	1.0	55.1	5.0	4.10	98.0	0.107
TGL41-68A	64.6	71.4	1.0	58.1	5.0	4.30	92.0	0.107
TGL41-75	67.5	82.5	1.0	60.7	5.0	3.70	108.0	0.108
TGL41-75A	71.3	78.8	1.0	64.1	5.0	3.90	103.0	0.108
TGL41-82	73.8	90.2	1.0	66.4	5.0	3.40	118.0	0.108
TGL41-82A	77.9	86.1	1.0	70.1	5.0	3.50	113.0	0.108
TGL41-91	81.9	100.0	1.0	73.7	5.0	3.00	131.8	0.109
TGL41-91A	86.5	95.50	1.0	77.8	5.0	3.20	125.0	0.109
TGL41-100	90.0	110.0	1.0	81.0	5.0	1.39	144.0	0.109
TGL41-100A	95.0	105.0	1.0	85.5	5.0	1.46	137.0	0.109
TGL41-110	99.0	121.0	1.0	89.2	5.0	1.27	158.0	0.110
TGL41-110A	105.0	116.0	1.0	94.0	5.0	1.32	152.0	0.110
TGL41-120	108.0	132.0	1.0	97.2	5.0	1.16	173.0	0.110
TGL41-120A	114.0	126.0	1.0	102.0	5.0	1.21	165.0	0.110
TGL41-130	117.0	143.0	1.0	105.0	5.0	1.07	187.0	0.110
TGL41-130A	124.0	137.0	1.0	111.0	5.0	1.12	179.0	0.110
TGL41-150	135.0	165.0	1.0	121.0	5.0	.93	215.0	0.111
TGL41-150A	143.0	158.0	1.0	128.0	5.0	.97	207.0	0.111
TGL41-160	144.0	176.0	1.0	130.0	5.0	.87	230.0	0.111
TGL41-160A	152.0	168.0	1.0	136.0	5.0	.91	219.0	0.111
TGL41-170	153.0	187.0	1.0	138.0	5.0	.82	244.0	0.111
TGL41-170A	162.0	179.0	1.0	145.0	5.0	.85	234.0	0.111
TGL41-180	162.0	198.0	1.0	146.0	5.0	.78	258.0	0.111
TGL41-180A	171.0	189.0	1.0	154.0	5.0	.81	246.0	0.111
TGL41-200	180.0	220.0	1.0	162.0	5.0	.70	287.0	0.111
TGL41-200A	190.0	210.0	1.0	171.0	5.0	.73	274.0	0.111

NOTES:

1. V_{BR} measured after I_T applied for 300μs I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEE C62.35.
4. For bidirectional types having V_{WM} of 10 volts and less, the I_D limit is doubled.

FIGURE 1 - PEAK PULSE POWER RATING VERSUS PULSE TIME CURVE

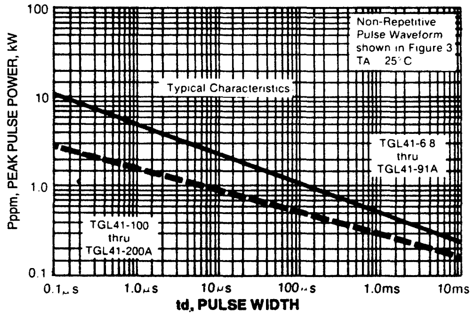


FIGURE 2 — PULSE DERATING CURVE

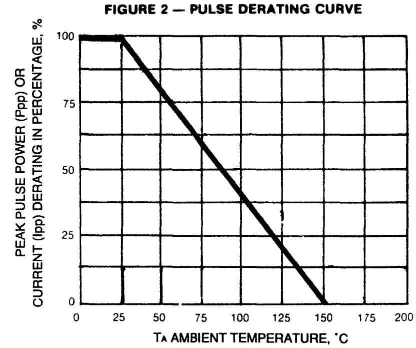


FIGURE 3 — PUSLE WAVEFORM

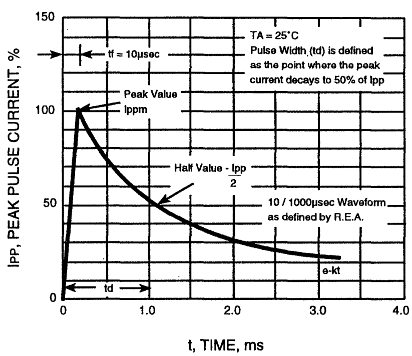


FIGURE 4 - TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

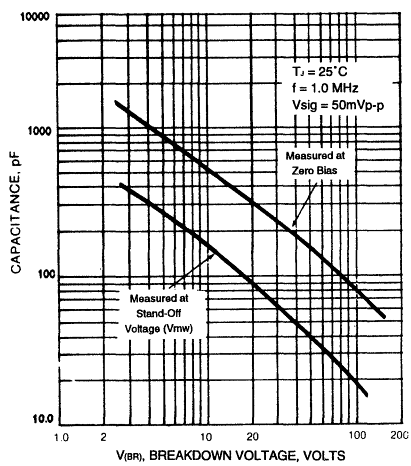


FIGURE 5 — STEADY STATE POWER DERATING

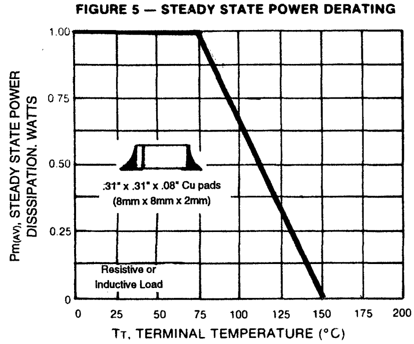
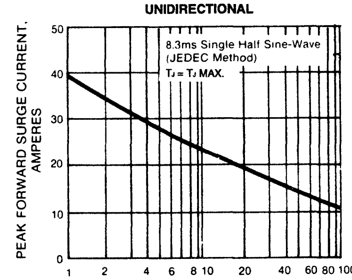


FIGURE 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL



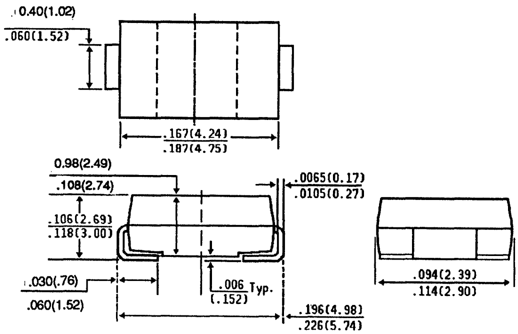
GF1A THRU GF1M

GLASS PASSIVATED SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.0 Ampere*

FEATURES

DO-214BA



PATENTED*

Dimensions in inches and (millimeters)

Glass-Plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- Ideal for surface mounted automotive applications
- High temperature metallurgically bonded constructed rectifiers
- Glass passivated junction
- Built-in strain relief
- Easy pick and place
- High temperature soldering guaranteed: 450°C/5 seconds at terminals
- Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-214BA molded plastic over glass passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.0048 ounces, 0.120 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	GF1A	GF1B	GF1D	GF1G	GF1J	GF1K	GF1M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_L=125°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.10					1.20		Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0							µA
Typical Reverse Recovery Time (NOTE 1)	T_{rr}	2.0							µs
Typical Junction Capacitance (NOTE 2)	C_J	15.0							pF
Maximum Thermal Resistance (NOTE 3)	RΘJL	30.0							°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175							°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and Applied Vr=4.0 volts.
3. P.C. board mounted on 5.0mm^2 (.013mm thick) copper land areas.

FIG 1- FORWARD CURRENT DERATING CURVE

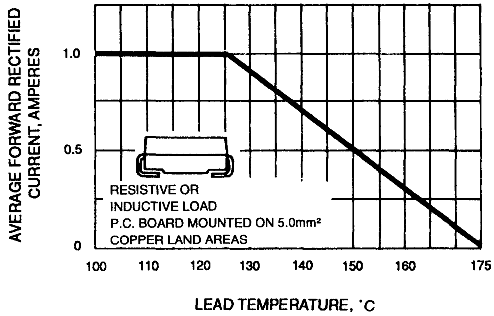


FIG 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

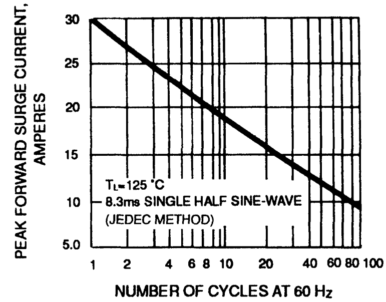


FIG 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

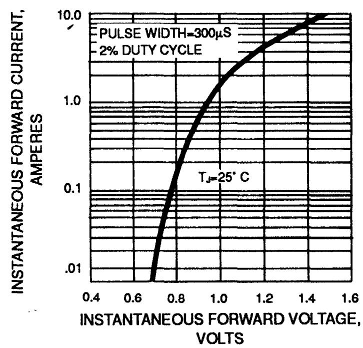


FIG 4 - TYPICAL JUNCTION CAPACITANCE

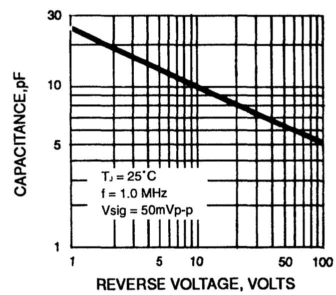


FIG 5 - TYPICAL REVERSE CHARACTERISTICS

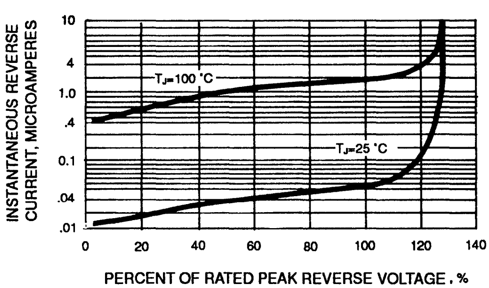
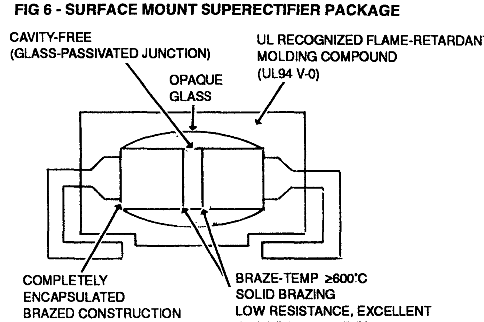


FIG 6 - SURFACE MOUNT SUPERECTIFIER PACKAGE



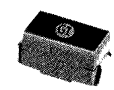
RGF1A THRU RGF1M

SURFACE MOUNT GLASS PASSIVATED FAST SWITCHING SILICON RECITFIER

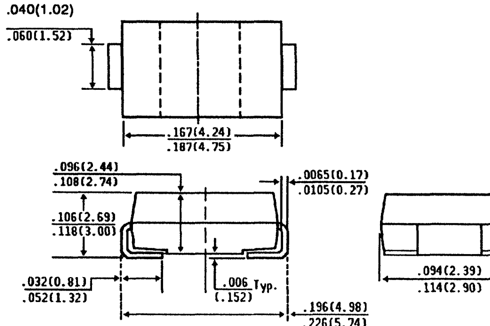
***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.0 Ampere*

FEATURES

- Plastic Package has Underwriters Laboratory Flammability Classification 94 V-O
- Ideal for surface mounted automotive applications
- High temperature metallurgically bonded constructed rectifiers
- Glass passivated junction
- Built-in strain relief
- Easy pick and place
- Fast switching for high efficiency
- High temperature soldering guaranteed: 450°C/5 seconds at terminals
- Complete device submersible temperature of 265°C for 10 seconds in solder bath



DO-214BA



PATENTED*

Dimensions in inches and (millimeters)

Glass-Plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976.

MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic over glass passivated junction
Terminals: Solder plated solderable per MIL-STD-750, 2026
Polarity: Color band denotes cathode
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.0048 ounces, 0.120 gram

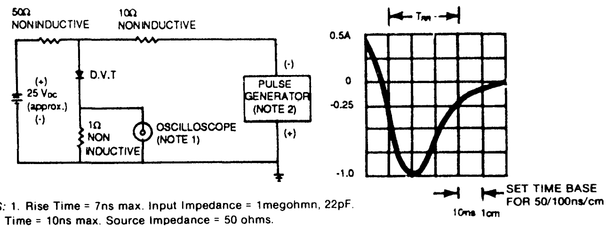
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. 60 Hz, resistive or inductive load.

	SYMBOLS	RGF1A	RGF1B	RGF1D	RGF1G	RGF1J	RGF1K	RGF1M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_L=120°C	$I_{(AV)}$	1.0							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC method)	I_{FSM}	30.0							Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.30							Volts
Maximum Full Load Reverse Current, Full Cycle Average, T_A=55°C	$I_{R(AV)}$	50.0							µA
Maximum DC Reverse Current at Rated DC Blocking Voltage T_A=25°C / T_A=125°C	I_R	5.0 / 100							µA
Maximum Reverse Recovery Time (NOTE 1)	T_{rr}	150				250	500		ns
Typical Junction Capacitance (NOTE 2)	C_J	8.5							pF
Maximum Thermal Resistance (NOTE 3)	$R_{\theta JL}$	30.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175							°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and Applied Vr=4.0 volts.
3. P.C. board mounted on 5.0mm^2 (.013mm thick) copper land areas.

FIG 1-REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time = 7ns max. Input Impedance = 1megohmn, 22pF.
2. Rise Time = 10ns max. Source Impedance = 50 ohms.

FIG 2- FORWARD CURRENT DERATING CURVE

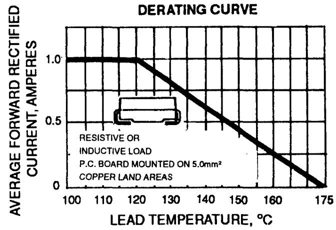


FIG 4 - TYPICAL JUNCTION CAPACITANCE

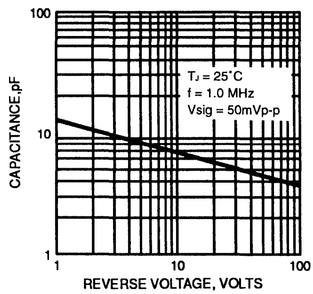


FIG 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

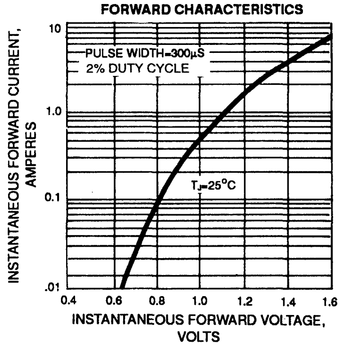


FIG 6 - TYPICAL REVERSE CHARACTERISTICS

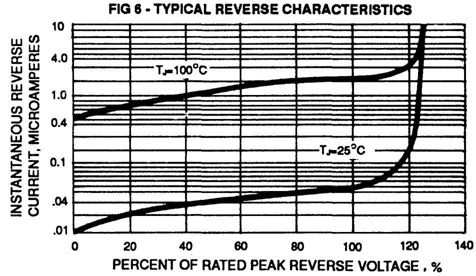


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

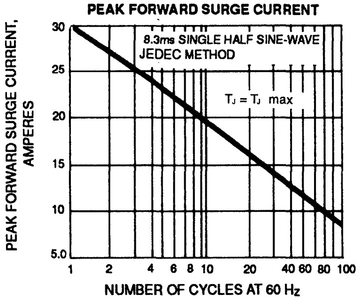
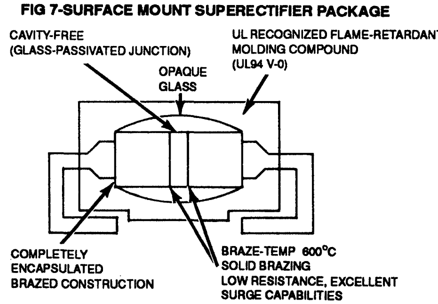


FIG 7-SURFACE MOUNT SUPERECTIFIER PACKAGE

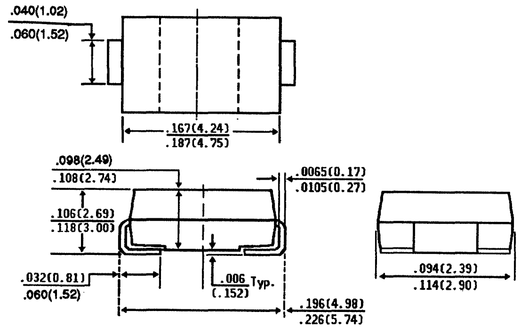


EGF1A THRU EGF1D

ULTRA FAST SURFACE MOUNT RECTIFIER

***VOLTAGE* - 50 to 200 Volts *CURRENT* - 1.0 Ampere**

DO-214BA



Dimensions in inches and (millimeters)

PATENTED*

Glass-Plastic encapsulation technique is covered by Patent No. 3,996,602 of 1976; brazed-lead assembly to Patent No. 3,930,306 of 1976.

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- Ideal for surface mounted automotive applications
- High temperature metallurgically bonded constructed rectifiers
- Superfast recovery times for high efficiency
- Glass passivated junction
- Built-in strain relief
- Easy pick and place
- High temperature soldering guaranteed: 450°C/5 seconds at terminals. Complete device submersible temperature of 265°C for 10 seconds in solder bath

MECHANICAL DATA

Case: JEDEC DO-214BA molded plastic over glass passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 12mm tape (*EIA STD RS-481*)
Weight: 0.0048 ounces, 0.120 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	EGF1A	EGF1B	EGF1C	EGF1D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_L=125°C	$I_{(AV)}$	1.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0				Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F	1.00				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 50.0				µA
Maximum Reverse Recovery Time (NOTE 1)	T_{rr}	50.0				ns
Typical Junction Capacitance (NOTE 2)	C_J	15.0				pF
Maximum Thermal Resistance (NOTE 3)	$R_{\Theta JL}$	30.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175				°C

NOTES:
1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. P.C. board mounted on 5.0mm^2 (.013mm thick) copper land areas.

FIG. 1 - FORWARD CURRENT DERATING CURVE

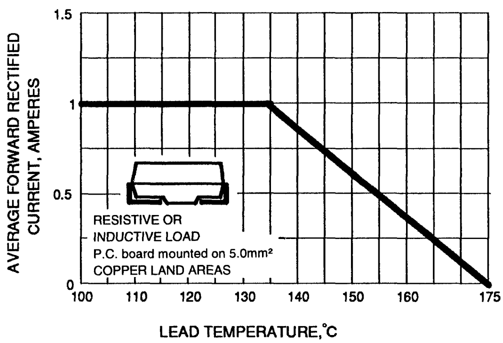


FIG. 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

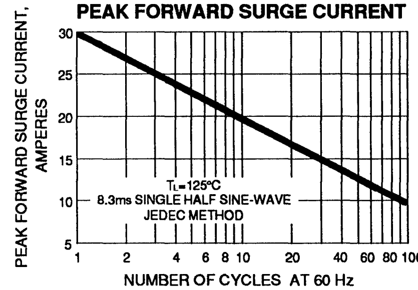


FIG. 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

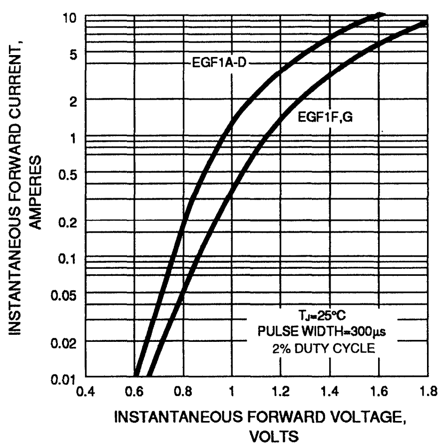


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

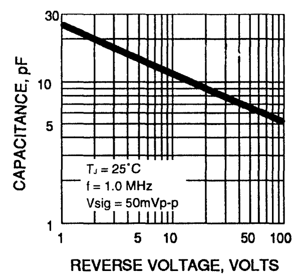


FIG. 5 - TYPICAL REVERSE CHARACTERISTICS

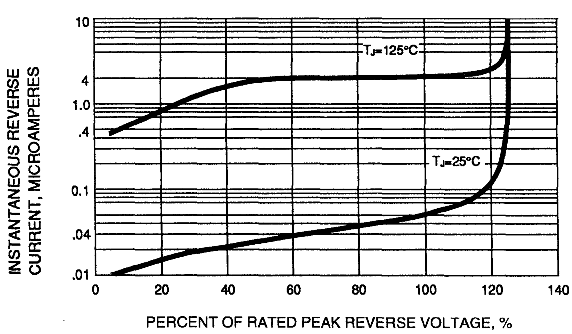
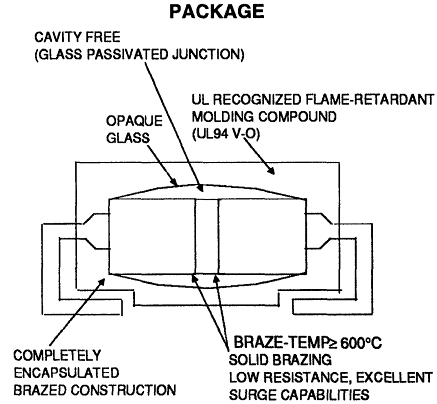


FIG. 6 - SURFACE MOUNT SUPERECTIFIER PACKAGE



• • • • • • P • R • E • L • I • M • I • N • A • R • Y • • • • • •

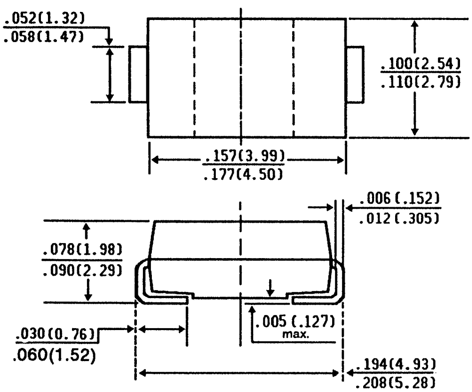
S1A THRU S1J

SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 600 Volts* ***CURRENT** - 1.0 Amperes*

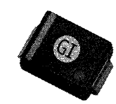
FEATURES

DO-214AC



Dimensions in inches and (millimeters)

- For surface mounted applications
- Low profile package
- Built-in strain relief
- Easy pick and place
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: Molded plastic
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Indicated by cathode band
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.002 ounces, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Single phase, half wave, 60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	*S1A*	*S1B*	*S1D*	*S1G*	*S1J*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current at T_L=110°C	$I_{(AV)}$			1.0			Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			30.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.10			Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R			1.0 50.0			µA
Typical Reverse Recovery Time (NOTE 1)	T_{rr}			1.8			µs
Typical Junction Capacitance (NOTE 2)	C_J			12.0			pf
Typical Thermal Resistance (NOTE 3)	$R\theta JL$ $R\theta JA$			27.0 75.0			°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}			-55 to +150			°C

NOTES:
1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. 5.0mm^2 (.013mm thick) land areas.

FIG. 1 - FORWARD CURRENT DERATING CURVE

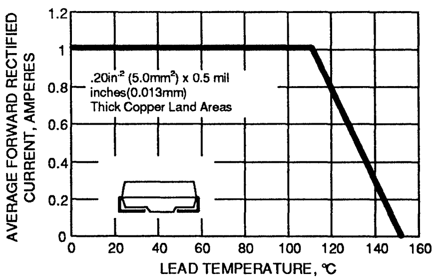


FIG 2 - MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

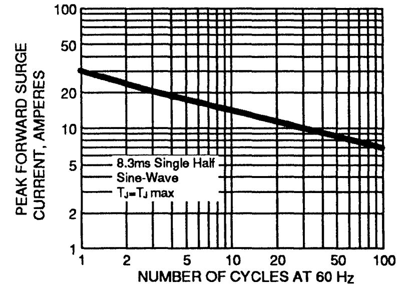


FIG 3 - TYPICAL REVERSE CHARACTERISTICS

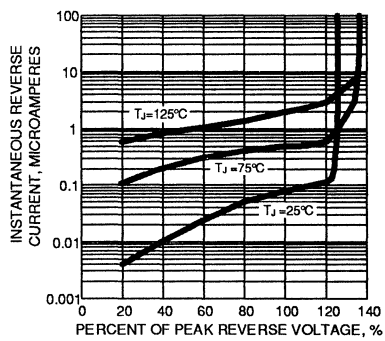


FIG 4 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

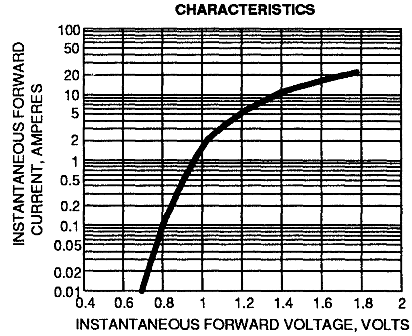


FIG.5- TRANSIENT THERMAL IMPEDANCE

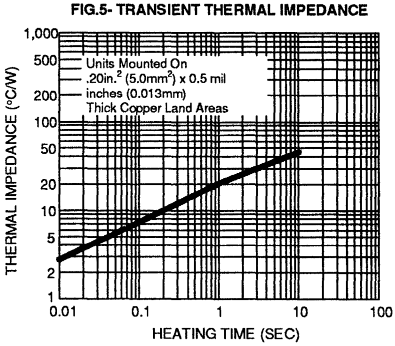
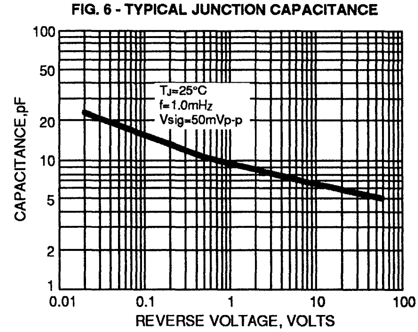


FIG. 6 - TYPICAL JUNCTION CAPACITANCE



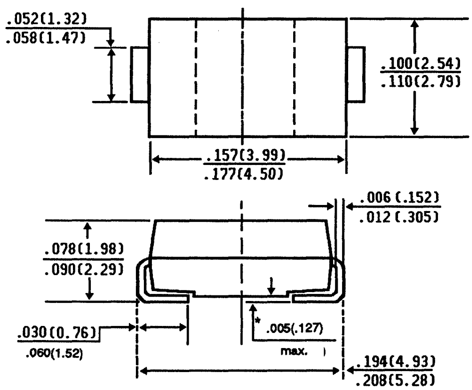
RS1A THRU RS1J

FAST SWITCHING SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 600 Volts* ***CURRENT** - 1.0 Ampere*

FEATURES

DO-214AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Easy pick and place
- Fast switching for high efficiency
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic over passivated junction
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 8mm tape *(EIA STD RS-481)*
Weight: 0.002 ounces, 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*RS1A*	*RS1B*	*RS1D*	*RS1G*	*RS1J*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	Volts
Maximum Average Forward Rectified Current at T_L=95°C	$I_{(AV)}$			1.0			Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			30.0			Amps
Maximum Instantaneous Forward Voltage at 1.0A	V_F			1.30			Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R			5.0 50.0			µA
Maximum Reverse Recovery Time (NOTE 1)	T_{rr}	150				250	ns
Typical Junction Capacitance (NOTE 2)	C_J			10.0			pF
Maximum Thermal Resistance (NOTE 3)	RΘJL RΘJA			32.0 105.0			°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}			-55 to +150			°C

NOTES:
1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. Mounted on P.C. board with 5.0mm^2 (.013mm thick) copper land areas.

FIG.1 - FORWARD CURRENT DERATING CURVE

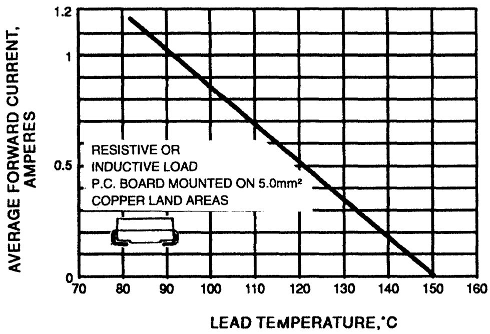


FIG.2 - MAXIMUM NON REPETITIVE PEAK FORWARD SURGE CURRENT

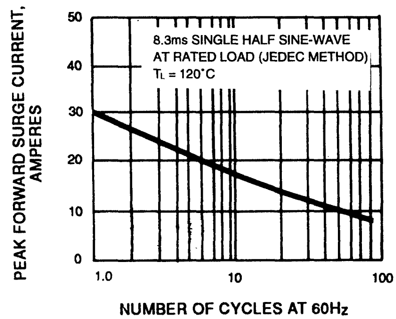
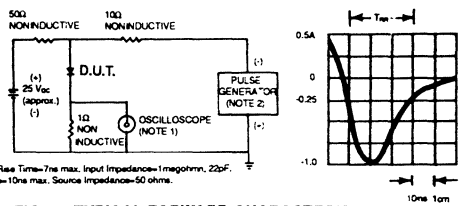


FIG.3 - REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time=7ns max. Input Impedance=1megohm, 22pF.
2. Rise Time=10ns max. Source Impedance=50 ohms.

FIG.4 - TYPICAL JUNCTION CAPACITANCE

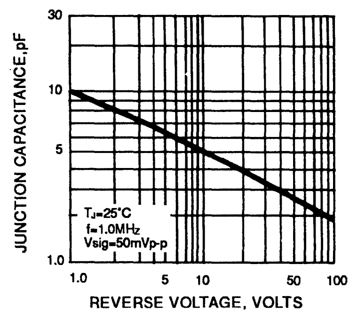


FIG. 5 - TYPICAL FORWARD CHARACTERISTICS

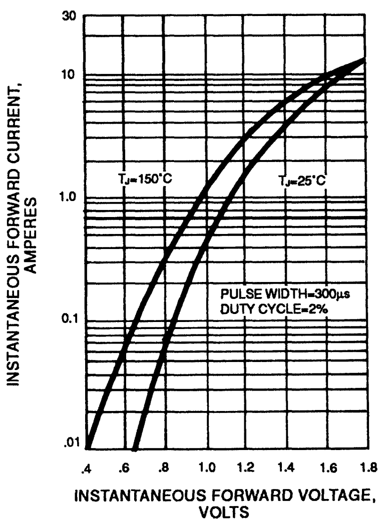
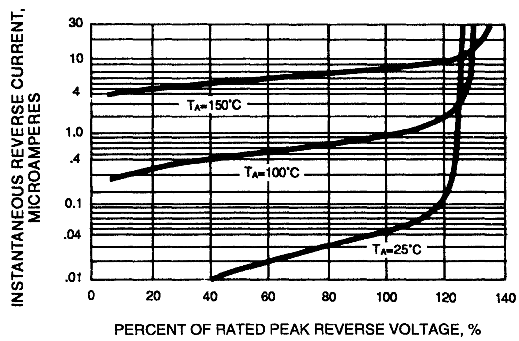


FIG.6 - TYPICAL REVERSE CHARACTERISTICS



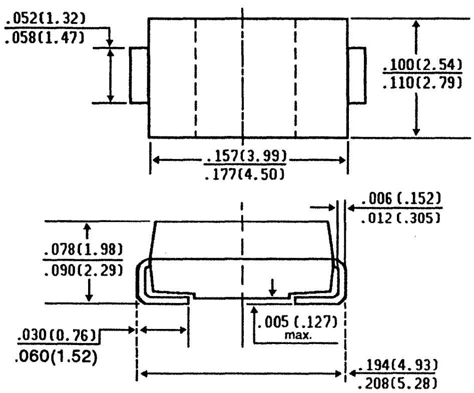
ES1A THRU ES1D

SURFACE MOUNT ULTRAFAST RECTIFIER

***VOLTAGE** - 50 - 200 Volts* ***CURRENT** - 1.0 Ampere*

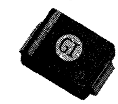
FEATURES

DO-214AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- For surface mounted applications
- Low profile package
- Ideally suited for use in very high frequency switching power supplies, inverters and as free wheeling diodes
- Ultrafast 15 nanosecond recovery times
- Low forward voltage
- Low leakage current
- Glass passivated junction
- High temperature soldering guaranteed: 250°C/10 seconds on terminals



MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode band
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.002 ounces, .064 gram

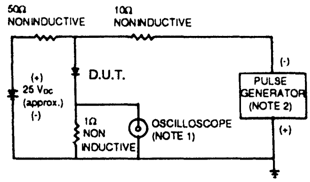
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

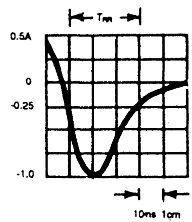
Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	ES1A	ES1B	ES1C	ES1D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_L=120°C	$I_{(AV)}$	0.6				Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0				Amps
Maximum Instantaneous Forward Voltage at 0.6A / at 1.0A	V_F	0.865 / 0.920				Volts
Maximum DC Reverse Current T_A=25°C / at Rated DC Blocking Voltage T_A=100°C	I_R	5.0 / 100				μA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	15.0				nS
Maximum Reverse Recovery Time (NOTE 2) T_A=25°C / T_A=100° C	T_{rr}	25.0 / 35.0				nS
Maximum Stored Charge (NOTE 2) T_A=25°C / T_A=100°C	Q_{RR}	10.0 / 25.0				nC
Typical Junction Capacitance (NOTE 3)	C_J	10.0				pF
Maximum Thermal Resistance (NOTE 4)	$R\theta JL$ / $R\theta JA$	35.0 / 85.0				°C/W
Operating and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

NOTES: 1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: I_F=0.6A, V_R=30V, di/dt=50 A/μs.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
4. P.C. board mounted on 5.0mm^2 (.013mm thick) copper pad areas.

FIG 1 - REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM





NOTES: 1. Rise Time = 7ns max. Input Impedance = 1megohmn, 22pF
2. Rise Time = 10ns max. Source Impedance = 50 ohms.

FIG 2 -MAXIMUM AVERAGE FORWARD CURRENT RATING

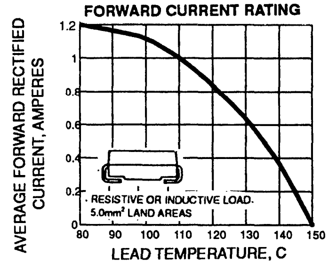


FIG 3 - TYPICAL REVERSE CHARACTERISTICS

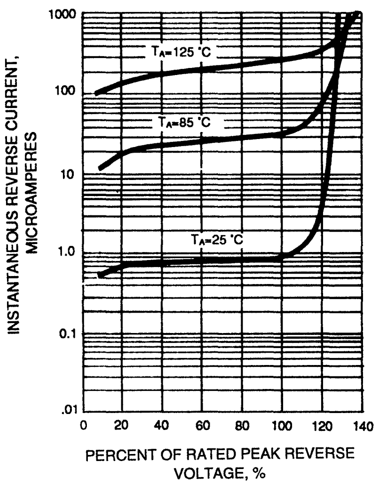


FIG 4 - TYPICAL FORWARD CHARACTERISTICS

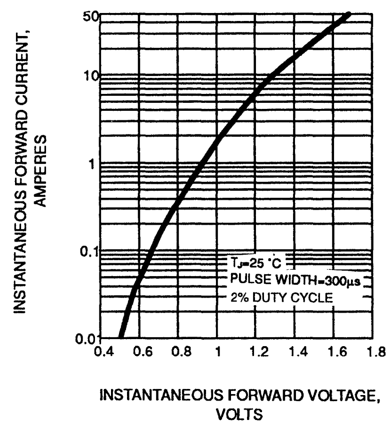


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

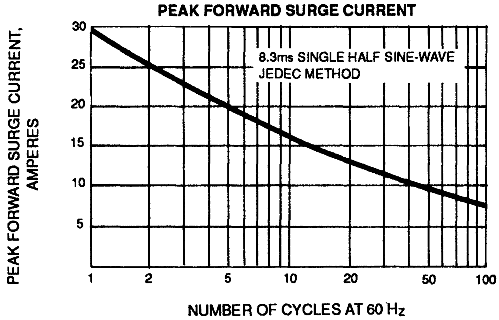
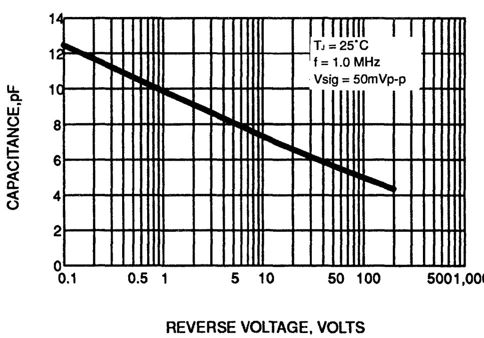


FIG 6 - TYPICAL JUNCTION CAPACITANCE



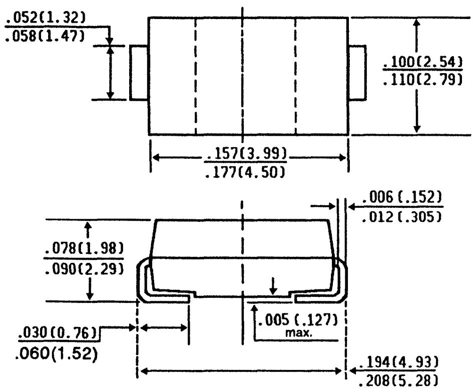
SS12 THRU SS16

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER

***VOLTAGE** - 20 TO 60 Volts* ***CURRENT** - 1.0 Ampere*

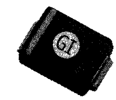
FEATURES

DO-214AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- High temperatur soldering guaranteed: 250°C/10 seconds on terminals



MECHANICAL DATA

Case: JEDEC DO-214AC molded plastic
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.002 ounces 0.064 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	SS12	SS13	SS14	SS15	SS16	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current at T_L (See Figure 1)	$I_{(AV)}$	1.0					Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	30.0					Amps
Maximum Instantaneous Forward Voltage at 1.0A (NOTE 1)	V_F	0.50			0.75		Volts
Maximum DC Reverse Current (NOTE 1) T_A=25°C	I_R	0.5					mA
at Rated DC Blocking Voltage T_A=100°C		10.0			5.0		
Maximum Thermal Resistance (NOTE 2)	RΘJL	35.0					°C/W
	RΘJA	95.0					
Operating Junction Temperature Range	T_J	-65 to +125			-65 to +150		°C
Storage Temperature Range	T_{STG}	-65 to +150					°C

NOTES:
1. Pulse Test with PW=300μsec, 2% Duty Cycle.
2. Mounted on P.C. Board with 5.0mm^2 (.013mm thick) copper pad areas.

FIG. 1 - FORWARD DERATING CURVE

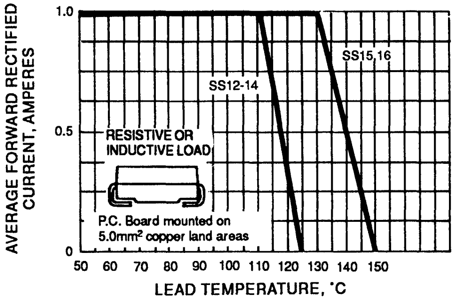


FIG.2- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

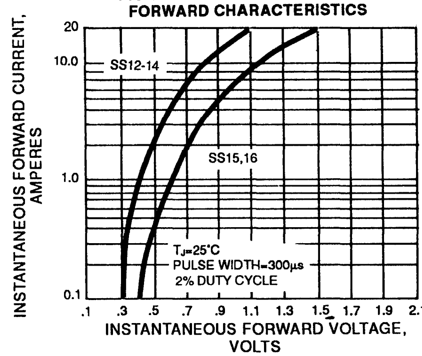


FIG.3A - TYPICAL REVERSE CHARACTERISTICS

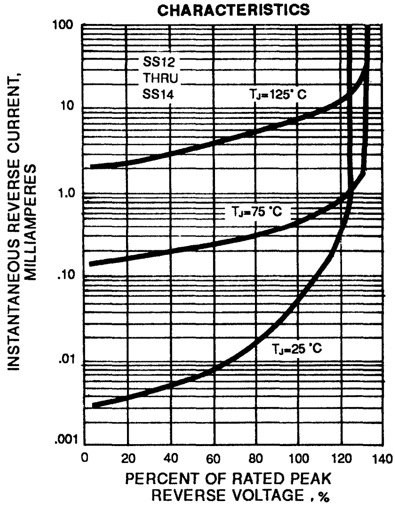


FIG 3B-TYPICAL REVERSE CHARACATERISTICS

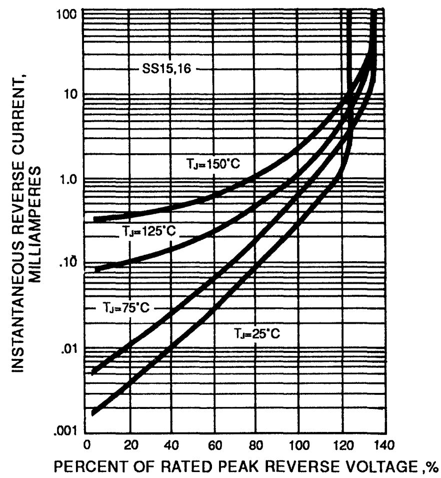


FIG.4 - TYPICAL JUNCTION CAPACITANCE

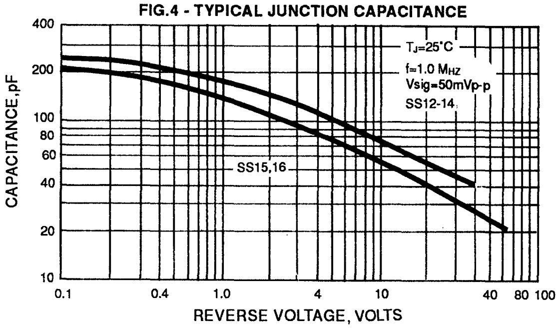
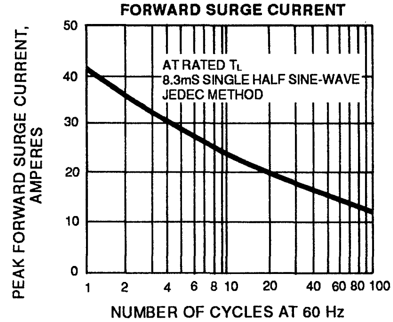


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



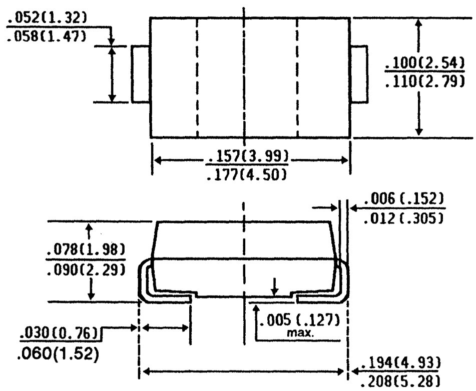
SMAJ5.0 THRU SMAJ170A

SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

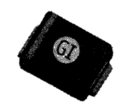
VOLTAGE - 5.0 to 170 Volts 400 Watt Peak Power Pulse

FEATURES

DO-214AC



Dimensions in inches and (millimeters)



- For surface mounted applications
- Low profile package
- Built-in strain relief
- Available in unidirectional only
- Glass passivated junction
- Excellent clamping capability
- Low inductance
- Fast response time: typically less than 1.0ps from 0 volts to BV min.
- Repetition rate (Duty Cyce) : 0.01%
- Typical I_D less than 1μA above 10V
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AC low profile molded plastic

Terminals: Solder plated, solderable per MIL-STD-750, Method 2026

Polarity: Indicated by cathode band

Weight: .002 ounces, .064 gram

Standard Packaging: 12mm tape per (*EIA std RS-481-1)*

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	VALUE	UNITS
Peak Pulse Power Dissipation at T_A=25°C (NOTE 1,2,5) Fig.1	P_{PPM}	Minimum 400	Watts
Peak Forward Surge Current per Figure 5 (NOTE 3)	I_{FSM}	40.0	Amps
Peak Pulse Current Current on 10/1000μs waveform (NOTE 1, FIG.2)	I_{PPM}	See Table 1	Amps
Steady State Power Dissipation (NOTE 4)	$P_{M(AV)}$	1.0	Watts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 5.0mm^2 copper pads to each terminal.
3. 8.3ms single half sine-wave duty cycle=4 pulses per minutes maximum.
4. Lead temperature at 75°C=T_L.
5. Peak pulse power waveform is 10/1000μS.

TABLE 1	ELECTRICAL CHARACTERISTICS AT 25°C

Device	Device Marking Code	Working Peak Reverse Voltage V_{WM} (Volts)	Breakdown Voltage $V_{(BR)}$ (Volts) at Min.	Max.	I_T mA	Maximum Clamping Voltage at I_{PPM} V_C (Volts) (NOTE 5)	Maximum Peak Impulse Surge Current I_{PPM} (NOTE 5) (Amps)	Maximum Reverse Leakage at V_{WM} I_D (µA)
SMAJ5.0	AD	5.0	6.40	7.30	10	9.6	41.6	800
SMAJ5.0A	AE	5.0	6.40	7.0	10	9.2	43.5	800
SMAJ6.0	AF	6.0	6.67	8.15	10	11.4	35.1	800
SMAJ6.0A	AG	6.0	6.67	7.37	10	10.3	38.8	800
SMAJ6.5	AH	6.5	7.22	8.82	10	12.3	32.5	500
SMAJ6.5A	AK	6.5	7.22	7.98	10	11.2	35.7	500
SMAJ7.0	AL	7.0	7.78	9.51	10	13.3	30.1	200
SMAJ7.0A	AM	7.0	7.78	8.60	10	12.0	33.3	200
SMAJ7.5	AN	7.5	8.33	10.3	1.0	14.3	28.0	100
SMAJ7.5A	AP	7.5	8.33	9.21	1.0	12.9	31.0	100
SMAJ8.0	AQ	8.0	8.89	10.9	1.0	15.0	26.5	50.0
SMAJ8.0A	AR	8.0	8.89	9.83	1.0	13.6	29.4	50.0
SMAJ8.5	AS	8.5	9.44	11.5	1.0	15.9	25.1	10.0
SMAJ8.5A	AT	8.5	9.44	10.4	1.0	14.4	27.7	10.0
SMAJ9.0	AU	9.0	10.0	12.2	1.0	16.9	23.6	5.0
SMAJ9.0A	AV	9.0	10.0	11.1	1.0	15.4	26.0	5.0
SMAJ10	AW	10	11.1	13.6	1.0	18.8	21.2	5.0
SMAJ10A	AX	10	11.1	12.3	1.0	17.0	23.5	5.0
SMAJ11	AY	11	12.2	14.9	1.0	20.1	20.0	5.0
SMAJ11A	AZ	11	12.2	13.5	1.0	18.2	22.0	5.0
SMAJ12	BD	12	13.3	16.3	1.0	22.0	18.1	5.0
SMAJ12A	BE	12	13.3	14.7	1.0	19.9	20.1	5.0
SMAJ13	BF	13	14.4	17.6	1.0	23.8	16.8	5.0
SMAJ13A	BG	13	14.4	15.9	1.0	21.5	18.6	5.0
SMAJ14	BH	14	15.6	19.1	1.0	25.8	15.5	5.0
SMAJ14A	BK	14	15.6	17.2	1.0	23.2	17.2	5.0
SMAJ15	BL	15	16.7	20.4	1.0	26.9	14.8	5.0
SMAJ15A	BM	15	16.7	18.5	1.0	24.4	16.4	5.0
SMAJ16	BN	16	17.8	21.8	1.0	28.8	13.8	5.0
SMAJ16A	BP	16	17.8	19.7	1.0	26.0	15.3	5.0
SMAJ17	BQ	17	18.9	23.1	1.0	30.5	13.1	5.0
SMAJ17A	BR	17	18.9	20.9	1.0	27.6	14.5	5.0
SMAJ18	BS	18	20.0	24.4	1.0	32.2	12.4	5.0
SMAJ18A	BT	18	20.0	22.1	1.0	29.2	13.7	5.0
SMAJ20	BU	20	22.2	27.1	1.0	35.8	11.1	5.0
SMAJ20A	BV	20	22.2	24.5	1.0	32.4	12.3	5.0
SMAJ22	BW	22	24.4	29.8	1.0	39.4	10.1	5.0
SMAJ22A	BX	22	24.4	26.9	1.0	35.5	11.2	5.0
SMAJ24	BY	24	26.7	32.6	1.0	43.0	9.3	5.0
SMAJ24A	BZ	24	26.7	29.5	1.0	38.9	10.3	5.0
SMAJ26	CD	26	28.9	35.3	1.0	46.6	8.6	5.0
SMAJ26A	CE	26	28.9	31.9	1.0	42.1	9.5	5.0
SMAJ28	CF	28	31.1	38.0	1.0	60.0	8.0	5.0
SMAJ28A	CG	28	31.1	34.4	1.0	45.4	8.8	5.0
SMAJ30	CH	30	33.3	40.7	1.0	53.5	7.5	5.0
SMAJ30A	CK	30	33.3	36.8	1.0	48.4	8.3	5.0
SMAJ33	CL	33	36.7	44.9	1.0	59.0	6.8	5.0
SMAJ33A	CM	33	36.7	40.6	1.0	53.3	7.5	5.0
SMAJ36	CN	36	40.0	48.9	1.0	64.3	6.2	5.0
SMAJ36A	CP	36	40.0	44.2	1.0	58.1	6.9	5.0
SMAJ40	CQ	40	44.4	54.3	1.0	71.4	5.6	5.0
SMAJ40A	CR	40	44.4	49.1	1.0	64.5	6.2	5.0
SMAJ43	CS	43	47.8	58.4	1.0	76.7	5.2	5.0
SMAJ43A	CT	43	47.8	52.8	1.0	69.4	5.7	5.0
SMAJ45	CU	45	50.0	61.1	1.0	80.3	5.0	5.0
SMAJ45A	CV	45	50.0	55.3	1.0	72.7	5.5	5.0

ELECTRICAL CHARACTERISTICS AT 25°C

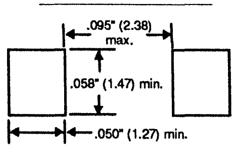
Device	Device Marking Code	Working Peak Reverse Voltage V_{WM} (Volts)	Breakdown Voltage $V_{(BR)}$ (Volts) at Min.	Max.	IT mA	Maximum Clamping Voltage at I_{PPM} V_C (Volts) (NOTE 5)	Maximum Peak Impulse Surge Current I_{PPM} (NOTE 5) (Amps)	Maximum Reverse Leakage at V_{RWM} I_D (µA)
SMAJ48	CW	48	53.3	65.1	1.0	85.5	4.7	5.0
SMAJ48A	CX	48	53.3	58.9	1.0	77.4	5.2	5.0
SMAJ51	CY	51	56.7	69.3	1.0	91.1	4.4	5.0
SMAJ51A	CZ	51	56.7	62.7	1.0	82.4	4.9	5.0
SMAJ54	RD	54	60.0	73.3	1.0	96.3	4.2	5.0
SMAJ54A	RE	54	60.0	66.3	1.0	87.1	4.6	5.0
SMAJ58	RF	58	64.4	78.7	1.0	103.0	3.9	5.0
SMAJ58A	RG	58	64.4	71.2	1.0	93.6	4.3	5.0
SMAJ60	RH	60	66.7	81.5	1.0	107.0	3.7	5.0
SMAJ60A	RK	60	66.7	73.7	1.0	96.8	4.1	5.0
SMAJ64	RL	64	71.1	86.4	1.0	114.0	3.5	5.0
SMAJ64A	RM	64	71.1	78.6	1.0	103.0	3.9	5.0
SMAJ70	RN	70	77.8	95.1	1.0	125	3.2	5.0
SMAJ70A	RP	70	77.8	86.0	1.0	113	3.5	5.0
SMAJ75	RQ	75	83.3	102	1.0	134	3.0	5.0
SMAJ75A	RR	75	83.3	92.1	1.0	121	3.3	5.0
SMAJ78	RS	78	86.7	106	1.0	139	2.9	5.0
SMAJ78A	RT	78	86.7	95.8	1.0	126	2.2	5.0
SMAJ85	RU	85	94.4	115	1.0	151	2.6	5.0
SMAJ85A	RV	85	94.4	104	1.0	137	2.9	5.0
SMAJ90	RW	90	100	122	1.0	160	2.5	5.0
SMAJ90A	RX	90	100	111	1.0	146	2.7	5.0
SMAJ100	RY	100	111	136	1.0	179	2.2	5.0
SMAJ100A	RZ	100	111	123	1.0	162	2.5	5.0
SMAJ110	SD	110	122	149	1.0	196	2.0	5.0
SMAJ110A	SE	110	122	135	1.0	177	2.3	5.0
SMAJ120	SF	120	133	163	1.0	214	1.9	5.0
SMAJ120A	SG	120	133	147	1.0	193	2.0	5.0
SMAJ130	SH	130	144	176	1.0	231	1.7	5.0
SMAJ130A	SK	130	144	159	1.0	209	1.9	5.0
SMAJ150	SL	150	167	204	1.0	268	1.5	5.0
SMAJ150A	SM	150	167	185	1.0	243	1.6	5.0
SMAJ160	SN	160	178	218	1.0	287	1.4	5.0
SMAJ160A	SP	160	178	197	1.0	259	1.5	5.0
SMAJ170	SQ	170	189	231	1.0	304	1.3	5.0
SMAJ170A	SR	170	189	209	1.0	275	1.4	5.0

APPLICATION NOTES

Recommended Pad Layout

The pad dimensions should be 0.010" longer than the contact size in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

MODIFIED J-BEND



(Dimensions in inches and (millimeters)

This device is designed specifically for transient voltage suppression from threats generated by ESD for board level load switching components.

The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground.

This series is designed to optimize board space and for use with surface mount technology automated assembly equipment.

They can be easily mounted on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage.

GI General Instrument

FIG. 1 - PEAK PULSE POWER RATING CURVE

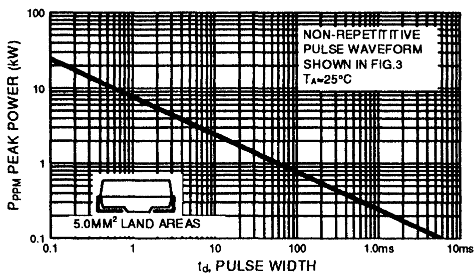


FIG. 2 - PULSE RATING CURVE

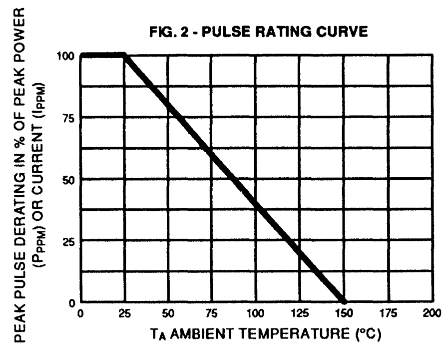


FIG. 3 - PULSE WAVEFORM

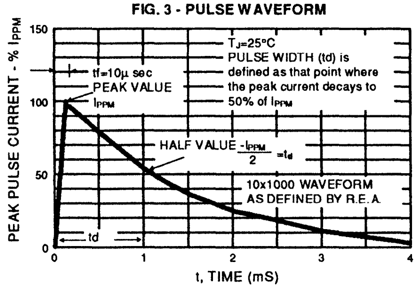


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

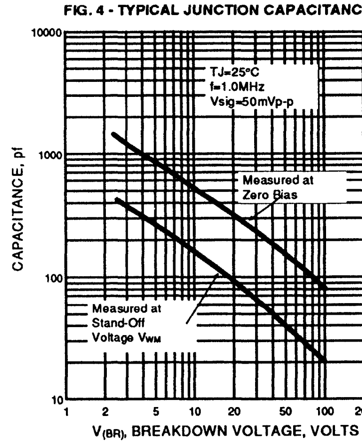
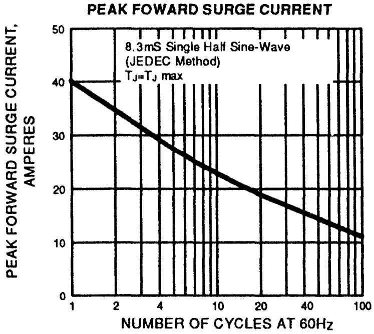


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FOWARD SURGE CURRENT

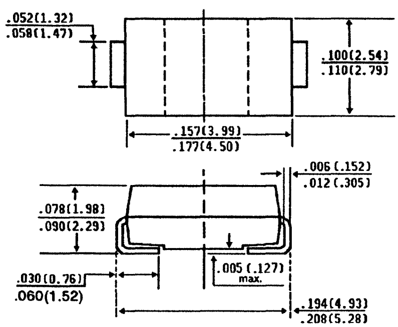


TPSMA6.8 THRU TPSMA43A

AUTOMOTIVE SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

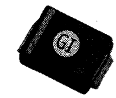
VOLTAGE - 6.8 - 43.0 Volts 400 Watt Peak Pulse Power

DO-214AC



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Easy pick and place
- Available in unidirectional only
- Low profile package
- Built-in strain relief
- Exclusive G.I. P.A.R. chip construction
- Repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 volts to BV min.
- Typical I_D less than 1μA above 10V at T_A=150°C
- Designed to handle all under the hood surface mount applications
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AC Molded plastic
Weight: 0.002 ounces, 0.064 grams
Terminals: Solder plated; solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Standard Packaging: 12mm cavity Tape (EIA STD RS-481)

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATINGS	*SYMBOLS*	*VALUE*	*UNITS*
Peak Power Dissipation on 10/1000μs waveform, (NOTES 1, 2 FIG. 3)	P_{PPM}	Minimum 400	Watts
Peak Power Pulse Current on 10/1000μs waveform (NOTE 1, FIG. 1)	I_{PPM}	See Table 1	Amps
Peak Forward Surge Current 8.3ms single half sine-wave Superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Instantaneous Forward Voltage at 50A (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on P.C. board with 5.0mm^2 copper pads attached to each terminal.
3. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum.

ELECTRICAL CHARACTERISTICS (T_A=25°C unless otherwise noted)

Device Types	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) Min.	Max.	at I_T (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Reverse Leakage at V_{WM} T_A=150°C I_D (µA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
TPSMA6.8	ADP	6.12	7.48	10.0	5.50	300.0	1000.0	37.0	10.8
TPSMA6.8A	AEP	6.45	7.14	10.0	5.80	300.0	1000.0	38.1	10.5
TPSMA7.5	AFP	6.75	8.25	10.0	6.05	150.0	500.0	34.2	11.7
TPSMA7.5A	AGP	7.13	7.88	10.0	6.40	150.0	500.0	35.4	11.3
TPSMA8.2	AHP	7.38	9.02	10.0	6.63	50.0	200.0	32.0	12.5
TPSMA8.2A	AKP	7.79	8.61	10.0	7.02	50.0	200.0	33.1	12.1
TPSMA9.1	ALP	8.19	10.00	1.0	7.37	10.0	50.0	29.0	13.8
TPSMA9.1A	AMP	8.65	9.55	1.0	7.78	10.0	50.0	29.8	13.4
TPSMA10	ANP	9.00	11.00	1.0	8.10	5.0	20.0	26.7	15.0
TPSMA10A	APP	9.50	10.50	1.0	8.55	5.0	20.0	27.6	14.5
TPSMA11	AQP	9.90	12.10	1.0	8.92	1.0	5.0	24.7	16.2
TPSMA11A	ARP	10.50	11.60	1.0	9.40	1.0	5.0	25.6	15.6
TPSMA12	ASP	10.80	13.20	1.0	9.72	1.0	5.0	23.1	17.3
TPSMA12A	ATP	11.40	12.60	1.0	10.20	1.0	5.0	23.9	16.7
TPSMA13	AUP	11.70	14.30	1.0	10.50	1.0	5.0	21.0	19.0
TPSMA13A	AVP	12.40	13.70	1.0	11.10	1.0	5.0	22.0	18.2
TPSMA15	AWP	13.50	16.30	1.0	12.10	1.0	5.0	18.2	22.0
TPSMA15A	AXP	14.30	15.80	1.0	12.80	1.0	5.0	18.7	21.2
TPSMA16	AYP	14.40	17.60	1.0	12.90	1.0	5.0	17.0	23.5
TPSMA16A	AZP	15.20	16.80	1.0	13.60	1.0	5.0	17.8	22.5
TPSMA18	BDP	16.20	19.80	1.0	14.50	1.0	5.0	15.1	26.5
TPSMA18A	BEP	17.10	18.90	1.0	15.30	1.0	5.0	15.7	25.5
TPSMA20	BFP	18.00	22.00	1.0	16.20	1.0	5.0	13.7	29.1
TPSMA20A	BGP	19.00	21.00	1.0	17.10	1.0	5.0	14.4	27.7
TPSMA22	BHP	19.80	24.20	1.0	17.80	1.0	5.0	12.5	31.9
TPSMA22A	BKP	20.90	23.10	1.0	18.80	1.0	5.0	13.1	30.6
TPSMA24	BLP	21.60	26.40	1.0	19.40	1.0	5.0	11.5	34.7
TPSMA24A	BMP	22.80	25.20	1.0	20.50	1.0	5.0	12.0	33.2
TPSMA27	BNP	24.30	29.70	1.0	21.80	1.0	5.0	10.2	39.1
TPSMA27A	BPP	25.70	28.40	1.0	23.10	1.0	5.0	10.7	37.5
TPSMA30	BQP	27.00	33.00	1.0	24.30	1.0	5.0	9.2	43.5
TPSMA30A	BRP	28.50	31.50	1.0	25.60	1.0	5.0	9.7	41.4
TPSMA33	BSP	29.70	36.30	1.0	26.80	1.0	5.0	8.4	47.7
TPSMA33A	BTP	31.40	34.70	1.0	28.20	1.0	5.0	8.7	45.7
TPSMA36	BUP	32.40	39.60	1.0	29.10	1.0	5.0	7.7	52.0
TPSMA36A	BVP	34.20	37.80	1.0	30.80	1.0	5.0	8.0	49.9
TPSMA39	BWP	35.10	42.90	1.0	31.60	1.0	5.0	7.1	56.4
TPSMA39A	BXP	37.10	41.00	1.0	33.30	1.0	5.0	7.4	53.9
TPSMA43	BYP	38.70	47.30	1.0	34.80	1.0	5.0	6.5	61.9
TPSMA43A	BZP	40.90	45.20	1.0	36.80	1.0	5.0	6.7	59.3

NOTES:
1. $V_{(BR)}$ measured after I_T applied for 300µs, I_T=Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIG.1 - PEAK PULSE POWER RATING CURVE

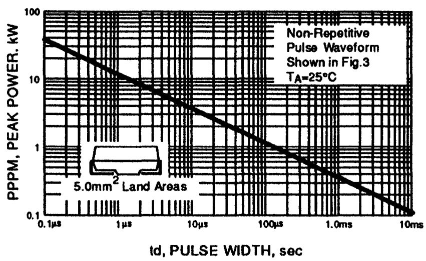


FIG. 2 - PULSE DERATING CURVE

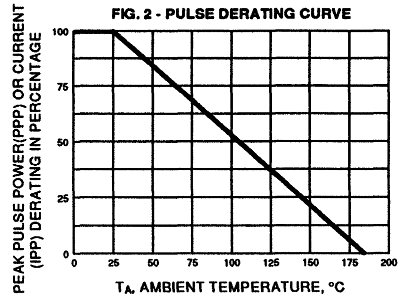


FIG.3 - PULSE WAVEFORM

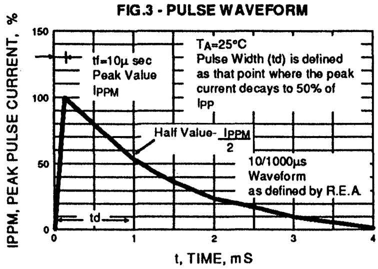


FIG.4 - TYPICAL JUNCTION CAPACITANCE

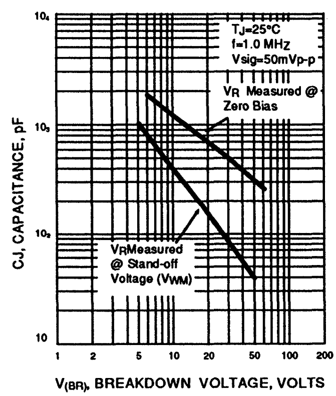
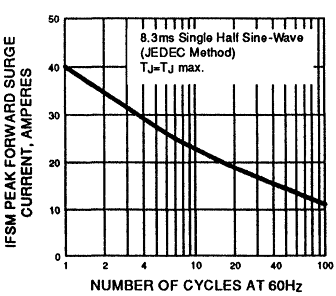


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



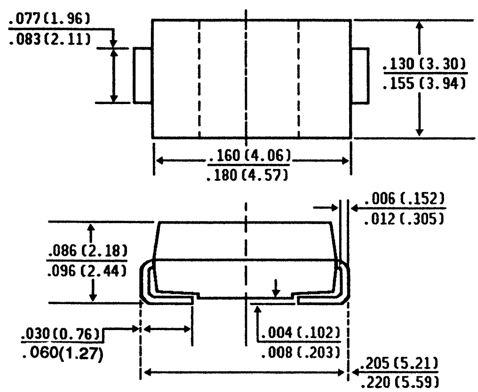
S2A THRU S2M

SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 1.5 Amperes*

FEATURES

DO-214AA



Dimensions in inches and (millimeters)

- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- ◆ For surface mounted applications
- ◆ Low profile package
- ◆ Built-in strain relief
- ◆ Easy pick and place
- ◆ Glass passivated chip junction
- ◆ High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic over passivated junction
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Indicated by cathode band
Standard Packaging: 12mm tape
(EIA STD RS-481)
Weight: 0.003 ounces, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, Resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	S2A	S2B	S2D	S2G	S2J	S2K	S2M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_L=100°C (NOTE 3)	$I_{(AV)}$	1.5							Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0							Amps
Maximum Instantaneous Forward Voltage at 1.5A	V_F	1.15							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	1.0 125.0							µA
Typical Reverse Recovery Time (NOTE 1)	T_{rr}	2.0							µs
Typical Junction Capacitance (NOTE 2)	C_J	30.0							pF
Maximum Thermal Resistance (NOTE 3)	$R\theta JL$ $R\theta JA$	20.0 100.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150							°C

NOTES:
1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. 5.0mm^2 (.013mm thick) land areas.

FIG 1 - FORWARD CURRENT DERATING CURVE

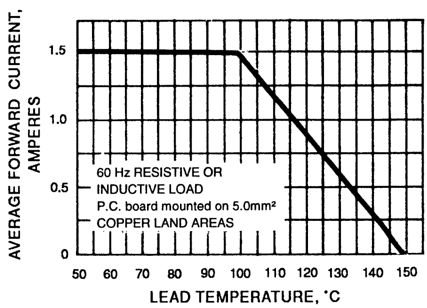


FIG 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

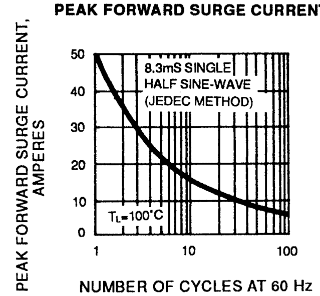


FIG 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

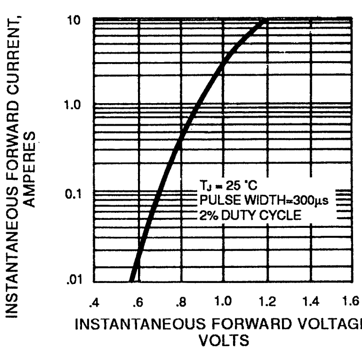


FIG 4 - TYPICAL JUNCTION CHARACTERISTICS

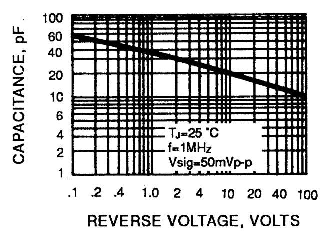
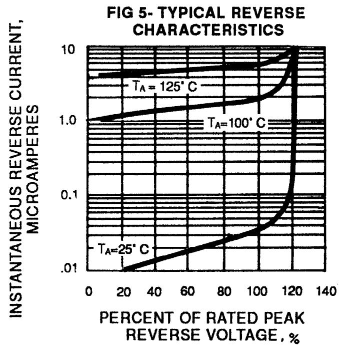


FIG 5- TYPICAL REVERSE CHARACTERISTICS



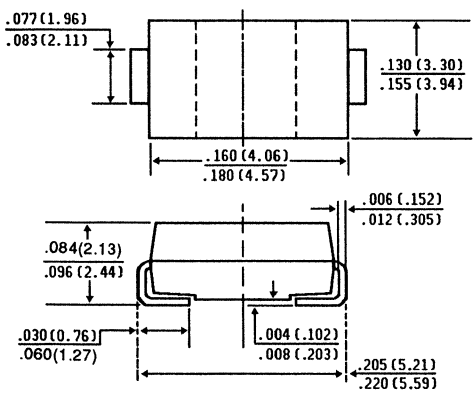
RS2A THRU RS2K

FAST SWITCHING SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 800 Volts* ***CURRENT** - 1.5 Amperes*

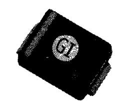
FEATURES

DO-214AA



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Easy pick and place



- Glass passivated junction
- Fast switching for high efficiency
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic over passivated junction
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Indicated by cathode band
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.003 ounces, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	RS2A	RS2B	RS2D	RS2G	RS2J	RS2K	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current at T_L=100°C (NOTE 3)	$I_{(AV)}$	1.5						Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0						Amps
Maximum Instantaneous Forward Voltage at 1.5A	V_F	1.30						Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	5.0 200.0						µA
Maximum Reverse Recovery Time (NOTE 1)	T_{rr}	150				250	500	ns
Typical Junction Capacitance (NOTE 2)	C_J	50.0						pF
Maximum Thermal Resistance (NOTE 3)	RθJL RθJA	20.0 100.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150						°C

NOTES:
1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. 5.0mm² (.013mm thick) land areas.

FIG 1 - FORWARD CURRENT DERATING CURVE

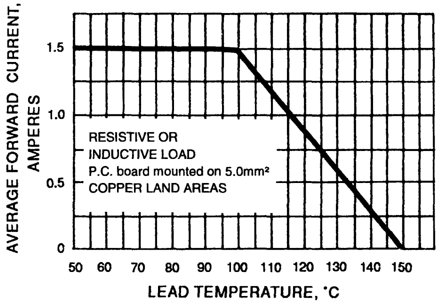


FIG 2 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

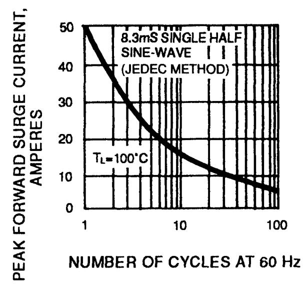


FIG 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

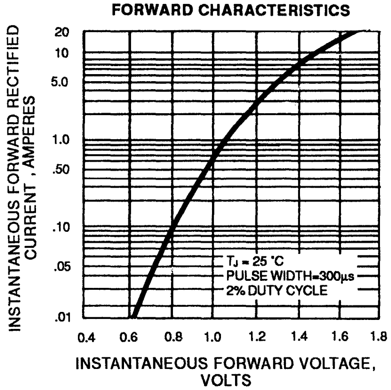


FIG 4 - TYPICAL JUNCTION CHARACTERISTICS

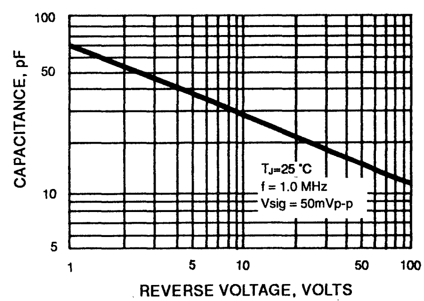


FIG 5- TYPICAL REVERSE CHARACTERISTICS

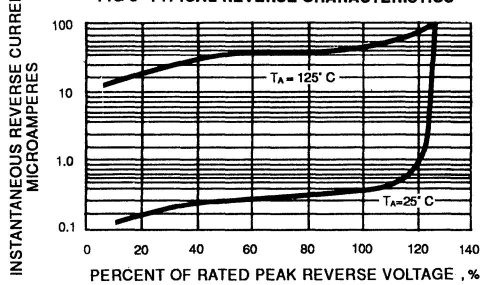
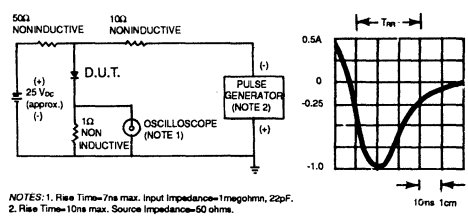


FIG 6 - REVERSE RECOVERY TIME CHARACTERISTIC AND TEST CIRCUIT DIAGRAM



NOTES: 1. Rise Time=7ns max. Input Impedance=1megohm, 22pF.
2. Rise Time=10ns max. Source Impedance=50 ohms.

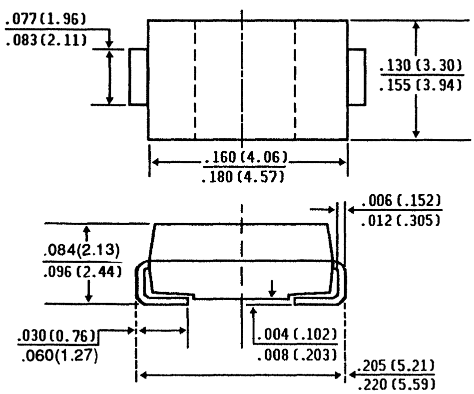
ES2A THRU ES2D

FAST EFFICIENT SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 200 Volts* ***CURRENT** - 2.0 Amperes*

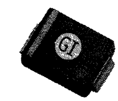
FEATURES

DO-214AA



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammabillity Classification 94 V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Easy pick and place
- Glass passivated junction
- Superfast recovery times for high efficiency
- Low power loss, high efficiency
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic over passivated junction
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.003 ounces, 0.093 gram

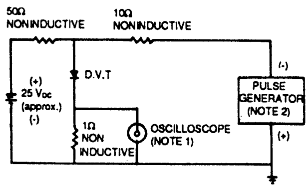
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

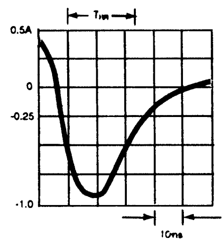
Ratings at 25°C ambient temperature unless otherwise specified.
Resistive or inductive load.

	SYMBOLS	*ES2A*	*ES2B*	*ES2C*	*ES2D*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_L=110°C	$I_{(AV)}$	2.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	50.0				Amps
Maximum Instantaneous Forward Voltage at 2 .0A	V_F	0.90				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 350				µA
Maximum Reverse Recovery Time (NOTE 1)	T_{RR}	20.0				ns
Maximum Reverse Recovery Time T_A=25° C (NOTE 2) T_A=100°C	T_{rr}	30.0 50.0				ns
Maximum Stored Charge T_A=25°C (NOTE 2) T_A=100°C	Q_{RR}	10.0 25.0				nc
Typical Junction Capacitance (NOTE 3)	C_J	25.0				pF
Maximum Thermal Resistance (NOTE 4)	$R\theta JL$	20.0				°C/W
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150				°C

Notes:
1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: V_R=30V, di/dt=50 A/µs I_F=2.0A.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
4. 5.0mm^2 (.013mm thick) land areas.

FIG 1 - REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM





NOTES: 1. Rise Time = 7ns max. Input Impedance = 1megohmn, 22pF.
2. Rise Time = 10ns max. Source Impedance = 50 ohms.

FIG. 2-FORWARD CURRENT DERATING CURVE

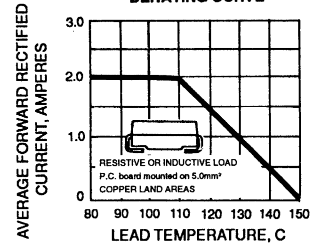


FIG 3 - TYPICAL REVERSE CHARACTERISTICS

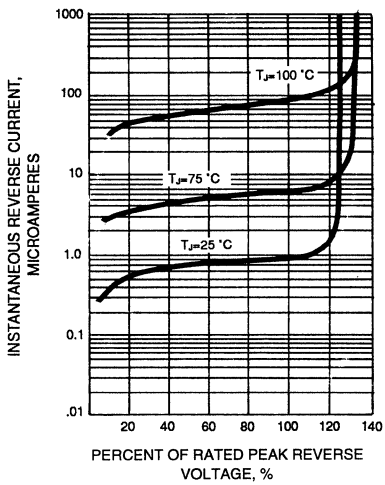


FIG 4 - TYPICAL FORWARD CHARACTERISTICS

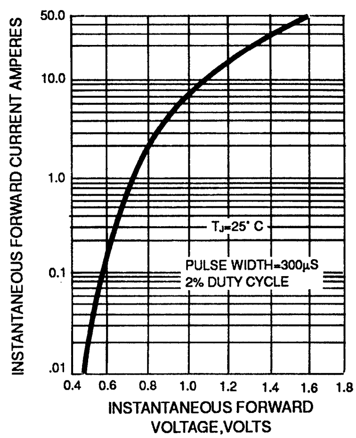


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

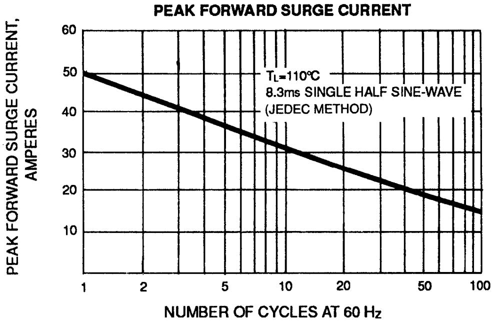
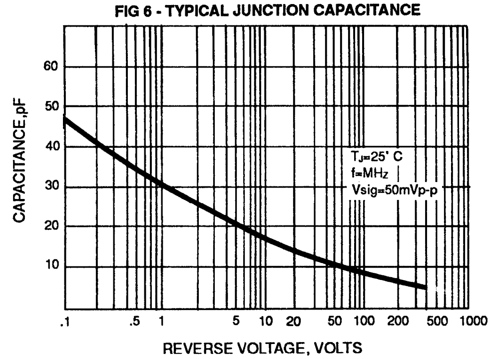


FIG 6 - TYPICAL JUNCTION CAPACITANCE



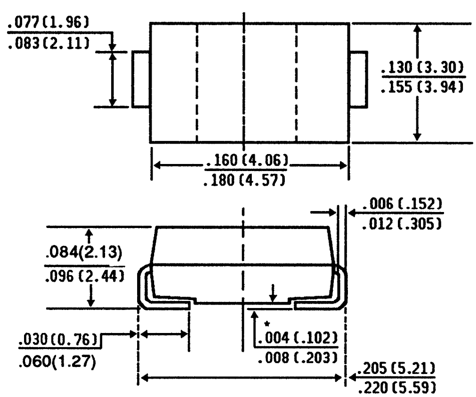
SS22 THRU SS26

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER

***VOLTAGE** - 20 to 60 Volts* ***CURRENT** - 2.0 Amperes*

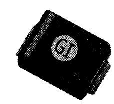
FEATURES

DO-214AA



Dimensions in inches and (millimeters)

*Typical Range



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- High surge capacity
- Epitaxial construction
- For use in low voltage high frequency inverters, free wheeling, and polarity protection applications
- Guardring for transient protection
- High temperature soldering guaranteed: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA molded plastic
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 12mm tape *(EIA STD RS-481)*
Weight: 0.003 ounces 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	SS22	SS23	SS24	SS25	SS26	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current at T_L (See Figure 1)	$I_{(AV)}$			2.0			Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}			50.0			Amps
Maximum Instantaneous Forward Voltage at 2.0A (NOTE 1)	V_F		0.50		0.70		Volts
Maximum DC Reverse Current (NOTE 1) T_A=25°C	I_R			0.5			mA
at Rated DC Blocking Voltage T_A=100°C			20.0		10.0		
Maximum Thermal Resistance (NOTE 2)	$R_{\theta JL}$			20.0			°C/W
	$R_{\theta JA}$			100.0			
Operating Junction Temperature Range	T_J		-65 to +125		-65 to +150		°C
Storage Temperature Range	T_{STG}			-65 to +150			°C

NOTES:
1. Pulse Test with PW=300 µsec, 2% Duty Cycle.
2. 5.0mm^2 (.013mm thick) land areas.

FIG. 1-FORWARD CURRENT DERATING CURVE

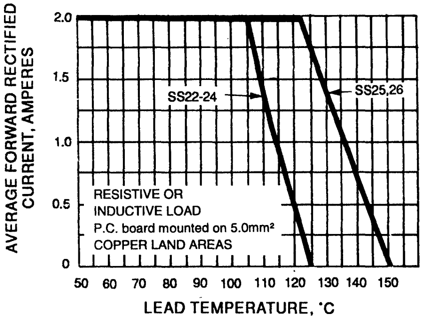


FIG.3 - TYPICAL REVERSE CHARACTERISTICS

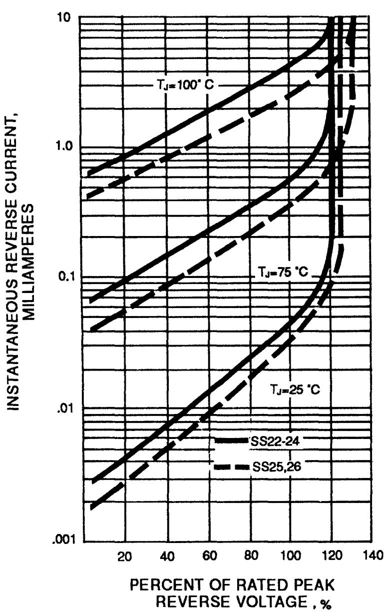


FIG.2- TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

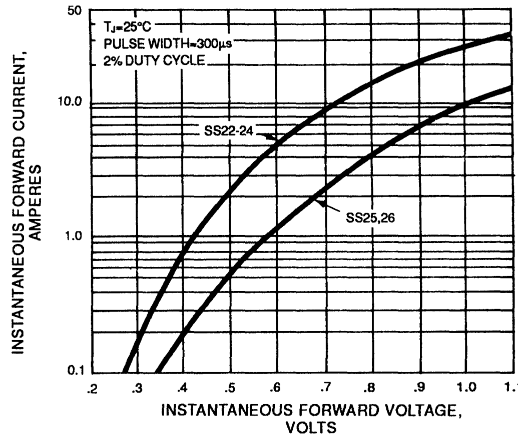


FIG.4 - TYPICAL JUNCTION CAPACITANCE

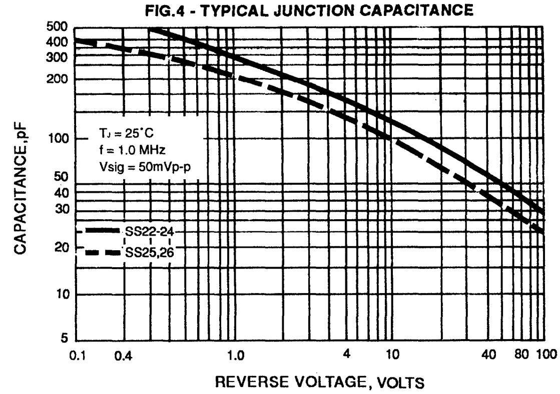
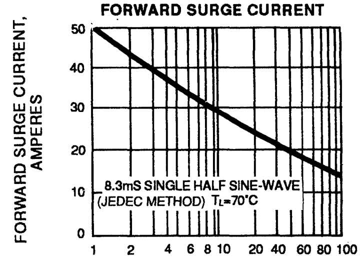


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



SMBG AND SMBJ 5.0 THRU 170,A SERIES

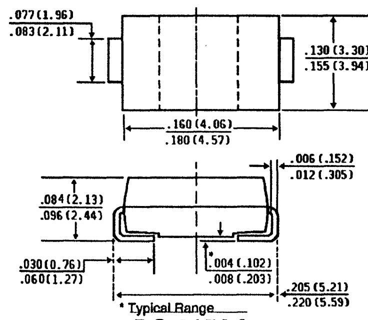
UNIDIRECTIONAL SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

VOLTAGE - 5.0 - 170 Volts ***Peak Pulse Power*** *- 600 Watts*

FEATURES

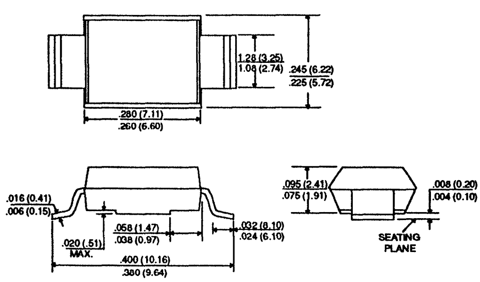
DO-214AA

MODIFIED J-BEND



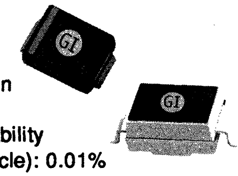
DO-215AA

GULL WING



Dimensions in inches and (millimeters)

- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- Repetition Rate (duty cycle): 0.01%
- Fast response time: typically less than 1.0ps from 0 volts to BV for unidirectional types
- Typical I_D less than 1μA above 10V
- High temperature soldering: 250°C/10 seconds at terminals
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O



MECHANICAL DATA

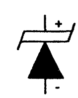
Case: JEDEC DO214 / DO215 Molded plastic over passivated junction

Terminals: Solder plated, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes positive end (cathode)

Standard Packaging: 12mm tape (EIA STD RS-481)

Weight: 0.003 ounces, 0.093 gram



Schematic Symbol

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (Notes 1, 2, Fig. 1)	P_{PPM}	Minimum 600	Watts
Peak Pulse Current on 10/1000μs waveform (Note 1, Fig. 3)	I_{PPM}	See Table 1	Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (Notes 2,3)	I_{FSM}	100.0	Amps
Maximum Instantaneous Forward Voltage at 50A (Note 3, 4)	V_{FM}	See Note 3, 4	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 5.0mm^2 (.013mm thick) land areas.
3. Measured on 8.3ms, single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum.
4. V_F=3.5V for SMB-5.0 thru SMB-90 devices and V_F 5.0V for SMB-100 thru SMB-170 devices.

ELECTRICAL CHARACTERISTICS AT T_A=25°C (unless otherwise noted)

Gull Wing Lead	Modified "J" Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) (Min / Max)	at I_T (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(mA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMBG5.0	SMBJ5.0	KD	6.40/7.55	10	5.0	800.0	62.5	9.6
SMBG5.0A	SMBJ5.0A	KE	6.40/7.25	10	5.0	800.0	65.2	9.2
SMBG6.0	SMBJ6.0	KF	6.67/8.45	10	6.0	800.0	52.6	11.4
SMBG6.0A	SMGJ6.0A	KG	6.67/7.67	10	6.0	800.0	58.3	10.3
SMBG6.5	SMBJ6.5	KH	7.22/9.14	10	6.5	500.0	48.7	12.3
SMBG6.5A	SMBJ6.5A	KK	7.22/8.30	10	6.5	500.0	53.6	11.2
SMBG7.0	SMBJ7.0	KL	7.78/9.86	10	7.0	200.0	45.1	13.3
SMBG7.0A	SMBJ7.0A	KM	7.78/8.95	10	7.0	200.0	50.0	12.0
SMBG7.5	SMBJ7.5	KN	8.33/10.67	1.0	7.5	100.0	42.0	14.3
SMBG7.5A	SMBJ7.5A	KP	8.33/9.58	1.0	7.5	100.0	46.5	12.9
SMBG8.0	SMBJ8.0	KQ	8.89/11.3	1.0	8.0	50.0	40.0	15.0
SMBG8.0A	SMBJ8.0A	KR	8.89/10.2	1.0	8.0	50.0	44.1	13.6
SMBG8.5	SMBJ8.5	KS	9.44/11.9	1.0	8.5	20.0	37.7	15.9
SMBG8.5A	SMBJ8.5A	KT	9.44/10.8	1.0	8.5	20.0	41.7	14.4
SMBG9.0	SMBJ9.0	KU	10.0/12.6	1.0	9.0	10.0	35.5	16.9
SMBJ9.0A	SMBJ9.0A	KV	10.0/11.5	1.0	9.0	10.0	39.0	15.4
SMBG10	SMBJ10	KW	11.1/14.1	1.0	10	5.0	31.9	18.8
SMBG10A	SMBJ10A	KX	11.1/12.8	1.0	10	5.0	35.3	17.0
SMBG11	SMBJ11	KY	12.2/15.4	1.0	11	5.0	29.9	20.1
SMBG11A	SMBJ11A	KZ	12.2/14.0	1.0	11	5.0	33.0	18.2
SMBG12	SMBJ12	LD	13.3/16.9	1.0	12	5.0	27.3	22.0
SMBG12A	SMBJ12A	LE	13.3/15.3	1.0	12	5.0	30.2	19.9
SMBG13	SMBJ13	LF	14.4/18.2	1.0	13	5.0	25.2	23.8
SMBG13A	SMBJ13A	LG	14.4/16.5	1.0	13	5.0	27.9	21.5
SMBG14	SMBJ14	LH	15.6/19.8	1.0	14	5.0	23.3	25.8
SMBG14A	SMBJ14A	LK	15.6/17.9	1.0	14	5.0	25.8	23.2
SMBG15	SMBJ15	LL	16.7/21.1	1.0	15	5.0	22.3	26.9
SMBG15A	SMBJ15A	LM	16.7/19.2	1.0	15	5.0	24.0	24.4
SMBG16	SMBJ16	LN	17.8/22.6	1.0	16	5.0	20.8	28.8
SMBG16A	SMBJ16A	LP	17.8/20.5	1.0	16	5.0	23.1	26.0
SMBG17	SMBJ17	LQ	18.9/23.9	1.0	17	5.0	19.7	30.5
SMBG17A	SMBJ17A	LR	18.9/21.7	1.0	17	5.0	21.7	27.6
SMBG18	SMBJ18	LS	20.0/25.3	1.0	18	5.0	18.6	32.2
SMBG18A	SMBJ18A	LT	20.0/23.3	1.0	18	5.0	20.5	29.2
SMBG20	SMBJ20	LU	22.2/28.1	1.0	20	5.0	16.7	35.8
SMBG20A	SMBJ20A	LV	22.2/25.5	1.0	20	5.0	18.5	32.4
SMBG22	SMBJ22	LW	24.4/30.9	1.0	22	5.0	15.2	39.4
SMBG22A	SMBJ22A	LX	24.4/28.0	1.0	22	5.0	16.9	35.5
SMBG24	SMBJ24	LY	26.7/33.8	1.0	24	5.0	14.0	43.0
SMBG24A	SMBJ24A	LZ	26.7/30.7	1.0	24	5.0	15.4	38.9
SMBG26	SMBJ26	MD	28.9/36.6	1.0	26	5.0	12.4	46.6
SMBG26A	SMBJ26A	ME	28.9/33.2	1.0	26	5.0	14.2	42.1
SMBG28	SMBJ28	MF	31.1/39.4	1.0	28	5.0	12.0	50.0
SMBG28A	SMBJ28A	MG	31.1/35.8	1.0	28	5.0	13.2	45.4
SMBG30	SMBJ30	MH	33.3/42.2	1.0	30	5.0	11.2	53.5
SMBG30A	SMBJ30A	MK	33.1/38.3	1.0	30	5.0	12.4	46.6
SMBG33	SMBJ33	ML	36.7/46.5	1.0	33	5.0	10.2	59.0
SMBG33A	SMBJ33A	MM	36.7/42.2	1.0	33	5.0	11.3	53.3
SMBG36	SMBJ36	MN	40.0/50.7	1.0	36	5.0	9.3	64.3
SMBG36A	SMBJ36A	MP	40.0/46.0	1.0	36	5.0	10.3	58.1
SMBG40	SMBJ40	MQ	44.4/56.3	1.0	40	5.0	8.4	71.4
SMBG40A	SMBJ40A	MR	44.4/51.1	1.0	40	5.0	9.3	64.5
SMBG43	SMBJ43	MS	47.8/60.5	1.0	43	5.0	7.8	76.7
SMBG43A	SMBJ43A	MT	47.8/54.9	1.0	43	5.0	8.6	69.4
SMBG45	SMBJ45	MU	50.0/63.3	1.0	45	5.0	7.5	80.3
SMBG45A	SMBJ45A	MV	50.0/57.5	1.0	45	5.0	8.3	72.7
SMBG48	SMBJ48	MW	53.3/67.5	1.0	48	5.0	7.0	85.5
SMBG48A	SMBJ48A	MX	53.3/61.3	1.0	48	5.0	7.7	77.4
SMBG51	SMBJ51	MY	56.7/71.8	1.0	51	5.0	6.6	91.1
SMBG51A	SMBJ51A	MZ	56.7/65.2	1.0	51	5.0	7.3	82.4
SMBG54	SMBJ54	ND	60.0/76.0	1.0	54	5.0	6.2	96.3
SMBG54A	SMBJ54A	NE	60.0/69.0	1.0	54	5.0	6.9	87.1

ELECTRICAL CHARACTERISTICS AT25°C

Gull-Wing Lead	Modified "J" Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) (Min./Max.)	@ I_T mA	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(mA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C(Volts)
SMBG58	SMBJ58	NF	64.4/81.6	1.0	58	5	5.8	103.0
SMBG58A	SMBJ58A	NG	64.4/74.1	1.0	58	5	6.4	93.6
SMBG60	SMBJ60	NH	66.7/84.5	1.0	60	5	5.6	107.0
SMBG60A	SMBJ60A	NK	66.7/76.7	1.0	60	5	6.2	96.8
SMBG64	SMBJ64	NL	71.1/90.1	1.0	64	5	5.3	114.0
SMBG64A	SMBJ64A	NM	71.1/81.8	1.0	64	5	5.8	103.0
SMBG70	SMBJ70	NN	77.8/98.6	1.0	70	5	4.8	125
SMBG70A	SMBJ70A	NP	77.8/89.5	1.0	70	5	5.3	113
SMBG75	SMBJ75	NQ	83.3/105.7	1.0	75	5	4.5	134
SMBG75A	SMBJ75A	NR	83.3/95.8	1.0	75	5	4.9	121
SMBG78	SMBJ78	NS	86.7/109.9	1.0	78	5	4.3	139
SMBG78A	SMBJ78A	NT	86.7/99.7	1.0	78	5	4.7	126
SMBG85	SMBJ85	NU	94.4/119.2	1.0	85	5	3.9	151
SMBG85A	SMBJ85A	NV	94.4/108.2	1.0	85	5	4.4	137
SMBG90	SMBJ90	NW	100/126.5	1.0	90	5	3.8	160
SMBG90A	SMBJ90A	NX	100/115.5	1.0	90	5	4.1	146
SMBG100	SMBJ100	NY	111/141.0	1.0	100	5	3.4	179
SMBG100A	SMBJ100A	NZ	111/128.0	1.0	100	5	3.7	162
SMBG110	SMBJ110	PD	122/154.5	1.0	110	5	3.0	196
SMBG110A	SMBJ110A	PE	122/140.5	1.0	110	5	3.4	177
SMBG120	SMBJ120	PF	133/169.0	1.0	120	5	2.8	214
SMBG120A	SMBJ120A	PG	133/153.0	1.0	120	5	3.1	193
SMBG130	SMBJ130	PH	144/182.5	1.0	130	5	2.6	231
SMBG130A	SMBJ130A	PK	144/165.5	1.0	130	5	2.9	209
SMBG150	SMBJ150	PL	167/211.5	1.0	150	5	2.2	268
SMBG150A	SMBJ150A	PM	167/192.5	1.0	150	5	2.5	243
SMBG160	SMBJ160	PN	178/226.0	1.0	160	5	2.1	287
SMBG160A	SMBJ160A	PP	178/205.0	1.0	160	5	2.3	259
SMBG170	SMBJ170	PQ	189/239.5	1.0	170	5	2.0	304
SMBG170A	SMBJ170A	PR	189/217.5	1.0	170	5	2.2	275

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300μs I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derate per Figure 2.
3. A TransZorb TVS is normally selected according to the reverse "Stand Off Voltage" (V_{WM}) which should be equal to or greater than the D.C. or continuous peak operating voltage level.
4. All terms and symbols are consistant with ANSI / IEEE C.62.35 specifications.

APPLICATION NOTES

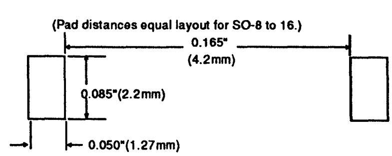
These surface mountable packages are designed specifically for transient voltage suppression. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground. These high speed transient voltage suppressors can be used to effectively protect sensitive components such as integrated circuits and MOS devices.

A 600W (SMB) device is normally selected when the threat of transients is from lightening-induced transients conducted via external leads or I/O lines. It is also used to protect against switching transients induced by large coils or industrial motors. System impedance at component level in a system is usually high enough to limit the current to within the peak pulse current (Ipp) rating of this series.

RECOMMENDED PAD SIZES

The pad dimentions should be 0.010" (.25mm) longer than the contact size, in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

GULL- WING



MODIFIED J-BEND

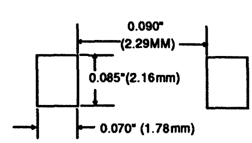


FIG. 1 - PEAK PULSE POWER RATING CURVE

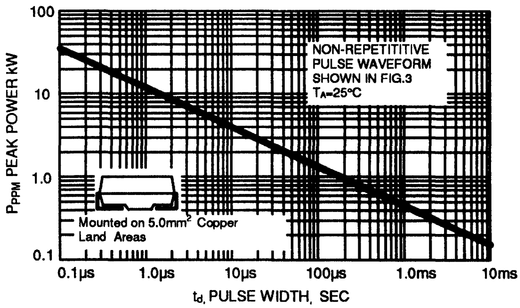


FIG. 2 - PULSE RATING CURVE

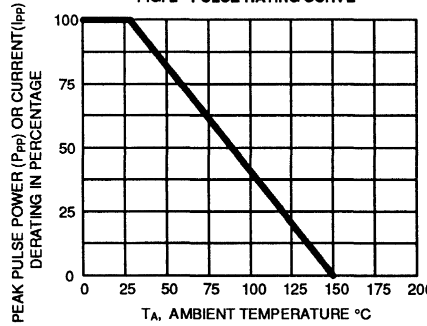


FIG.3 - PULSE WAVEFORM

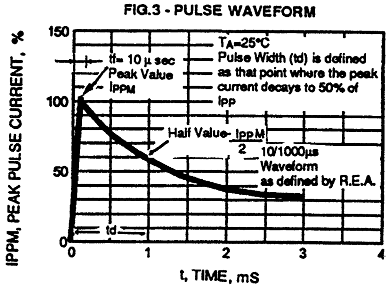
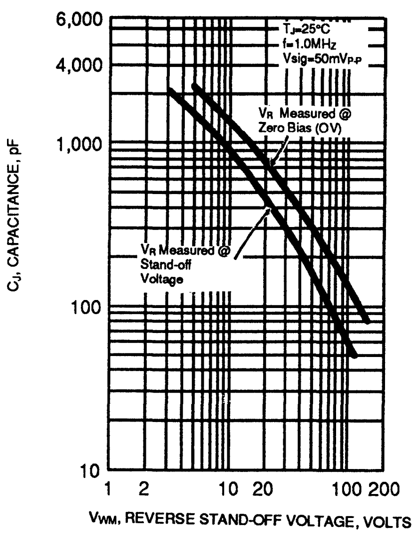


FIG. 4 - TYPICAL JUNCTION CAPACITANCE



SMBG AND SMBJ 5.0 THRU 170C,CA SERIES

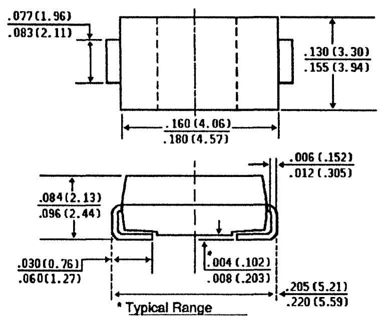
BIDIRECTIONAL SURFACE MOUNT TRANSIENT VOLTAGESUPPRESSOR

VOLTAGE - 5.0 - 170 Volts ***Peak Pulse Power*** *- 600 Watts*

FEATURES

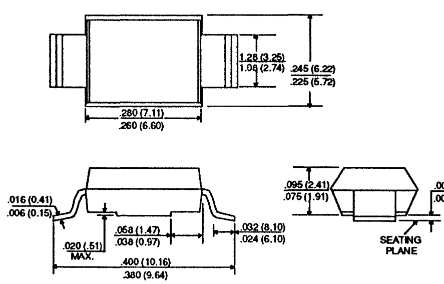
DO-214AA

MODIFIED J-BEND



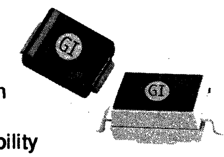
DO-215AA

GULL WING



Dimensions in inches and (millimeters)

- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- Repetition Rate (duty cycle): 0.01%
- Fast response time: typically less than 5.0ns from 0 volts to BV for bidirectional types
- Typical I_D less than 1μA above 10V
- High temperature soldering: 250°C/10 seconds at terminals
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O



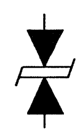
MECHANICAL DATA

Case: JEDEC DO214 / DO215 molded plastic over passivated junction

Terminals: Solder plated solderable pe MIL-STD-750, Method 2026

Standard Packaging: 12mm tape *(EIA STD RS-481)*

Weight: 0.003 ounces, 0.093 gram



Schematic Symbol

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Electrical characteristics apply in both directions
Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000ms waveform (Notes 1, 2, Fig. 1)	P_{PPM}	Minimum 600	Watts
Peak Pulse Current on 10/1000ms waveform (Note 1, Fig. 3)	I_{PPM}	See Table 1	Amps
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 5.0mm^2 (.013mm thick) land areas.
3. Measured on 8.3ms single half sine-wave or equivalent squarewave, duty cycle 4 pulses per minute maximum.

ELECTRICAL CHARACTERISTICS T_A=25°C (unless otherwise noted)

Gull Wing Lead	Modified "J" Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min / Max	at I_T (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(mA)	Maximum Peak Pulse Surge Current IPPM (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMBG5.0C	SMBJ5.0C	KD	6.40 / 7.55	10	5.0	1600.0	62.5	9.6
SMBG5.0CA	SMBJ5.0CA	KE	6.40 / 7.25	10	5.0	1600.0	65.2	9.2
SMBG6.0C	SMBJ6.0C	KF	6.67 / 8.45	10	6.0	1600.0	52.6	11.4
SMBG6.0CA	SMGJ6.0CA	KG	6.67 / 7.67	10	6.0	1600.0	58.3	10.3
SMBG6.5C	SMBJ6.5C	AH	7.22 / 9.14	10	6.5	1000.0	48.7	12.3
SMBG6.5CA	SMBJ6.5CA	AK	7.22 / 8.30	10	6.5	1000.0	53.6	11.2
SMBG7.0C	SMBJ7.0C	KL	7.78 / 9.86	10	7.0	400.0	45.1	13.3
SMBG7.0CA	SMBJ7.0CA	KM	7.78 / 8.95	10	7.0	400.0	50.0	12.0
SMBG7.5C	SMBJ7.5C	AN	8.33 / 10.67	1.0	7.5	200.0	42.0	14.3
SMBG7.5CA	SMBJ7.5CA	AP	8.33 / 9.58	1.0	7.5	200.0	46.5	12.9
SMBG8.0C	SMBJ8.0C	AQ	8.89 / 11.3	1.0	8.0	100.0	40.0	15.0
SMBG8.0CA	SMBJ8.0CA	AR	8.89 / 10.23	1.0	8.0	100.0	44.1	13.6
SMBG8.5C	SMBJ8.5C	AS	9.44 / 11.92	1.0	8.5	20.0	37.7	15.9
SMBG8.5CA	SMBJ8.5CA	AT	9.44 / 10.82	1.0	8.5	20.0	41.7	14.4
SMBG9.0C	SMBJ9.0C	AU	10.0 / 12.6	1.0	9.0	10.0	35.5	16.9
SMBJ9.0CA	SMBJ9.0CA	AV	10.0 / 11.5	1.0	9.0	10.0	39.0	15.4
SMBG10C	SMBJ10C	AW	11.1 / 14.1	1.0	10	5.0	31.9	18.8
SMBG10CA	SMBJ10CA	AX	11.1 / 12.8	1.0	10	5.0	35.3	17.0
SMBG11C	SMBJ11C	KY	12.2 / 15.4	1.0	11	5.0	29.9	20.1
SMBG11CA	SMBJ11CA	KZ	12.2 / 14.0	1.0	11	5.0	33.0	18.2
SMBG12C	SMBJ12C	BD	13.3 / 16.9	1.0	12	5.0	27.3	22.0
SMBG12CA	SMBJ12CA	BE	13.3 / 15.3	1.0	12	5.0	30.2	19.9
SMBG13C	SMBJ13C	LF	14.4 / 18.2	1.0	13	5.0	25.2	23.8
SMBG13CA	SMBJ13CA	LG	14.4 / 16.5	1.0	13	5.0	27.9	21.5
SMBG14C	SMBJ14C	BH	15.6 / 19.8	1.0	14	5.0	23.3	25.8
SMBG14CA	SMBJ14CA	BK	15.6 / 17.9	1.0	14	5.0	25.8	23.2
SMBG15C	SMBJ15C	BL	16.7 / 21.1	1.0	15	5.0	22.3	26.9
SMBG15CA	SMBJ15CA	BM	16.7 / 19.2	1.0	15	5.0	24.0	24.4
SMBG16C	SMBJ16C	LN	17.8 / 22.6	1.0	16	5.0	20.8	28.8
SMBG16CA	SMBJ16CA	LM	17.8 / 20.5	1.0	16	5.0	23.1	26.0
SMBG17C	SMBJ17C	LQ	18.9 / 23.9	1.0	17	5.0	19.7	30.5
SMBG17CA	SMBJ17CA	LR	18.9 / 21.7	1.0	17	5.0	21.7	27.6
SMBG18C	SMBJ18C	BS	20.0 / 25.3	1.0	18	5.0	18.6	32.2
SMBG18CA	SMBJ18CA	BT	20.0 / 23.3	1.0	18	5.0	20.5	29.2
SMBG20C	SMBJ20C	LU	22.2 / 28.1	1.0	20	5.0	16.7	35.8
SMBG20CA	SMBJ20CA	LV	22.2 / 25.5	1.0	20	5.0	18.5	32.4
SMBG22C	SMBJ22C	BW	24.4 / 30.9	1.0	22	5.0	15.2	39.4
SMBG22CA	SMBJ22CA	BX	24.4 / 28.0	1.0	22	5.0	16.9	35.5
SMBG24C	SMBJ24C	BY	26.7 / 33.8	1.0	24	5.0	14.0	43.0
SMBG24CA	SMBJ24CA	BZ	26.7 / 30.7	1.0	24	5.0	15.4	38.9
SMBG26C	SMBJ26C	CD	28.9 / 36.6	1.0	26	5.0	12.4	46.6
SMBG26CA	SMBJ26CA	CE	28.9 / 33.2	1.0	26	5.0	14.2	42.1
SMBG28C	SMBJ28C	MF	31.1 / 39.4	1.0	28	5.0	12.0	50.0
SMBG28CA	SMBJ28CA	MG	31.1 / 35.8	1.0	28	5.0	13.2	45.4
SMBG30C	SMBJ30C	CH	33.3 / 42.2	1.0	30	5.0	11.2	53.5
SMBG30CA	SMBJ30CA	CK	33.1 / 38.3	1.0	30	5.0	12.4	46.6
SMBG33C	SMBJ33C	CL	36.7 / 46.5	1.0	33	5.0	10.2	59.0
SMBG33CA	SMBJ33CA	CM	36.7 / 42.2	1.0	33	5.0	11.3	53.3
SMBG36C	SMBJ36C	CN	40.0 / 50.7	1.0	36	5.0	9.3	64.3
SMBG36CA	SMBJ36CA	CP	40.0 / 46.0	1.0	36	5.0	10.3	58.1
SMBG40C	SMBJ40C	CQ	44.4 / 56.3	1.0	40	5.0	8.4	71.4
SMBG40CA	SMBJ40CA	CR	44.4 / 51.1	1.0	40	5.0	9.3	64.5
SMBG43C	SMBJ43C	CS	47.8 / 60.5	1.0	43	5.0	7.8	76.7
SMBG43CA	SMBJ43CA	C T	47.8 / 54.9	1.0	43	5.0	8.6	69.4
SMBG45C	SMBJ45C	MU	50.0 / 63.3	1.0	45	5.0	7.5	80.3
SMBG45CA	SMBJ45CA	MV	50.0 / 57.5	1.0	45	5.0	8.3	72.7
SMBG48C	SMBJ48C	MW	53.3 / 67.5	1.0	48	5.0	7.0	85.5
SMBG48CA	SMBJ48CA	MX	53.3 / 61.3	1.0	48	5.0	7.7	77.4
SMBG51C	SMBJ51C	MY	56.7 / 71.8	1.0	51	5.0	6.6	91.1
SMBG51CA	SMBJ51CA	MZ	56.7 / 65.2	1.0	51	5.0	7.3	82.4
SMBG54C	SMBJ54C	ND	60.0 / 76.0	1.0	54	5.0	6.2	96.3
SMBG54CA	SMBJ54CA	NE	60.0 / 69.0	1.0	54	5.0	6.9	87.1

ELECTRICAL CHARACTERISTICS T_A=25°C (unless utherwise noted)

Gull-Wing Lead	Modified "J" Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) Min. / Max.	at I_T mA	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(mA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMBG58C	SMBJ58C	NF	64.4 / 81.6	1.0	58	5.0	5.8	103.0
SMBG58CA	SMBJ58CA	NG	64.4 / 74.1	1.0	58	5.0	6.4	93.6
SMBG60C	SMBJ60C	NH	66.7 / 84.5	1.0	60	5.0	5.6	107.0
SMBG60CA	SMBJ60CA	NK	66.7 / 76.7	1.0	60	5.0	6.2	96.8
SMBG64C	SMBJ64C	NL	71.1 / 90.1	1.0	64	5.0	5.3	114.0
SMBG64CA	SMBJ64CA	NM	71.1 / 81.8	1.0	64	5.0	5.8	103.0
SMBG70C	SMBJ70C	NN	77.8 / 98.6	1.0	70	5.0	4.8	125
SMBG70CA	SMBJ70CA	NP	77.8 / 89.5	1.0	70	5.0	5.3	113
SMBG75C	SMBJ75C	NQ	83.3 / 105.7	1.0	75	5.0	4.5	134
SMBG75CA	SMBJ75CA	NR	83.3 / 95.8	1.0	75	5.0	4.9	121
SMBG78C	SMBJ78C	NS	86.7 / 109.8	1.0	78	5.0	4.3	139
SMBG78CA	SMBJ78CA	NT	86.7 / 99.7	1.0	78	5.0	4.7	126
SMBG85C	SMBJ85C	NU	94.4 / 119.2	1.0	85	5.0	3.9	151
SMBG85CA	SMBJ85CA	NV	94.4 / 108.2	1.0	85	5.0	4.4	137
SMBG90C	SMBJ90C	NW	100 / 126.5	1.0	90	5.0	3.8	160
SMBG90CA	SMBJ90CA	NX	100 / 115.5	1.0	90	5.0	4.1	146
SMBG100C	SMBJ100C	NY	111 / 141.0	1.0	100	5.0	3.4	179
SMBG100CA	SMBJ100CA	NZ	111 / 128.0	1.0	100	5.0	3.7	162
SMBG110C	SMBJ110C	PD	122 / 154.5	1.0	110	5.0	3.0	196
SMBG110CA	SMBJ110CA	PE	122 / 140.5	1.0	110	5.0	3.4	177
SMBG120C	SMBJ120C	PF	133 / 169.0	1.0	120	5.0	2.8	214
SMBG120CA	SMBJ120CA	PG	133 / 153.0	1.0	120	5.0	3.1	193
SMBG130C	SMBJ130C	PH	144 / 182.5	1.0	130	5.0	2.6	231
SMBG130CA	SMBJ130CA	PK	144 / 165.5	1.0	130	5.0	2.9	209
SMBG150C	SMBJ150C	PL	167 / 211.5	1.0	150	5.0	2.2	268
SMBG150CA	SMBJ150CA	PM	167 / 192.5	1.0	150	5.0	2.5	243
SMBG160C	SMBJ160C	PN	178 / 226.0	1.0	160	5.0	2.1	287
SMBG160CA	SMBJ160CA	PP	178 / 205.0	1.0	160	5.0	2.3	259
SMBG170C	SMBJ170C	PQ	189 / 239.5	1.0	170	5.0	2.0	304
SMBG170CA	SMBJ170CA	PR	189 / 217.5	1.0	170	5.0	2.2	275

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300µs I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derate per Figure 2.
3. A TransZorb TVS is normally selected according to the reverse "Stand Off Voltage" (VWM) which should be equal to or greater than the DC or continuous peak operating voltage level.
4. All terms and symbols are consistant with ANSI / IEEE C62.35 specifications.

APPLICATION NOTES

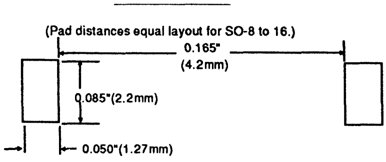
These surface mountable packages are designed specifically for transient voltage suppression. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground. These high speed transient voltage suppressors can be used to effectively protect sensitive components such as integrated circuits and MOS devices.

A 600W (SMB) device is normally selected when the threat of transients is from lightening-induced transients conducted via external leads or I/O lines. It is also used to protect against switching transients induced by large coils or industrial motors. System impediance at component level in a system is usually high enough to limit the current to within the peak pulse current (Ipp) rating of this series. In an overstress condition, the failure mode is a short circuit.

RECOMMENDED PAD SIZES

The pad dimentions should be 0.010" (.25mm) longer than the contact size, in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

GULL- WING



MODIFIED J-BEND

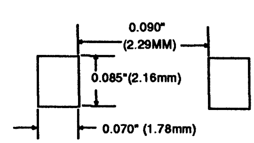


FIG. 1 - PEAK PULSE POWER RATING CURVE

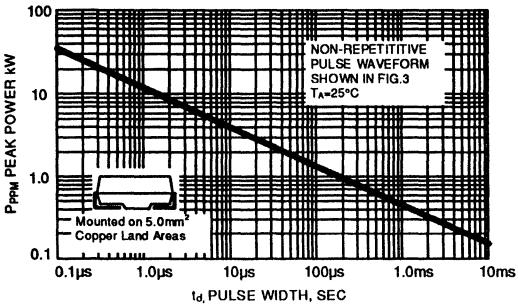


FIG. 2 - PULSE RATING CURVE

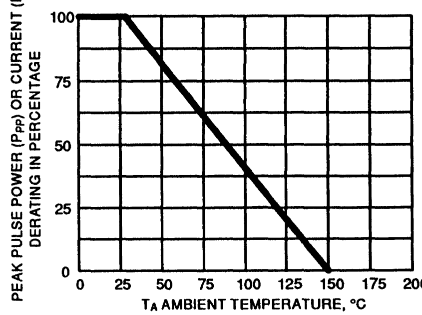


FIG. 3 - PULSE WAVEFORM

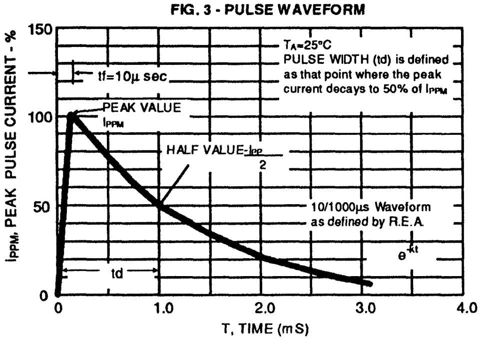


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

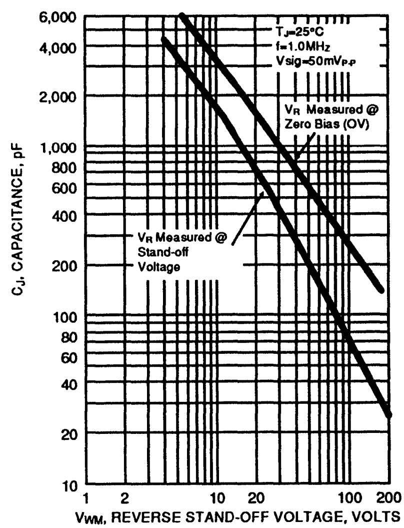
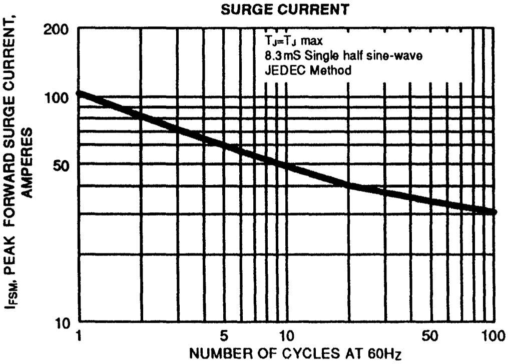


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



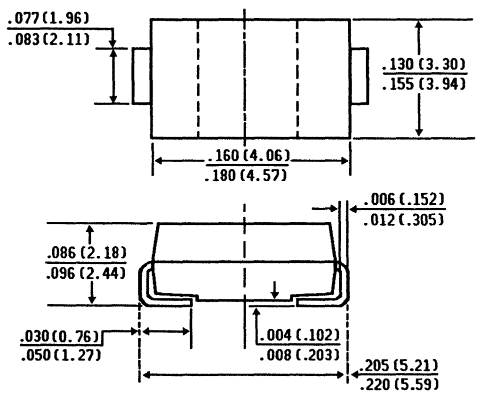
TPSMB6.8 THRU TPSMB43A

AUTOMOTIVE SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

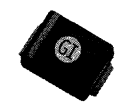
VOLTAGE - 6.8 - 43 Volts   600 Watt Peak Pulse Power

FEATURES

DO-214AA



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Easy pick and place
- Low profile package
- Built-in strain relief
- Available in unidirectional only
- Exclusive G.I. P.A.R. chip construction
- Repetition Rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 volts to BV
- Typical I_D less than 1μA above 10V at T_A=150°C
- Designed to handle all under the hood surface mount application
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AA Molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Standard Packaging: 12mm tape (EIA STD RS-481)
Weight: 0.003 ounces, 0.093 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	VALUE	UNITS
Peak Pulse Power Dissipation on 10/1000µs waveform (NOTES 1,2, FIG. 1)	P_{PPM}	Minimum 600	Watts
Peak Pulse Current on 10/1000 µs waveform (NOTE 1, FIG. 3)	I_{PPM}	See Table 1	Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2,3)	I_{FSM}	70.0	Amps
Instantaneous Forward Voltage at 50A (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 5.0mm^2 (.013mm thick) land areas per figure.
3. Mounted on 8.3ms single half sine-wave duty cycle=4 pulses per minute maximum.

ELECTRICAL CHARACTERISTICS AT T_A=25°C (unless otherwise noted)

Device	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) Min. / Max.	at I_T mA	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	T_A=150°C Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} Vc (Volts)
TPSMB6.8	KDP	6.12 / 7.48	10.0	5.50	500	1000.0	56	10.8
TPSMB6.8A	KEP	6.45 / 7.14	10.0	5.80	500	1000.0	57	10.5
TPSMB7.5	KFP	6.75 / 8.25	10.0	6.05	250	500.0	51	11.7
TPSMB7.5A	KGP	7.13 / 7.88	10.0	6.40	250	500.0	53	11.3
TPSMB8.2	KHP	7.38 / 9.02	10.0	6.63	100	200.0	48	12.5
TPSMB8.2A	KKP	7.79 / 8.61	10.0	7.02	100	200.0	50	12.1
TPSMB9.1	KLP	8.19 / 10.0	1.0	7.37	25	50.0	44	13.8
TPSMB9.1A	KMP	8.65 / 9.55	1.0	7.78	25	50.0	45	13.4
TPSMB10	KNP	9.00 / 11.0	1.0	8.10	5.0	20.0	40	15.0
TPSMB10A	KPP	9.50 / 10.5	1.0	8.55	5.0	20.0	41	14.5
TPSMB11	KQP	9.90 / 12.1	1.0	8.92	2.0	5.0	37	16.2
TPSMB11A	KRP	10.5 / 11.6	1.0	9.40	2.0	5.0	38	15.6
TPSMB12	KSP	10.8 / 13.2	1.0	9.72	2.0	5.0	35	17.3
TPSMB12A	KTP	11.4 / 12.6	1.0	10.2	2.0	5.0	36	16.7
TPSMB13	KUP	12.4 / 13.7	1.0	11.1	2.0	5.0	32	19.0
TPSMB13A	KVP	12.4 / 13.7	1.0	11.1	2.0	5.0	33	18.2
TPSMB15	KWP	13.5 / 16.5	1.0	12.1	2.0	5.0	27	22.0
TPSMB15A	KXP	14.3 / 15.8	1.0	12.8	2.0	5.0	28	21.2
TPSMB16	KYP	14.4 / 17.6	1.0	12.9	2.0	5.0	26	23.5
TPSMB16A	KZP	15.2 / 16.8	1.0	13.6	2.0	5.0	27	22.5
TPSMB18	LDP	16.2 / 19.8	1.0	14.5	2.0	5.0	23	26.5
TPSMB18A	LEP	17.1 / 18.9	1.0	15.3	2.0	5.0	24	25.2
TPSMB20	LFP	18.0 / 22.0	1.0	16.2	2.0	5.0	21	29.1
TPSMB20A	LGP	19.0 / 21.0	1.0	17.1	2.0	5.0	22	27.7
TPSMB22	LHP	19.8 / 24.2	1.0	17.8	2.0	5.0	19	31.9
TPSMB22A	LKP	20.9 / 23.1	1.0	18.8	2.0	5.0	20	30.6
TPSMB24	LLP	21.6 / 26.4	1.0	19.4	2.0	5.0	17	34.7
TPSMB24A	LMP	22.8 / 25.2	1.0	20.5	2.0	5.0	18	33.2
TPSMB27	LNP	24.3 / 29.7	1.0	21.8	2.0	5.0	15	39.1
TPSMB27A	LPP	25.7 / 28.4	1.0	23.1	2.0	5.0	16	37.5
TPSMB30	LQP	27.0 / 33.0	1.0	24.3	2.0	5.0	14	43.5
TPSMB30A	LRP	28.5 / 31.5	1.0	25.6	2.0	5.0	14.4	41.4
TPSMB33	LSP	29.7 / 36.3	1.0	26.8	2.0	5.0	12.6	47.7
TPSMB33A	LTP	31.4 / 34.7	1.0	28.2	2.0	5.0	13.2	45.7
TPSMB36	LUP	32.4 / 39.6	1.0	29.1	2.0	5.0	11.6	52.0
TPSMB36A	LVP	34.2 / 37.8	1.0	30.8	2.0	5.0	12.0	49.9
TPSMB39	LWP	35.1 / 42.9	1.0	31.6	2.0	5.0	10.6	56.4
TPSMB39A	LXP	37.1 / 41.0	1.0	33.3	2.0	5.0	11.2	53.9
TPSMB43	LYP	38.7 / 47.3	1.0	34.8	2.0	5.0	9.6	61.9
TPSMB43A	LZP	40.9 / 45.2	1.0	36.8	2.0	5.0	10.1	59.3

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300µs, I_T=Square Wave Pulse or Equivalent.
2. Surge current Waveform per Figure 3 and Derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIG.1 - PEAK PULSE POWER RATING CURVE

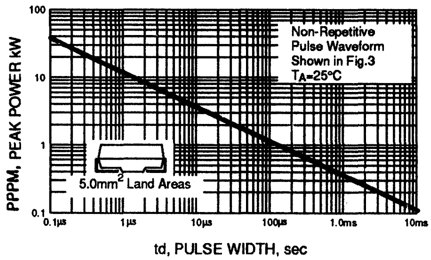


FIG. 2 - PULSE DERATING CURVE

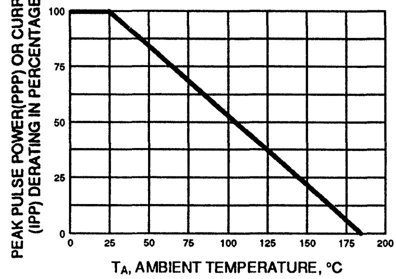


FIG.3 - PULSE WAVEFORM

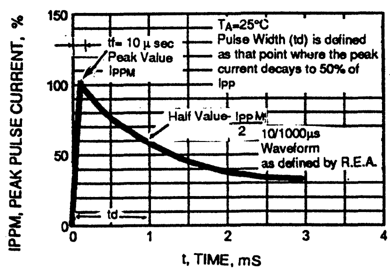


FIG.4 - TYPICAL JUNCTION CAPACITANCE

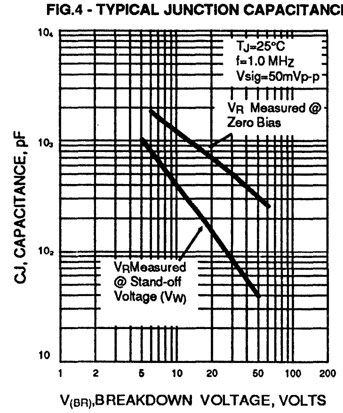
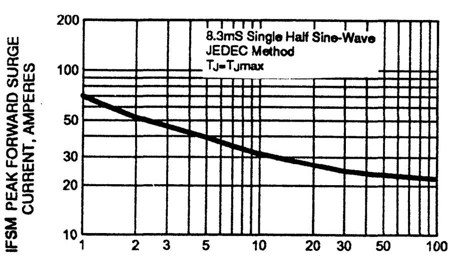


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



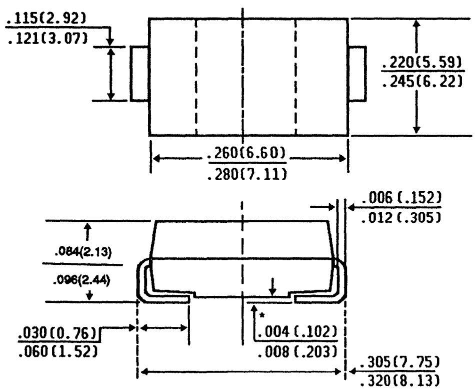
S3A THRU S3M

SURFACE MOUNT RECTIFIER

***VOLTAGE** - 50 to 1000 Volts* ***CURRENT** - 3.0 Amperes*

FEATURES

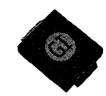
DO-214AB



Dimensions in inches and (millimeters)

*Typical Range

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Easy pick and place
- Glass passivated chip junction
- High temperature soldering: 260°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic over passivated junction
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color denoted cathode *(EIA STD RS-481)*
Weight: 0.007 ounces, 0.21 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.
60 Hz, resistive or inductive load.
For capacitive load, derate current by 20%.

	SYMBOLS	S3A	S3B	S3D	S3G	S3J	S3K	S3M	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	1000	Volts
Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	1000	Volts
Maximum Average Forward Rectified Current at T_L=75°C (NOTE 3)	$I_{(AV)}$	3.0							Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100.0							Amps
Maximum Instantaneous Forward Voltage at 2.5A	V_F	1.15							Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	10.0 250.0							µA
Typical Reverse Recovery Time (NOTE 1)	T_{rr}	2.5							µs
Typical Junction Capacitance (NOTE 2)	C_J	60.0							pF
Maximum Thermal Resistance (NOTE 3)	$R_{\theta JL}$ $R_{\theta JA}$	10.0 60.0							°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150							°C

NOTES:
1 Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. 8.0mm^2 (.013mm thick) land areas.

FIG 1 - FORWARD CURRENT DERATING CURVE

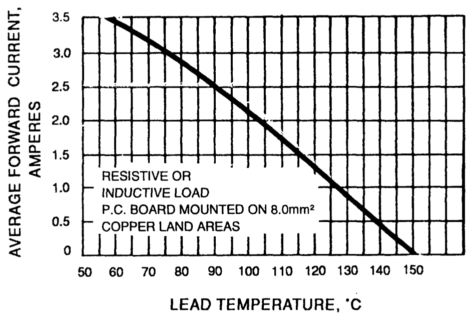


FIG. 2-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

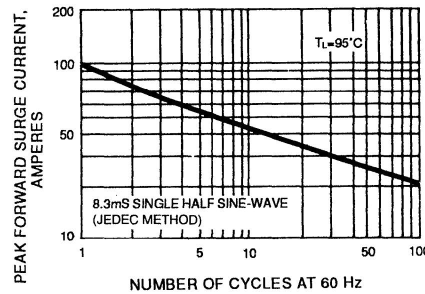


FIG 3 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

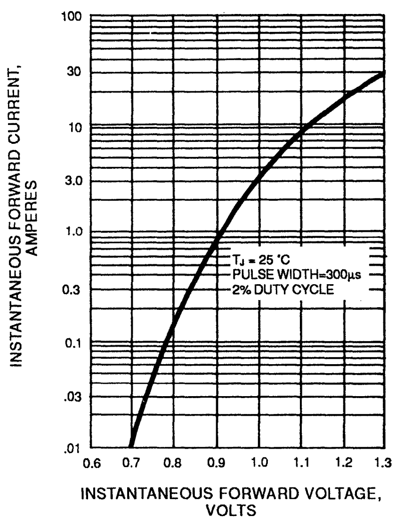


FIG 4 - TYPICAL JUNCTION CHARACTERISTICS

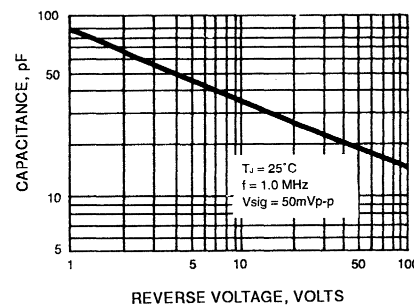
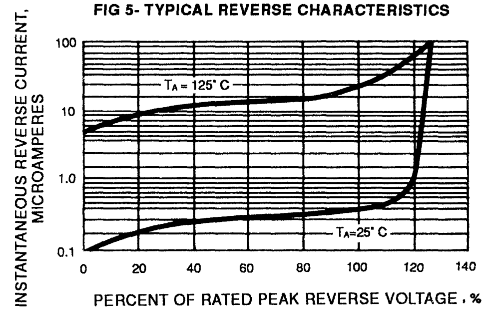


FIG 5- TYPICAL REVERSE CHARACTERISTICS



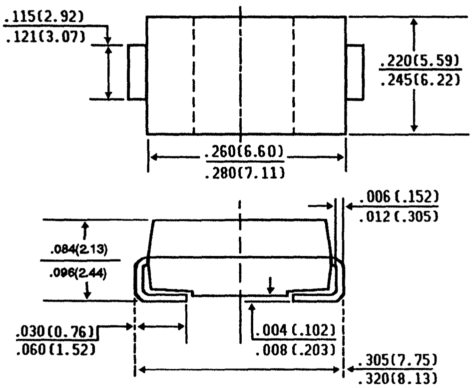
GI General Instrument

RS3A THRU RS3K

FAST SWITCHING SURFACE MOUNT RECTIFIER

VOLTAGE - 50 to 800 Volts CURRENT - 3.0 Amperes

DO-214AB

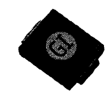


Dimensions in inches and (millimeters)

*Typical Range

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Fast switching fo high efficiency
- Easy pick and place
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic over passivated junction

Terminals: Solder plated solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Standard Packaging: 16mm tape *(EIA STD RS-481)*

Weight: 0.007 ounces, 0.21 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	*RS3A*	*RS3B*	*RS3D*	*RS3G*	*RS3J*	*RS3K*	*UNITS*
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	200	400	600	800	Volts
Maximum RMS Voltage	V_{RMS}	35	70	140	280	420	560	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	200	400	600	800	Volts
Maximum Average Forward Rectified Current at T_L=75°C	$I_{(AV)}$	3.0						Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100						Amps
Maximum Instantaneous Forward Voltage at 2.5A	V_F	1.3						Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=125°C	I_R	10.0 250						µA
Maximum Reverse Recovery Time (NOTE 1)	T_{rr}	150				250	500	ns
Typical Junction Capacitance (NOTE 2)	C_J	60.0						pF
Maximum Thermal Resistance (NOTE 3)	$R\theta JL$ $R\theta JA$	10.0 60.0						°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150						°C

NOTES: 1. Reverse Recovery Test conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. Measured at 1.0 MHz and applied Vr=4.0 volts.
3. 8.0mm^2 (.013mm thick) land areas.

FIG 1 - FORWARD CURRENT DERATING CURVE

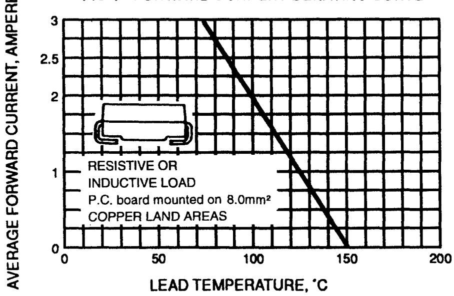


FIG 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

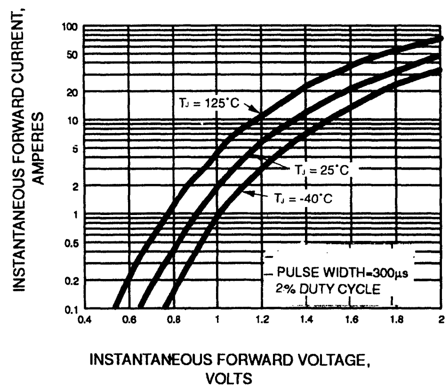


FIG 3 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

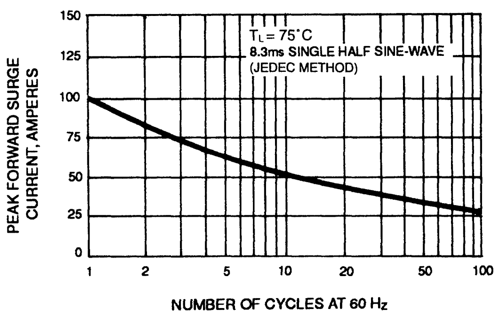


FIG 4 - TYPICAL REVERSE CHARACTERISTICS

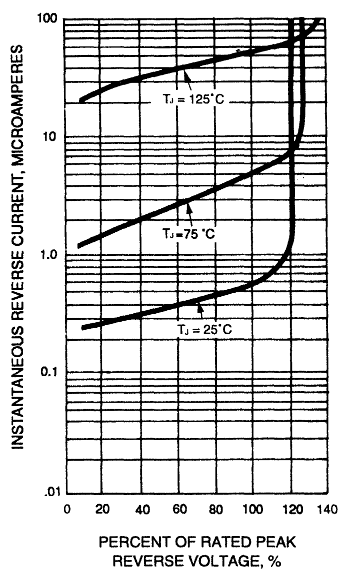
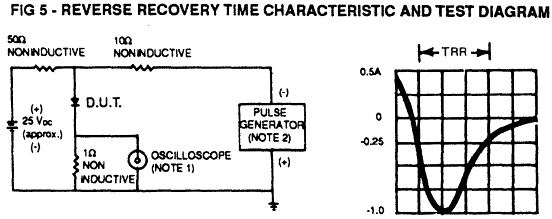


FIG 5 - REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max. Input Impedance = 1megohmn, 22pF.
2. Rise Time = 10ns max. Source Impedance = 50 ohms.

GI General Instrument

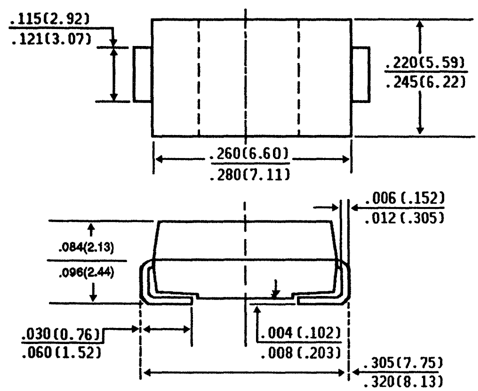
ES3A THRU ES3D

SURFACE MOUNT ULTRAFAST RECTIFIER

***VOLTAGE** - 50 to 200 Volts* ***CURRENT** - 3.0 Amperes*

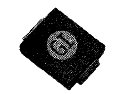
FEATURES

DO-214AB



Dimensions in inches and (millimeters)
*Typical Range

- Plastic package has Underwriters Laboratory Flammability Classification 94 V-O
- For surface mounted applications
- Low profile package
- Built-in strain relief
- Easy pick and place
- Superfast recovery times for high efficiency
- Glass passivated chip junction
- High temperature soldering: 250°C/10 seconds at terminals



MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic over passivated junction

Terminals: Solder plated soldrable per MIL-STD-750, Method 2026

Polarity: Color band denotes cathode

Standard Packaging: 16mm tape *(EIA STD RS-481)*

Weight: 0.007 ounces, 0.21 gram

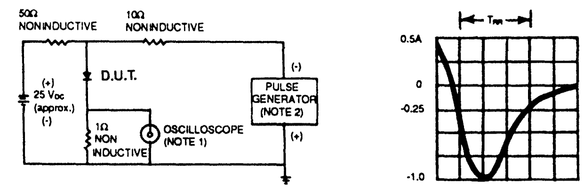
MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	ES3A	ES3B	ES3C	ES3D	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	50	100	150	200	Volts
Maximum RMS Voltage	V_{RMS}	35	70	105	140	Volts
Maximum DC Blocking Voltage	V_{DC}	50	100	150	200	Volts
Maximum Average Forward Rectified Current at T_L=100°C	$I_{(AV)}$	3.0				Amps
Peak Forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100				Amps
Maximum Instantaneous Forward Voltage at 3.0A	V_F	0.90				Volts
Maximum DC Reverse Current T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	10.0 500				μA
Maximum Reverse Recovery Time (NOTE 1)	T_{rr}	20.0				ns
Maximum Reverse Recovery Time T_A=25°C (NOTE 2) T_A=100°C	T_{rr}	30.0 50.0				ns
Maximum Stored Charge T_A=25° C (NOTE 2) T_A=100 °C	Q_{RR}	15.0 35.0				nc
Typical Junction Capacitance (NOTE 3)	C_J	45.0				pF
Typical Thermal Resistance (NOTE 4)	$R\theta JL$ $R\theta JA$	12.0 47.0				°C/W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150				°C

NOTES: 1. Reverse Recovery Test Conditions: I_F=0.5A, I_R=1.0A, Irr=0.25A.
2. T_{RR} and Q_{RR} measured on LEM tester: V_R=30V, di/dt=50 A/μs I_F=3.0A.
3. Measured at 1.0 MHz and applied reverse voltage of 4.0 volts.
4. 8.0mm^2 (.013mm thick) land areas.

FIG 1 - REVERSE RECOVERY TIME CHARACTERISTIC AND TEST DIAGRAM



NOTES: 1. Rise Time = 7ns max. Input Impedance = 1megohmn, 22pF.
2. Rise Time = 10ns max. Source Impedance = 50 ohms.

FIG 2 -MAXIMUM AVERAGE FORWARD CURRENT RATING

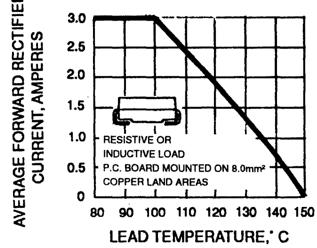


FIG 3 - TYPICAL REVERSE CHARACTERISTICS

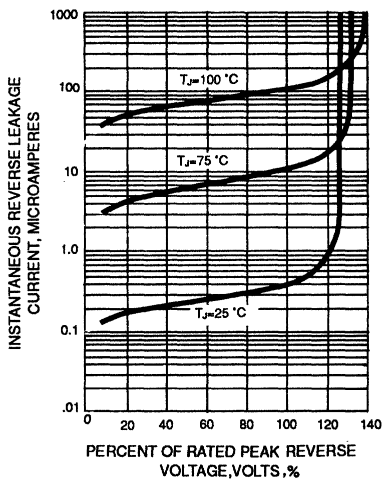


FIG 4 - TYPICAL FORWARD CHARACTERISTICS

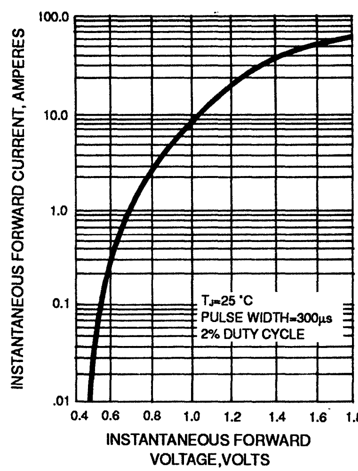


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

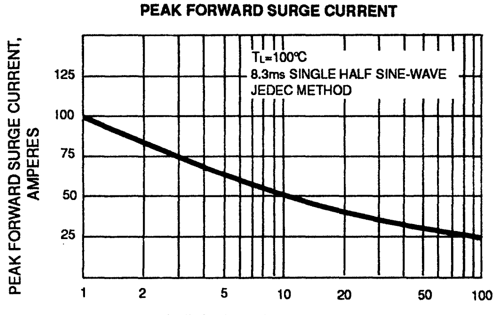
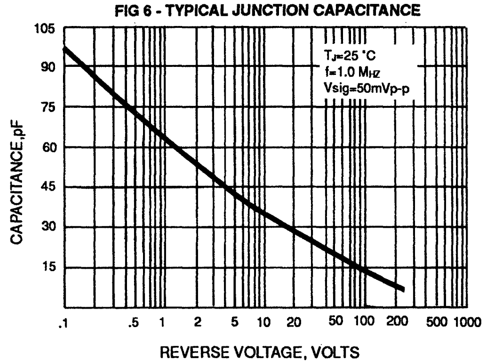


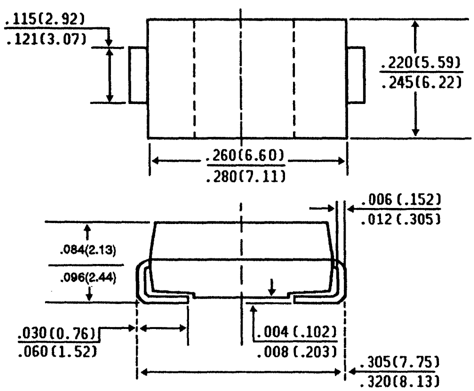
FIG 6 - TYPICAL JUNCTION CAPACITANCE



SS32 THRU SS36

SURFACE MOUNT SCHOTTKY BARRIER RECTIFIER
VOLTAGE - 20 to 60 Volts CURRENT - 3.0 Amperes

DO-214AB



Dimensions in inches and (millimeters)

*Typical Range

FEATURES

- Plastic package has Underwriters Laboratory Flammability Clssification 94V-O
- For surface mounted applications in order to optimize board size
- Low profile package
- Built-in strain relief
- Easy pick and place
- Metal to silicon rectifier, majority carrier conduction
- Low power loss, high efficiency
- High current capability, low V_F
- For use in low voltage, high frequency inverters, free wheeling, and polarity protection applications
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AB molded plastic
Terminals: Solder plated solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode
Standard Packaging: 16mm tape
(EIA STD RS-481)
Weight: 0.007 ounces 0.21 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

	SYMBOLS	SS32	SS33	SS34	SS35	SS36	UNITS
Maximum Recurrent Peak Reverse Voltage	V_{RRM}	20	30	40	50	60	Volts
Maximum RMS voltage	V_{RMS}	14	21	28	35	42	Volts
Maximum DC Blocking Voltage	V_{DC}	20	30	40	50	60	Volts
Maximum Average Forward Rectified Current at T_L (SEE FIGURE 1)	$I_{(AV)}$	3.0					Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method)	I_{FSM}	100					Amps
Maximum Instantaneous Forward Voltage at 3.0A (NOTE 1)	V_F	0.50			0.75		Volts
Maximum DC Reverse Current (NOTE 1) T_A=25°C at Rated DC Blocking Voltage T_A=100°C	I_R	0.5 20.0					mA
Maximum Thermal Resistance (NOTE 2)	$R_{\theta JL}$ $R_{\theta JA}$	10.0 60.0					°C/W
Operating Junction Temperature Range	T_J	-55 to +125			-55 to +150		°C
Storage Temperature Range	T_{STG}	-55 to +150					°C

NOTES:
1. Test Condition: Pulse Width 300 µs, Duty Cycle 2%.
2. Mounted on P.C. board with 8.0mm^2 (.013mm thick) copper land areas.

FIG 1 - FORWARD CURRENT DERATING CURVE

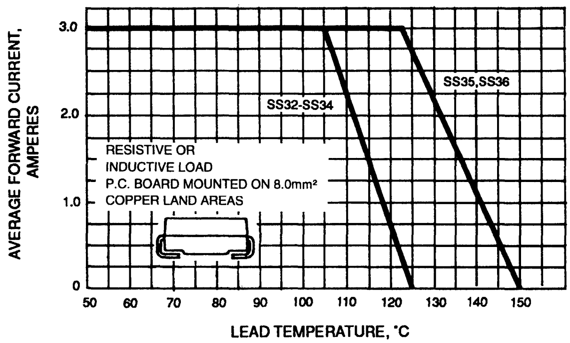


FIG 2 - TYPICAL INSTANTANEOUS FORWARD CHARACTERISTICS

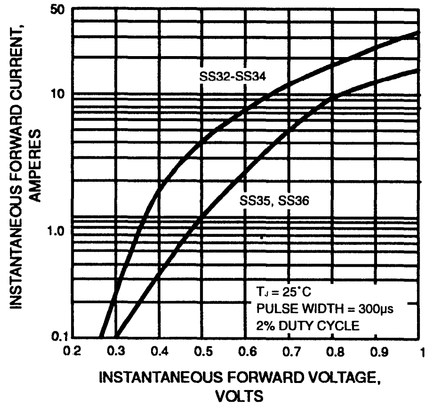


FIG 3 - TYPICAL REVERSE CHARACTERISTICS

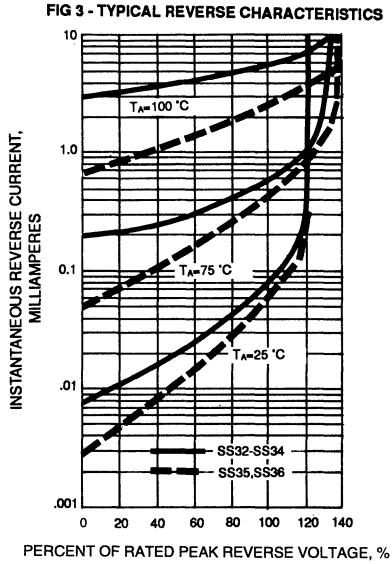


FIG 4 - TYPICAL JUNCTION CAPACITANCE

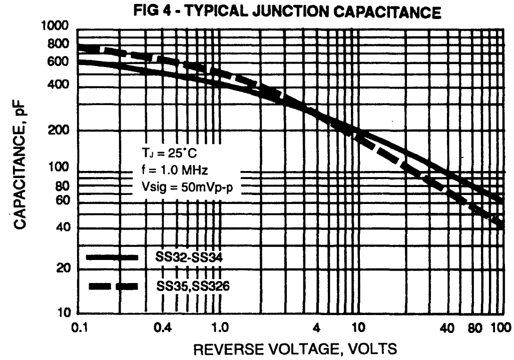
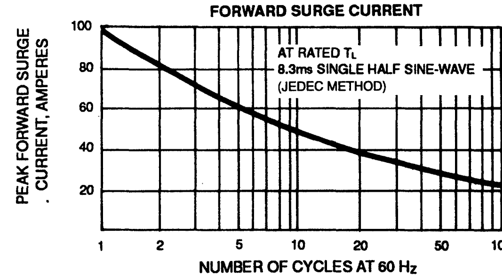


FIG 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



SMCG AND SMCJ5.0 THRU 170, A SERIES

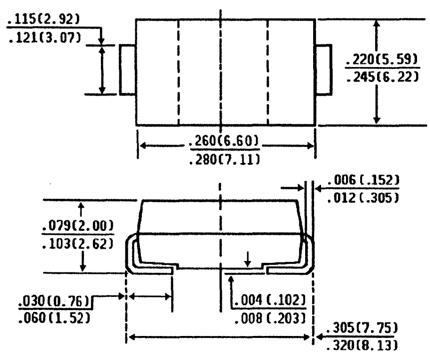
UNIDIRECTIONAL SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE** - 5.0 - 170 Volts* ***Peak Pulse Power** - 1500 Watts*

FEATURES

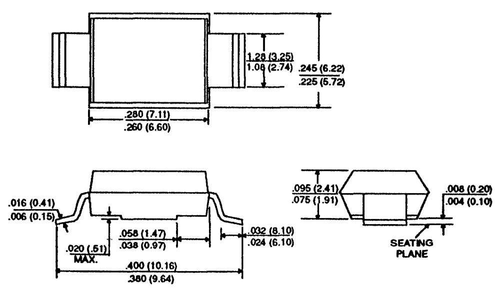
DO-214AB

MODIFIED J-BEND



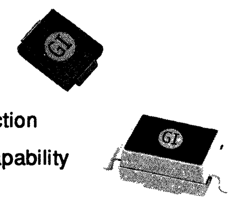
DO-215AA

GULL-WING



Dimensions in inches and (millimeters)

- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Excellent clamping capability
- Low inductance
- Repetition Rate (duty cycle): 0.05%
- Fast response time: typically less than 1.0ps from 0 volts to BV min.
- Typical I_D less than 1μA above 10V
- High temperature soldering: 250°C/10 seconds at terminals
- Plastic package has Underwriters Laboratory Flammability Classification 944V-O



MECHANICAL DATA

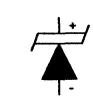
Case: JEDEC DO214 / DO215 molded plastic over passivated junction

Terminals: Solder plated, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes positive end (cathode)

Standard Packaging: 16mm tape *(EIA STD RS-481)*

Weight: .007 ounces, 0.21 gram



Schematic Symbol

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (Notes 1, 2, Fig. 1)	P_{PPM}	Minimum 1500	Watts
Peak Pulse Current on 10/1000μs waveform (Note 1, Fig. 3)	I_{PPM}	See Table 1	Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2,3)	I_{FSM}	100.0	Amps
Maximum Instantaneous Forward Voltage at 100A	V_{FM}	See Notes 3, 4	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 8.0mm^2 copper pads to each terminal.
3. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.
4. V_F=3.5V for SMC-5.0 thru SMC-90 and V_F=5.0V for SMC-100 thru SMC-170 devices

ELECTRICAL CHARACTERISTICS at T_A=25°C (unless otherwise noted)

Gull-Wing Lead	Modified J-Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min. / Max.	at I_T mA	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(mA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMCG5.0	SMCJ5.0	GDD	6.40/7.55	10	5.0	1000	156.2	9.6
SMCG5.0A	SMCJ5.0A	GDE	6.40/7.25	10	5.0	1000	163.0	9.2
SMCG6.0	SMCJ6.0	GDF	6.67/8.45	10	5.0	1000	131.6	11.4
SMCG6.0A	SMCJ6.0A	GDG	6.67/7.67	10	6.0	1000	145.6	10.3
SMCG6.5	SMCJ6.5	GDH	7.22/9.14	10	6.5	500	122.0	12.3
SMCG6.5A	SMCJ6.5A	GDK	7.22/8.30	10	6.5	500	133.9	11.2
SMCG7.0	SMCJ7.0	GDL	7.78/9.86	10	7.0	200	112.8	13.3
SMCG7.0A	SMCJ7.0A	GDM	7.78/8.95	10	7.0	200	125.0	12.0
SMCG7.5	SMCJ7.5	GDN	8.33/10.67	1.0	7.5	100	104.9	14.3
SMCG7.5A	SMCJ7.5A	GDP	8.33/9.58	1.0	7.5	100	116.3	12.9
SMCG8.0	SMCJ8.0	GDQ	8.89/11.3	1.0	8.0	50	100.0	15.0
SMCG8.0A	SMCJ8.0A	GDR	8.89/10.2	1.0	8.0	50	110.3	13.6
SMCG8.5	SMCJ8.5	GDS	9.44/11.9	1.0	8.5	25	95.3	15.9
SMCG8.5A	SMCJ8.5A	GDT	9.44/10.8	1.0	8.5	20	104.2	14.4
SMCG9.0	SMCJ9.0	GDU	10.0/12.6	1.0	9.0	10	88.7	16.9
SMCG9.0A	SMCJ9.0A	GDV	10.0/11.5	1.0	9.0	10	97.4	15.4
SMCG10	SMCJ10	GDW	11.1/14.1	1.0	10	5.0	79.8	18.8
SMCG10A	SMCJ10A	GDX	11.1/12.8	1.0	10	5.0	88.2	17.0
SMCG11	SMCJ11	CDY	12.2/15.4	1.0	11	5.0	74.6	20.1
SMCG11A	SMCJ11A	GDZ	12.2/14.0	1.0	11	5.0	82.4	18.2
SMCG12	SMCJ12	GED	13.3/16.9	1.0	12	5.0	68.2	22.0
SMCG12A	SMCJ12A	GEE	13.3/15.3	1.0	12	5.0	75.3	19.9
SMCG13	SMCJ13	GEF	14.4/18.2	1.0	13	5.0	63.0	23.8
SMCG13A	SMCJ13A	GEG	14.4/16.5	1.0	13	5.0	69.7	21.5
SMCG14	SMCJ14	GEH	15.6/19.8	1.0	14	5.0	58.1	25.8
SMCG14A	SMCJ14A	GEK	15.6/17.9	1.0	14	5.0	64.7	23.2
SMCG15	SNCJ15	GEL	16.7/21.1	1.0	15	5.0	55.8	26.9
SMCG15A	SNCJ15A	GEM	16.7/19.2	1.0	15	5.0	61.5	24.4
SMCG16	SMCJ16	GEN	17.8/22.6	1.0	16	5.0	52.1	28.8
SMCG16A	SMCJ16A	GEP	17.8/20.5	1.0	16	5.0	57.7	26.0
SMCG17	SMCJ17	GEQ	18.9/23.9	1.0	17	5.0	49.2	30.5
SMCG17A	SMCJ17A	GER	18.9/21.7	1.0	17	5.0	53.3	27.6
SMCG18	SMCJ18	GES	20.0/25.3	1.0	18	5.0	46.6	32.2
SMCG18A	SMCJ18A	GET	20.0/23.3	1.0	18	5.0	51.4	29.2
SMCG20	SMCJ20	GEU	22.2/28.1	1.0	20	5.0	41.9	35.8
SMCG20A	SMCJ20A	GEV	22.2/25.5	1.0	20	5.0	46.3	32.4
SMCG22	SMCJ22	GEW	24.4/30.9	1.0	22	5.0	38.1	39.4
SMCG22A	SMCJ22A	GEX	24.4/28.0	1.0	22	5.0	42.2	35.5
SMCG24	SMCJ24	GEY	26.7/33.8	1.0	24	5.0	34.9	43.0
SMCG24A	SMCJ24A	GEZ	26.7/36.7	1.0	24	5.0	38.6	38.9
SMCG26	SMCJ26	GFD	28.9/36.6	1.0	26	5.0	32.2	46.6
SMCG26A	SMCJ26A	GFE	28.9/33.2	1.0	26	5.0	35.6	42.1
SMCG28	SMCJ28	GFF	31.1/39.4	1.0	28	5.0	30.0	50.0
SMCG28A	SMCJ28A	GFG	31.1/35.8	1.0	28	5.0	33.0	45.4
SMCG30	SMCJ30	GFH	33.3/42.2	1.0	30	5.0	28.0	53.5
SMCG30A	SMCJ30A	GFK	33.3/38.3	1.0	30	5.0	31.0	48.4
SMCG33	SMCJ33	GFL	36.7/46.5	1.0	33	5.0	25.2	59.0
SMCG33A	SMCJ33A	GFM	36.7/42.3	1.0	33	5.0	28.1	53.3
SMCG36	SMCJ36	GFN	40.0/50.7	1.0	36	5.0	23.3	64.3
SMCG36A	SMCJ36A	GFP	40.0/46.0	1.0	36	5.0	25.8	58.1
SMCG40	SMCJ40	GFQ	44.4/56.3	1.0	40	5.0	21.0	71.4
SMCG40A	SMCJ40A	GFR	44.4/51.1	1.0	40	5.0	23.2	64.5
SMCG43	SMCJ43	GFS	47.8/60.5	1.0	43	5.0	19.6	76.7
SMCG43A	SMCJ43A	GFT	47.8/54.9	1.0	43	5.0	21.6	69.4
SMCG45	SMCJ45	GFU	50.0/63.3	1.0	45	5.0	18.7	80.3
SMCG45A	SMCJ45A	GFV	50.0/57.5	1.0	45	5.0	20.6	72.7
SMCG48	SMCJ48	GFW	53.3/67.5	1.0	48	5.0	17.5	85.5
SMCG48A	SMCJ48A	GFX	53.3/61.3	1.0	48	5.0	19.4	77.4
SMCG51	SMCJ51	GFY	56.7/71.8	1.0	51	5.0	18.5	91.1
SMCG51A	SMCJ51A	GFZ	56.7/65.2	1.0	51	5.0	18.2	82.4
SMCG54	SMCJ54	GGD	60.0/76.0	1.0	54	5.0	15.6	96.3
SMCG54A	SMCJ54A	GGE	60.0/69.0	1.0	54	5.0	17.2	87.1

ELECTRICAL CHARACTERISTICS AT T_A=25°C (unless otherwise noted)

Gull-Wing Lead	Modified J-Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts(NOTE 1) Min. / Max.	@ I_T mA	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_R (µA)	Maximum Peak Pulse Surge Current IPPM (NOTE 2) (Amps)	Maximum Clamping Voltage at IPPM VC (Volts)
SMCG58	SMCJ58	GGF	64.4/81.6	1.0	58	5.0	14.6	103.0
SMCG58A	SMCJ58A	GGG	64.4/74.1	1.0	58	5.0	16.0	93.6
SMCG60	SMCJ60	GGH	66.7/84.5	1.0	60	5.0	14.0	107.0
SMCG60A	SMCJ60A	GGK	66.7/76.7	1.0	60	5.0	15.5	96.8
SMCG64	SMCJ64	GGL	71.1/90.1	1.0	64	5.0	13.2	114.0
SMCG64A	SMCJ64A	GGM	71.1/81.8	1.0	64	5.0	14.6	103.0
SMCG70	SMCJ70	GGN	77.8/98.6	1.0	70	5.0	12.0	125
SMCG70A	SMCJ70A	GGP	77.8/89.5	1.0	70	5.0	13.3	113
SMCG75	SMCJ75	GGQ	83.3/105.7	1.0	75	5.0	11.2	134
SMCG75A	SMCJ75A	GGR	83.3/95.8	1.0	75	5.0	12.4	121
SMCG78	SMCJ78	GGS	86.7/109.9	1.0	78	5.0	10.8	139
SMCG78A	SMCJ78A	GGT	86.7/99.7	1.0	78	5.0	11.4	126
SMCG85	SMCJ85	GGU	94.4/119.2	1.0	85	5.0	9.9	151
SMCG85A	SMCJ85A	GGV	94.4/108.2	1.0	85	5.0	10.4	137
SMCG90	SMCJ90	GGW	100/126.5	1.0	90	5.0	9.4	160
SMCG90A	SMCJ90A	GGX	100/115.5	1.0	90	5.0	10.3	146
SMCG100	SMCJ100	GGY	111/141.0	1.0	111	5.0	8.4	179
SMCG100A	SMCJ100A	GGZ	111/128.0	1.0	100	5.0	9.3	162
SMCG110	SMCJ110	GHD	122/154.5	1.0	110	5.0	7.7	196
SMCG110A	SMCJ110A	GHE	122/140.5	1.0	110	5.0	8.4	177
SMCG120	SMCJ120	GHF	133/169.0	1.0	120	5.0	7.0	214
SMCG120A	SMCJ120A	GHG	133/153.0	1.0	120	5.0	7.9	193
SMCG130	SMCJ130	GHH	144/182.5	1.0	130	5.0	6.5	231
SMCG130A	SMCJ130A	GHK	144.165.5	1.0	130	5.0	7.2	209
SMCG150	SMCJ150	GHL	167/211.5	1.0	150	5.0	5.6	268
SMCG150A	SMCJ150A	GHM	167/192.5	1.0	150	5.0	6.2	243
SMCG160	SMCJ160	GHN	178/226.0	1.0	160	5.0	5.2	287
SMCG160A	SMCJ160A	GHP	178/205.0	1.0	160	5.0	5.8	259
SMCG170	SMCJ170	GHQ	189/239.5	1.0	170	5.0	4.9	304
SMCG170A	SMCJ170A	GHR	189/217.5	1.0	170	5.0	5.5	275

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300 us. I_T = Square Wave Pulse or equivalent.
2. Surge current Waveform per Figure 3 and Derate per Figure 2.
3. A TransZorb TVS is normally selected according to the reverse "Stand Off Voltage"(V_{WM}) which should be equal to or greater than the dc or continuous voltage level.
4. All terms and symbols are consistant with ANSI / IEEE C62.35 specifications.

APPLICATION NOTES

This series of TransZorb transient voltage suppressors, available in small outline mountable packages, is designed to optimize board space. Packaged for use with surface mount technology automated assembly equiptment, these parts can be placed on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground.

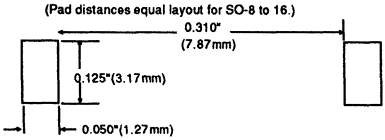
A 1500W (SMC) device is normally selected when the threat of transients is from lightening induced transients, conducted via external leads or I/O lines. It is also used to protect against switching transients induced by large coils or industrial motors. Source impedance at component level in a system is usually high enough to limit the current within the peak pulse current (Ipp) rating of this series.

RECOMMENDED PAD SIZES

The pad dimentions should be 0.010"(.25mm) longer than the contact size, in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

GULL- WING

(Pad distances equal layout for SO-8 to 16.)



MODIFIED J-BEND

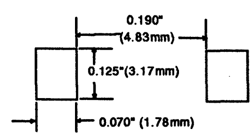


FIG. 1 - PEAK PULSE POWER RATING CURVE

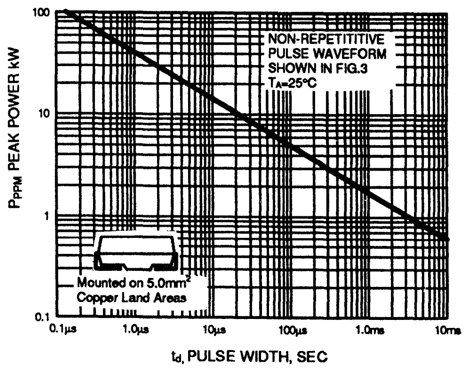


FIG. 2 - PULSE RATING CURVE

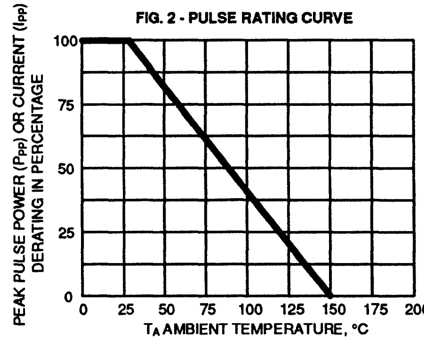


FIG.3 - PULSE WAVEFORM

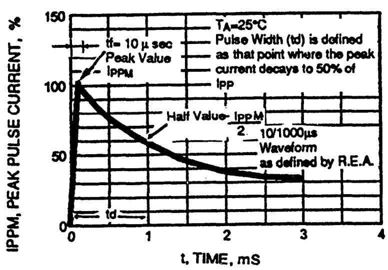


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

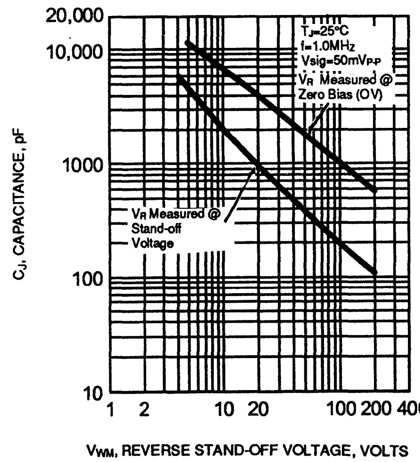
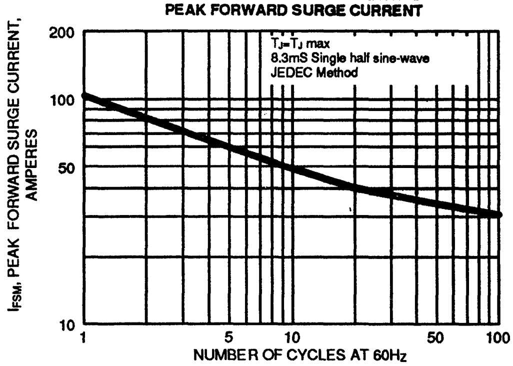


FIG. 5 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



SMCG AND SMCJ 5.0 THRU 170C,CA SERIES

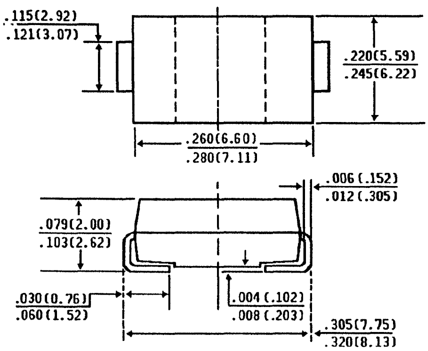
BIDIRECTIONAL SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE** - 5.0 - 170 Volts* ***Peak Pulse Power** - 1500 Watts*

FEATURES

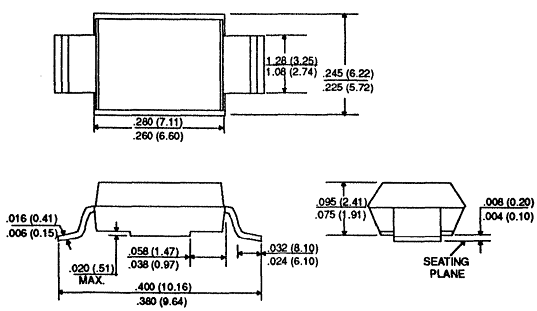
DO-214AB

MODIFIED J-BEND



DO-215AA

GULL WING



Dimensions in inches and (millimeters)

- For surface mounted applications in order to optimize board space.
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Excellent clamping capability
- Low inductance
- Repetition Rate (duty cycle):0.5%
- Fast response time: typically less than 5.0nS from 0 volts to BV for bidirectional types
- Typical I_D less than 1μA above 10V
- High temperature soldering: 250°C/10 seconds at terminals
- Plastic package has Underwriters Laboratory Flammability Classification 94V-O

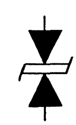
MECHANICAL DATA

Case: JEDEC DO214 / DO215 molded plastic over passivated junction

Terminals: Solder plated, solderable per MIL-STD-750, Method 2026

Standard Packaging: 16mm tape *(EIA STD RS-481)*

Weight: .007 ounces, 0.21 gram



Schematic Symbol

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Electrical characteristics apply in both directions.
Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (Notes 1, 2)	P_{PPM}	Minimum 1500	Watts
Peak Pulse Current on 10/1000μs waveform (Note 1, Fig. 3)	IPPM	See Table 1	Amps
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 8.0mm^2 copper pads to each terminal.

ELECTRICAL CHARACTERISTICS AT T_A=25°C (unless otherwise noted)

Gull-Wing Lead	Modified J-Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts(NOTE 1) Min. / Max.	at I_T mA	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMCG5.0C	SMCJ5.0C	GDD	6.40/7.55	10	5.0	1000	156.2	9.6
SMCG5.0CA	SMCJ5.0CA	GDE	6.40/7.25	10	5.0	1000	163.0	9.2
SMCG6.0C	SMCJ6.0C	GDF	6.67/8.45	10	5.0	1000	131.6	11.4
SMCG6.0CA	SMCJ6.0CA	GDG	6.67/7.67	10	6.0	1000	145.6	10.3
SMCG6.5C	SMCJ6.5C	BDH	7.22/9.14	10	6.5	500	122.0	12.3
SMCG6.5CA	SMCJ6.5CA	BDK	7.22/8.30	10	6.5	500	133.9	11.2
SMCG7.0C	SMCJ7.0C	GDL	7.78/9.86	10	7.0	200	112.8	13.3
SMCG7.0CA	SMCJ7.0CA	GDM	7.78/8.95	10	7.0	200	125.0	12.0
SMCG7.5C	SMCJ7.5C	BDN	8.33/10.67	1.0	7.5	100	104.9	14.3
SMCG7.5CA	SMCJ7.5CA	BDP	8.33/9.58	1.0	7.5	100	116.3	12.9
SMCG8.0C	SMCJ8.0C	BDQ	8.89/11.3	1.0	8.0	50	100.0	15.0
SMCG8.0CA	SMCJ8.0CA	BDR	8.89/10.2	1.0	8.0	50	110.3	13.6
SMCG8.5C	SMCJ8.5C	BDS	9.44/11.9	1.0	8.5	25	95.3	15.9
SMCG8.5CA	SMCJ8.5CA	BDT	9.44/10.8	1.0	8.5	20	104.2	14.4
SMCG9.0C	SMCJ9.0C	BDU	10.0/12.6	1.0	9.0	10	88.7	16.9
SMCG9.0CA	SMCJ9.0CA	BDV	10.0/11.5	1.0	9.0	10	97.4	15.4
SMCG10C	SMCJ10C	BDW	11.1/14.1	1.0	10	5.0	79.8	18.8
SMCG10CA	SMCJ10CA	BDX	11.1/12.8	1.0	10	5.0	88.2	17.0
SMCG11C	SMCJ11C	GDY	12.2/15.4	1.0	11	5.0	74.6	20.1
SMCG11CA	SMCJ11CA	GDZ	12.2/14.0	1.0	11	5.0	82.4	18.2
SMCG12C	SMCJ12C	BED	13.3/16.9	1.0	12	5.0	68.2	22.0
SMCG12CA	SMCJ12CA	BEE	13.3/15.3	1.0	12	5.0	75.3	19.9
SMCG13C	SMCJ13C	GEF	14.4/18.2	1.0	13	5.0	63.0	23.8
SMCG13CA	SMCJ13CA	GEG	14.4/16.5	1.0	13	5.0	69.7	21.5
SMCG14C	SMCJ14C	BEH	15.6/19.8	1.0	14	5.0	58.1	25.8
SMCG14CA	SMCJ14CA	BEK	15.6/17.9	1.0	14	5.0	64.7	23.2
SMCG15C	SNCJ15C	BEL	16.7/21.1	1.0	15	5.0	55.8	26.9
SMCG15CA	SNCJ15CA	BEM	16.7/19.2	1.0	15	5.0	61.5	24.4
SMCG16C	SMCJ16C	GEN	17.8/22.6	1.0	16	5.0	52.1	28.8
SMCG16CA	SMCJ16CA	GEP	17.8/20.5	1.0	16	5.0	57.7	26.0
SMCG17C	SMCJ17C	GEQ	18.9/23.9	1.0	17	5.0	49.2	30.5
SMCG17CA	SMCJ17CA	GER	18.9/21.7	1.0	17	5.0	53.3	27.6
SMCG18C	SMCJ18C	BES	20.0/25.3	1.0	18	5.0	46.6	32.2
SMCG18CA	SMCJ18CA	BET	20.0/23.3	1.0	18	5.0	51.4	29.2
SMCG20C	SMCJ20C	GEU	22.2/28.1	1.0	20	5.0	41.9	35.8
SMCG20CA	SMCJ20CA	GEV	22.2/25.5	1.0	20	5.0	46.3	32.4
SMCG22C	SMCJ22C	BEW	24.4/30.9	1.0	22	5.0	38.1	39.4
SMCG22CA	SMCJ22CA	BEX	24.4/28.0	1.0	22	5.0	42.2	35.5
SMCG24C	SMCJ24C	BEY	26.7/33.8	1.0	24	5.0	34.9	43.0
SMCG24CA	SMCJ24CA	BEZ	26.7/30.7	1.0	24	5.0	38.6	38.9
SMCG26C	SMCJ26C	BFD	28.9/36.6	1.0	26	5.0	32.2	46.6
SMCG26CA	SMCJ26CA	BFE	28.9/32.2	1.0	26	5.0	35.6	42.1
SMCG28C	SMCJ28C	GFF	31.1/39.4	1.0	28	5.0	30.0	50.0
SMCG28CA	SMCJ28CA	GFG	31.1/35.8	1.0	28	5.0	33.0	45.4
SMCG30C	SMCJ30C	BFH	33.3/42.2	1.0	30	5.0	28.0	53.5
SMCG30CA	SMCJ30CA	BFK	33.3/38.3	1.0	30	5.0	31.0	48.4
SMCG33C	SMCJ33C	BFL	36.7/46.9	1.0	33	5.0	25.2	59.0
SMCG33CA	SMCJ33CA	BFM	36.7/42.2	1.0	33	5.0	28.1	53.3
SMCG36C	SMCJ36C	BFN	40.0/5.07	1.0	36	5.0	23.3	64.3
SMCG36CA	SMCJ36CA	BFP	40.0/46.0	1.0	36	5.0	25.8	58.1
SMCG40C	SMCJ40C	BFQ	44.4/56.3	1.0	40	5.0	21.0	71.4
SMCG40CA	SMCJ40CA	BFR	44.4/51.1	1.0	40	5.0	23.2	64.5
SMCG43C	SMCJ43C	BFS	47.8/60.5	1.0	43	5.0	19.6	76.7
SMCG43CA	SMCJ43CA	BFT	47.8/54.9	1.0	43	5.0	21.6	69.4
SMCG45C	SMCJ45C	GFU	50.0/63.3	1.0	45	5.0	18.7	80.3
SMCG45CA	SMCJ45CA	GFV	50.0/57.5	1.0	45	5.0	20.6	72.7
SMCG48C	SMCJ48C	GFW	53.3/67.5	1.0	48	5.0	17.5	85.5
SMCG48CA	SMCJ48CA	GFX	53.3/61.3	1.0	48	5.0	19.4	77.4
SMCG51C	SMCJ51C	GFY	56.7/71.8	1.0	51	5.0	18.5	91.1
SMCG51CA	SMCJ51CA	GFZ	56.7/65.2	1.0	51	5.0	18.2	82.4
SMCG54C	SMCJ54C	GGD	60.0/76.0	1.0	54	5.0	15.6	96.3
SMCG54CA	SMCJ54CA	GGE	60.0/69.0	1.0	54	5.0	17.2	87.1

ELECTRICAL CHARACTERISTICS AT T_A=25°C (unless otherwise noted)

Gull-Wing Lead	Modified J-Bend Lead	Device Marking Code	Breakdown Voltage $V_{(BR)}$ (Volts)(NOTE 1) Min./Max.	at I_T (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)
SMCG58C	SMCJ58C	GGF	64.4/81.6	1.0	58	5.0	14.6	103.0
SMCG58CA	SMCJ58CA	GGG	64.4/74.6	1.0	58	5.0	16.0	93.6
SMCG60C	SMCJ60C	GGH	66.7/84.5	1.0	60	5.0	14.0	107.0
SMCG60CA	SMCJ60CA	GGK	66.7/76.7	1.0	60	5.0	15.5	96.8
SMCG64C	SMCJ64C	GGL	71.1/90.1	1.0	64	5.0	13.2	114.0
SMCG64CA	SMCJ64CA	GGM	71.1/81.8	1.0	64	5.0	14.6	103.0
SMCG70C	SMCJ70C	GGN	77.8/98.6	1.0	70	5.0	12.0	125
SMCG70CA	SMCJ70CA	GGP	77.8/89.5	1.0	70	5.0	13.3	113
SMCG75C	SMCJ75C	GGQ	83.3/105.7	1.0	75	5.0	11.2	134
SMCG75CA	SMCJ75CA	GGR	83.3/95.8	1.0	75	5.0	12.4	121
SMCG78C	SMCJ78C	GGS	86.7/109.9	1.0	78	5.0	10.8	139
SMCG78CA	SMCJ78CA	GGT	86.7/99.7	1.0	78	5.0	11.4	126
SMCG85C	SMCJ85C	GGU	94.4/119.2	1.0	85	5.0	9.9	151
SMCG85CA	SMCJ85CA	GGV	94.4/108.2	1.0	85	5.0	10.4	137
SMCG90C	SMCJ90C	GGW	100/126.5	1.0	90	5.0	9.4	160
SMCG90CA	SMCJ90CA	GGX	100/115.5	1.0	90	5.0	10.3	146
SMCG100C	SMCJ100C	GGY	111/141.0	1.0	111	5.0	8.4	179
SMCG100CA	SMCJ100CA	GGZ	111/128.0	1.0	100	5.0	9.3	162
SMCG110C	SMCJ110C	GHD	122/154.5	1.0	110	5.0	7.7	196
SMCG110CA	SMCJ110CA	GHE	122/140.5	1.0	110	5.0	8.4	177
SMCG120C	SMCJ120C	GHF	133/169.0	1.0	120	5.0	7.0	214
SMCG120CA	SMCJ120CA	GHG	133/153.0	1.0	120	5.0	7.9	193
SMCG130C	SMCJ130C	GHH	144/182.5	1.0	130	5.0	6.5	231
SMCG130CA	SMCJ130CA	GHK	144/165.5	1.0	130	5.0	7.2	209
SMCG150C	SMCJ150C	GHL	167/211.5	1.0	150	5.0	5.6	268
SMCG150CA	SMCJ150CA	GHM	167/192.5	1.0	150	5.0	6.2	243
SMCG160C	SMCJ160C	GHN	178/226.0	1.0	160	5.0	5.2	287
SMCG160CA	SMCJ160CA	GHP	178/205.0	1.0	160	5.0	5.8	259
SMCG170C	SMCJ170C	GHQ	189/239.5	1.0	170	5.0	4.9	304
SMCG170CA	SMCJ170CA	GHR	189/217.5	1.0	170	5.0	5.5	275

NOTES:
1. $V_{(BR)}$ measured after I_T applied for 300 us. I_T = Square Wave Pulse or equivalent.
2. Surge current Waveform per Figure 3 and Derate per Figure 2.
3. .A TransZorb TVS is normally selected according to the reverse "Stand Off Voltage"(V_{WM}) which should be equal to or greater than the DC or continuous peak operating voltage level.
4. All terms and symbols are consistant with ANSI / IEEE C.62.35 specifications.

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This series of TransZorb transient voltage suppressors, available in small outline mountable packages, is designed to optimize board space. Packaged for use with surface mount technology automated assembly equiptment, these parts can be placed on printed circuit boards and ceramic substrates to protect sensitive components from transient voltage damage. The wide leads assure a large surface contact for good heat dissipation, and a low resistance path for surge current flow to ground. These high speed transient voltage suppressors can be used to effectively protect sensitive components such as integrated circuits and MOS devices.

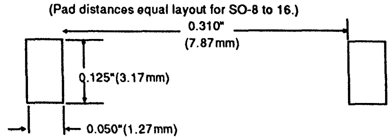
A 1500W (SMC) device is normally selected when the threat of transients is from lightening induced transients, conducted via external leads or I/O lines. It is also used to protect against switching transients induced by large coils or industrial motors. Source impediance at component level in a system is usually high enough to limit the current within the peak pulse current (Ipp) rating of this series. In an overstress condition, the failure mode is a short circuit.

RECOMMENDED PAD SIZES

The pad dimentions should be 0.010"(.25mm) longer than the contact size, in the lead axis. This allows a solder fillet to form, see figure below. Contact factory for soldering methods.

GULL- WING

(Pad distances equal layout for SO-8 to 16.)



MODIFIED J-BEND

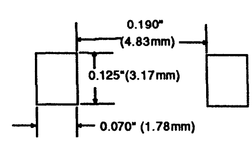


FIG. 1 - PEAK PULSE POWER RATING CURVE

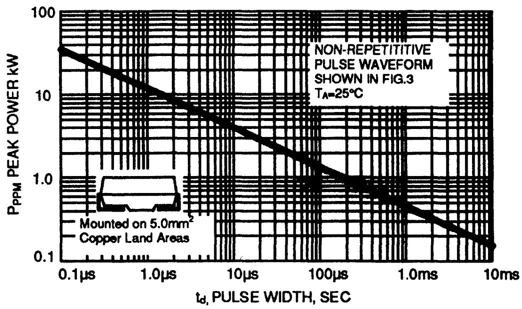


FIG. 2 - PULSE RATING CURVE

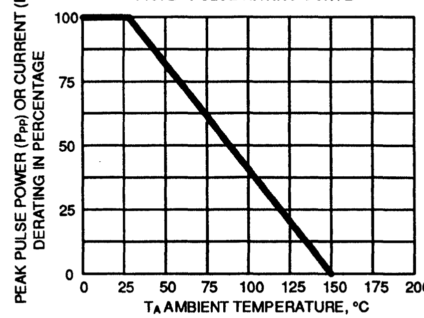


FIG.3 - PULSE WAVEFORM

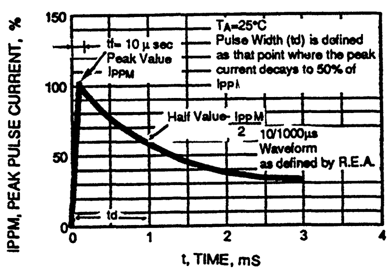
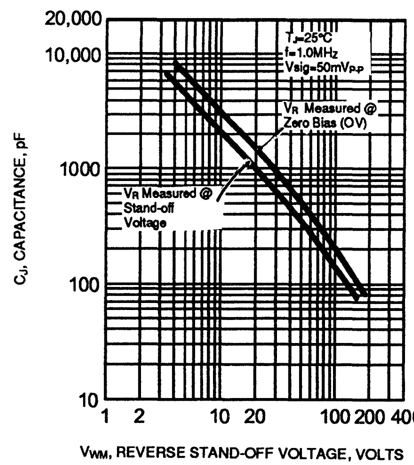


FIG. 4 - TYPICAL JUNCTION CAPACITANCE



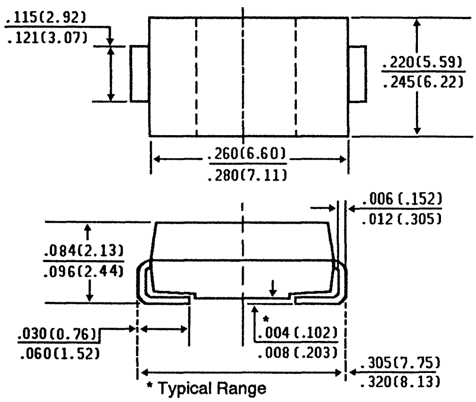
TPSMC6.8 THRU TPSMC43A

AUTOMOTIVE SURFACE MOUNT TRANSIENT VOLTAGE SUPPRESSOR

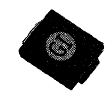
VOLTAGE - 6.8 - 43 Volts   1500 Watt Peak Pulse Power

FEATURES

DO-214AB



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Easy pick and place
- Available in unidirectional only
- Low profile package
- Built-in strain relief
- Exclusive G.I. P.A.R. chip construction
- Repetition Rate (duty cycle): 0.05%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0 volts to BV
- Typical I_R less than 1μA above 10V at T_A=150°C
- Designed to handle all under the hood surface mount application
- High temperature soldering: 250°C/10 seconds at terminals

MECHANICAL DATA

Case: JEDEC DO-214AB Molded plastic over passivated junction
Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Standard Packaging: 16mm tape *(EIA STD RS-481)*
Weight: 0.007 ounces, 0.21 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	VALUE	UNITS
Peak Pulse Power Dissipation on 10/1000μs waveform (NOTES 1, 2, FIG. 3)	P_{PPM}	Minimum 1500	Watts
Peak Power Pulse Current on 10/1000μs waveform (NOTE 1, FIG. 1)	I_{PPM}	See Table 1	Amps
Peak forward Surge Current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTES 2, 3)	I_{FSM}	200.0	Amps
Instantaneous Forward Voltage at 100A (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on 8.0mm^2 copper pads to each terminal.
3. Measured on 8.3ms single half sine-wave, or equivilent squarewave, duty cycle=4 pulses per minute maximum.

ELECTRICAL CHARACTERISTICS at T_A=25°C (unless otherwise noted)

Device	Device Marking Code	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) Min. / Max.	at I_T (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_R (µA)	T_A=150°C Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Surge Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)
TPSMC6.8	DDP	6.12/ 7.48	10	5.50	500.0	1000.0	139	10.8
TPSMC6.8A	DEP	6.45 / 7.14	10	5.80	500.0	1000.0	143	10.5
TPSMC7.5	DFP	6.75 / 8.25	10	6.05	250.0	500.0	128	11.7
TPSMC7.5A	DGP	7.13 / 7.88	10	6.40	250.0	500.0	132	11.3
TPSMC8.2	DHP	7.38 / 9.02	10	6.63	100.0	200.0	120	12.5
TPSMC8.2A	DKP	7.79 / 8.61	10	7.02	100.0	200.0	124	12.1
TPSMC9.1	DLP	8.19 / 10.0	1.0	7.37	25.0	50.0	109	13.8
TPSMC9.1A	DMP	8.65 / 9.55	1.0	7.78	25.0	50.0	112	13.4
TPSMC10	DNP	9.00 / 11.0	1.0	8.10	10.0	25.0	100	15.0
TPSMC10A	DPP	9.50 / 10.5	1.0	8.55	10.0	25.0	103	14.5
TPSMC11	DQP	9.90 / 12.1	1.0	8.92	2.0	10.0	93.0	16.2
TPSMC11A	DRP	10.5 / 11.6	1.0	9.40	2.0	10.0	96.0	15.6
TPSMC12	DSP	10.8 / 13.2	1.0	9.72	2.0	10.0	87.0	17.3
TPSMC12A	DTP	11.4 / 12.6	1.0	10.2	2.0	10.0	90.0	16.7
TPSMC13	DUP	12.4 / 13.7	1.0	11.1	2.0	10.0	79.0	19.0
TPSMC13A	DVP	12.4 / 13.7	1.0	11.1	2.0	10.0	82.0	18.2
TPSMC15	DWP	13.5 / 16.5	1.0	12.1	2.0	10.0	68.0	22.0
TPSMC15A	DXP	14.3 / 15.8	1.0	12.8	2.0	10.0	71.0	21.2
TPSMC16	DYP	14.4 / 17.6	1.0	12.9	2.0	10.0	64.0	23.5
TPSMC16A	DZP	15.2 / 16.8	1.0	13.6	2.0	10.0	67.0	22.5
TPSMC18	EDP	16.2 / 19.8	1.0	14.5	2.0	10.0	56.5	26.5
TPSMC18A	EEP	17.1 / 18.9	1.0	15.3	2.0	10.0	59.5	25.2
TPSMC20	EFP	18.0 / 22.0	1.0	16.2	2.0	10.0	51.5	29.1
TPSMC20A	EGP	19.0 / 21.0	1.0	17.1	2.0	10.0	54.0	27.7
TPSMC22	EHP	19.8 / 24.2	1.0	17.8	2.0	10.0	47.0	31.9
TPSMC22A	EKP	20.9 / 23.1	1.0	18.8	2.0	10.0	49.0	30.6
TPSMC24	ELP	21.6 / 26.4	1.0	19.4	2.0	10.0	43.0	34.7
TPSMC24A	EMP	22.8 / 25.2	1.0	20.5	2.0	10.0	45.0	33.2
TPSMC27	ENP	24.3 / 29.7	1.0	21.8	2.0	10.0	38.5	39.1
TPSMC27A	EPP	25.7 / 28.4	1.0	23.1	2.0	10.0	40.0	37.5
TPSMC30	EQP	27.0 / 33.0	1.0	24.3	2.0	10.0	34.5	43.5
TPSMC30A	ERP	28.5 / 31.5	1.0	25.6	2.0	10.0	36.0	41.4
TPSMC33	ESP	29.7 / 36.3	1.0	26.8	2.0	10.0	31.5	47.7
TPSMC33A	ETP	31.4 / 34.7	1.0	28.2	2.0	10.0	33.0	45.7
TPSMC36	EUP	32.4 / 39.6	1.0	29.1	2.0	10.0	29.0	52.0
TPSMC36A	EVP	34.2 / 37.8	1.0	30.8	2.0	10.0	30.0	49.9
TPSMC39	EWP	35.1 / 42.9	1.0	31.6	2.0	10.0	26.5	56.4
TPSMC39A	EXP	37.1 / 41.0	1.0	33.3	2.0	10.0	28.0	53.9
TPSMC43	EYP	38.7 / 47.3	1.0	34.8	2.0	10.0	24.0	61.9
TPSMC43A	EZP	40.9 / 45.2	1.0	36.8	2.0	10.0	25.3	59.3

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300µs, I_T=Square Wave Pulse or equivalent.
2. Surge current Waveform per Figure 3 and Derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIG.1 - PEAK PULSE POWER RATING CURVE

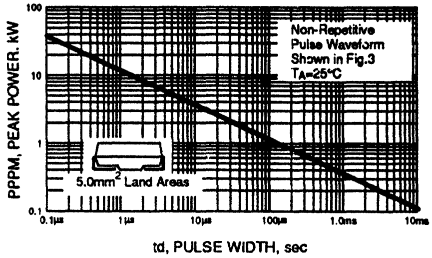


FIG. 2 - PULSE DERATING CURVE

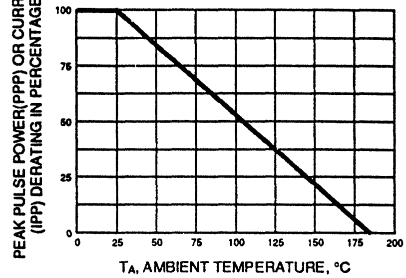


FIG.3 - PULSE WAVEFORM

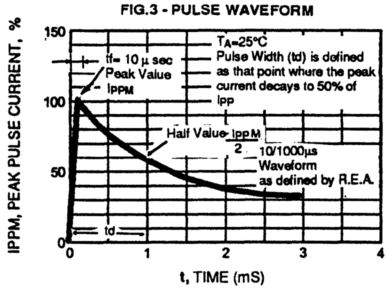


FIG.4 - TYPICAL JUNCTION CAPACITANCE

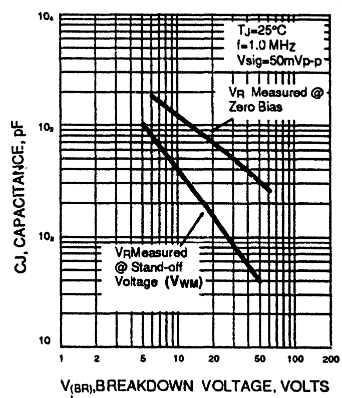
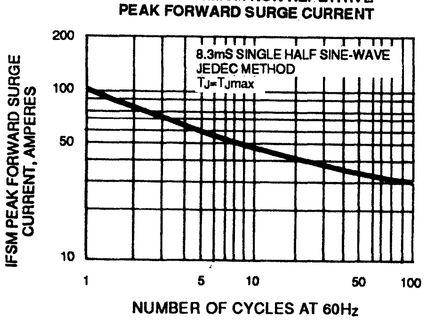


FIG. 5 - MAXIMUM NON-REPETITIVE
PEAK FORWARD SURGE CURRENT



TRANSIENT VOLTAGE SUPPRESSORS

General Instrument Transient Voltage Suppressors are the state-of -the-art in semiconductor surge protection for modern electronic equipment. These products employ the same semiconductor technology that is used in high speed integrated circuits.

Because TVS devices are semiconductors, there is no inherent wear out mechanism. They are designed to provide protection against all types of transient threats from ESD to induced lightning. When overstressed, they short circuit at the changing voltage and protect the associated equipment. With proper device selection, they will not affect circuit performance nor, degrade with repeated transient events. Their wide range of voltage selections accommodate all low voltage circuit applications.

General Instrument TVS units are available in five power ranges: 400, 500, 600, 1500, and 5,000 watts with a wide variety of voltages.

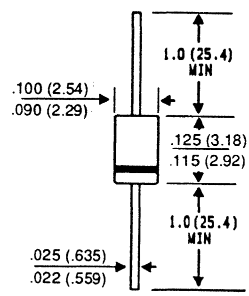
GI General Instrument

TMPG06-6.8 THRU TMPG06-43A

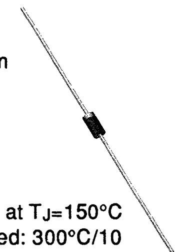
AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE-** 6.8 to 43 Volts 400 Watt Peak Pulse Power*

FEATURES



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Exclusive G.I. PAR chip construction
- 400W Peak Pulse Power capability on 10/1000μs waveform
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV
- Typical I_D less than 10μ A above 10V at T_J=150°C
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension
- Designed to handle under the hood applications

MECHANICAL DATA

Case:Molded plastic over a passivated junction
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight : 0.0064 ounce, .181 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Power Dissipation on 10/1000μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Peak Pulse Power Current on 10/1000μs waveform (NOTE1,2, FIG. 3)	I_{PPM}	See Table 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .25', (6.33mm) (NOTE 2)	PM(AV)	1.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Instantaneous Forward Voltage at 25A (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. Mounted on Copper Leaf area of 1.57 in^2 (40mm^2).
3. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum.

ELECTRICAL CHARACTERISTICS ($T_A = 25°C$ unless otherwise noted)

DEVICE TYPE	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(μA)	T_J=150°C Maximum Reverse Leakage at V_{RWM} I_D(μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C(Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
TMPG06-6.8	6.12	7.48	10.0	5.50	300	1000	39.8	10.8	0.057
TMPG06-6.8A	6.45	7.14	10.0	5.80	300	1000	41.0	10.5	0.057
TMPG06-7.5	6.75	8.25	10.0	6.05	150	500	36.8	11.7	0.060
TMPG06-7.5A	7.13	7.88	10.0	6.40	150	500	38.1	11.3	0.061
TMPG06-8.2	7.38	9.02	10.0	6.63	50.0	200	34.4	12.5	0.065
TMPG06-8.2A	7.79	8.61	10.0	7.02	50.0	200	35.5	12.1	0.065
TMPG06-9.1	8.19	10.0	1.0	7.37	10.0	50.0	32.2	13.8	0.068
TMPG06-9.1A	8.65	9.55	1.0	7.78	10.0	50.0	32.1	13.4	0.068
TMPG06-10	9.00	11.0	1.0	8.10	5.0	20.0	28.7	15.0	0.073
TMPG06-10A	9.50	10.5	1.0	8.55	5.0	20.0	29.7	14.5	0.073
TMPG06-11	9.90	12.1	1.0	8.92	2.0	10.0	26.5	16.2	0.075
TMPG06-11A	10.5	11.6	1.0	9.40	2.0	10.0	27.6	15.6	0.075
TMPG06-12	10.8	13.2	1.0	9.72	1.0	5.0	24.9	17.3	0.076
TMPG06-12A	11.4	12.6	1.0	10.2	1.0	5.0	25.8	16.7	0.078
TMPG06-13	11.7	14.3	1.0	10.5	1.0	5.0	22.6	19.0	0.081
TMPG06-13A	12.4	13.7	1.0	11.1	1.0	5.0	23.6	18.2	0.081
TMPG06-15	13.5	16.3	1.0	12.1	1.0	5.0	19.6	22.0	0.084
TMPG06-15A	14.3	15.8	1.0	12.8	1.0	5.0	20.3	21.2	0.084
TMPG06-16	14.4	17.6	1.0	12.9	1.0	5.0	18.3	23.5	0.086
TMPG06-16A	15.2	16.8	1.0	13.6	1.0	5.0	19.1	22.5	0.086
TMPG06-18	16.2	19.8	1.0	14.5	1.0	5.0	16.2	26.5	0.088
TMPG06-18A	17.1	18.9	1.0	15.3	1.0	5.0	16.9	25.5	0.088
TMPG06-20	18.0	22.0	1.0	16.2	1.0	5.0	14.8	29.1	0.090
TMPG06-20A	19.0	21.0	1.0	17.0	1.0	5.0	15.5	27.7	0.090

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(μA)	T_C=150°C Maximum Reverse Leakage at V_{WM} I_D(μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Reverse Voltage at I_{PPM} V_C(Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
TMPG06-22	19.8	24.2	1.0	17.8	1.0	5.0	13.5	31.9	0.092
TMPG06-22A	20.9	23.1	1.0	18.8	1.0	5.0	14.1	30.6	0.092
TMPG06-24	21.6	26.4	1.0	19.4	1.0	5.0	12.4	34.2	0.094
TMPG06-24A	22.8	25.2	1.0	20.5	1.0	5.0	13.0	33.2	0.094
TMPG06-27	24.3	29.7	1.0	21.8	1.0	5.0	11.0	39.1	0.096
TMPG06-27A	25.7	28.4	1.0	23.1	1.0	5.0	11.5	37.5	0.096
TMPG06-30	27.0	33.0	1.0	24.3	1.0	5.0	9.9	43.5	0.097
TMPG06-30A	28.5	31.5	1.0	25.6	1.0	5.0	10.4	41.4	0.097
TMPG06-33	29.7	36.3	1.0	26.8	1.0	5.0	9.0	47.7	0.098
TMPG06-33A	31.4	34.7	1.0	28.2	1.0	5.0	9.4	45.7	0.098
TMPG06-36	32.4	39.6	1.0	29.1	1.0	5.0	8.3	52.0	0.099
TMPG06-36A	34.2	37.8	1.0	30.8	1.0	5.0	8.6	49.9	0.099
TMPG06-39	35.1	42.9	1.0	31.6	1.0	5.0	7.6	56.4	0.100
TMPG06-39A	37.1	41.0	1.0	33.3	1.0	5.0	8.0	53.9	0.100
TMPG06-43	38.7	47.3	1.0	34.8	1.0	5.0	7.0	61.9	0.101
TMPG06-43A	40.9	45.2	1.0	36.8	1.0	5.0	7.3	59.3	0.101

NOTES:
1. V_{BR} measured after I_T applied for 300 μs, I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derated per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIGURE 1 - PEAK PULSE POWER RATING VERSUS PULSE TIME CURVE

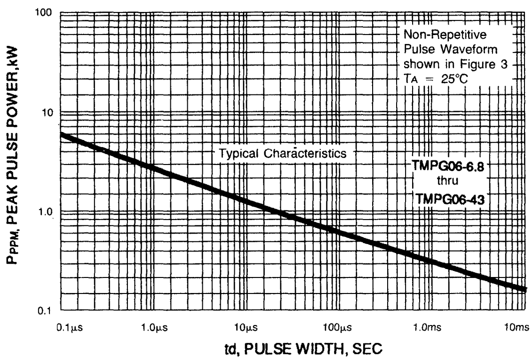


FIGURE 3 — PULSE WAVEFORM

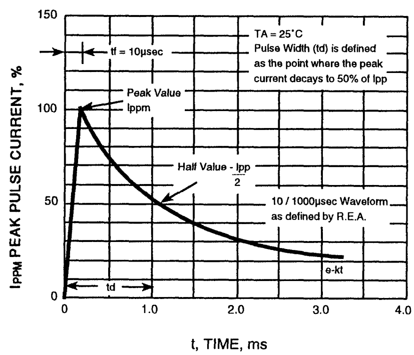


FIG. 5-STEADY STATE POWER DERATING CURVE

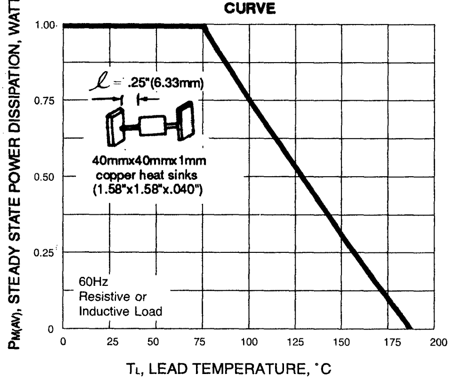


FIGURE 2 — PULSE DERATING CURVE

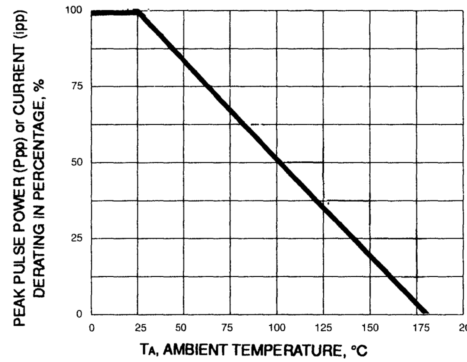


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

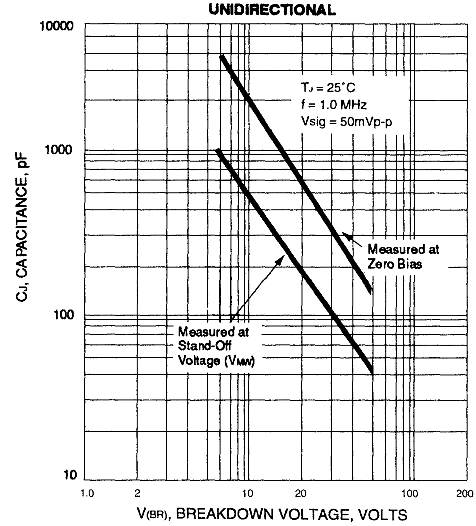
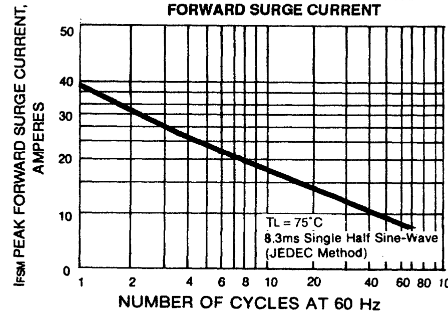


FIGURE 6 - MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT



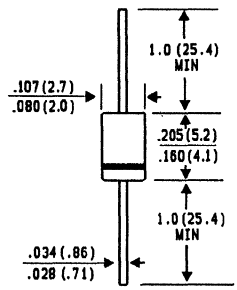
P4KA6.8 THRU P4KA43A

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE-** 6.8 to 43 Volts   400 Watt Peak Pulse Power*

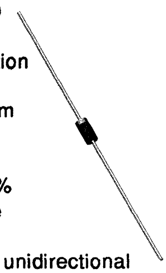
FEATURES

DO-204AL



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junction
- Exclusive G.I. PAR chip construction
- 400W Peak Pulse Power capability on 10/1000 µs waveform
- Excellent clamping capability
- Repetition Rate (duty cycle):0.01%
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional
- Typical I_D less than 10 µA above 10V at T_J=150°C
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension
- Designed to handle under the hood applications



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 µs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Peak Pulse Current on 10/1000 µs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3)	I_{FSM}	40.0	Amps
Maximum Instantaneous Forward Voltage at 25A	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. Mounted on Copper Leaf area of 1.57 in^2 (40mm^2) per Figure 5.
3. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum.

DEVICE TYPES	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1)		at I_T (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	T_J=150°C Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
	MIN	MAX							
P4KA6.8	6.12	7.48	10.0	5.50	300	1000	39.8	10.8	0.057
P4KA6.8A	6.45	7.14	10.0	5.80	300	1000	41.0	10.5	0.057
P4KA7.5	6.75	8.25	10.0	6.05	150	500	36.8	11.7	0.060
P4KA7.5A	7.13	7.88	10.0	6.40	150	500	38.1	11.3	0.061
P4KA8.2	7.38	9.02	10.0	6.63	50.0	200	34.4	12.5	0.065
P4KA8.2A	7.79	8.61	10.0	7.02	50.0	200	35.5	12.1	0.065
P4KA9.1	8.19	10.0	1.0	7.37	10.0	50.0	32.2	13.8	0.068
P4KA9.1A	8.65	9.55	1.0	7.78	10.0	50.0	32.1	13.4	0.068
P4KA10	9.00	11.0	1.0	8.10	5.0	20.0	28.7	15.0	0.073
P4KA10A	9.50	10.5	1.0	8.55	5.0	20.0	29.7	14.5	0.073
P4KA11	9.90	12.1	1.0	8.92	2.0	10.0	26.5	16.2	0.075
P4KA11A	10.5	11.6	1.0	9.40	2.0	10.0	27.6	15.6	0.075
P4KA12	10.8	13.2	1.0	9.72	1.0	10.0	24.9	17.3	0.076
P4KA12A	11.4	12.6	1.0	10.2	1.0	10.0	25.8	16.7	0.078
P4KA13	11.7	14.3	1.0	10.5	1.0	10.0	22.6	19.0	0.081
P4KA13A	12.4	13.7	1.0	11.1	1.0	10.0	23.6	18.2	0.081
P4KA15	13.5	16.3	1.0	12.1	1.0	10.0	19.6	22.0	0.084
P4KA15A	14.3	15.8	1.0	12.8	1.0	10.0	20.3	21.2	0.084
P4KA16	14.4	17.6	1.0	12.9	1.0	10.0	18.3	23.5	0.086
P4KA16A	15.2	16.8	1.0	13.6	1.0	10.0	19.1	22.5	0.086
P4KA18	16.2	19.8	1.0	14.5	1.0	10.0	16.2	26.5	0.088
P4KA18A	17.1	18.9	1.0	15.3	1.0	10.0	16.9	25.5	0.088
P4KA20	18.0	22.0	1.0	16.2	1.0	10.0	14.8	29.1	0.090
P4KA20A	19.0	21.0	1.0	17.0	1.0	10.0	15.5	27.7	0.090
P4KA22	19.8	24.2	1.0	17.8	1.0	10.0	13.5	31.9	0.092
P4KA22A	20.9	23.1	1.0	18.8	1.0	10.0	14.1	30.6	0.092
P4KA24	21.6	26.4	1.0	19.4	1.0	10.0	12.4	34.2	0.094
P4KA24A	22.8	25.2	1.0	20.5	1.0	10.0	13.0	33.2	0.094
P4KA27	24.3	29.7	1.0	21.8	1.0	10.0	11.0	39.1	0.096
P4KA27A	25.7	28.4	1.0	23.1	1.0	10.0	11.5	37.5	0.096
P4KA30	27.0	33.0	1.0	24.3	1.0	10.0	9.9	43.5	0.097
P4KA30A	28.5	31.5	1.0	25.6	1.0	10.0	10.4	41.4	0.097
P4KA33	29.7	36.3	1.0	26.8	1.0	10.0	9.0	47.7	0.098
P4KA33A	31.4	34.7	1.0	28.2	1.0	10.0	9.4	45.7	0.098
P4KA36	32.4	39.6	1.0	29.1	1.0	10.0	8.3	52.0	0.099
P4KA36A	34.2	37.8	1.0	30.8	1.0	10.0	8.6	49.9	0.099
P4KA39	35.1	42.9	1.0	31.6	1.0	10.0	7.6	56.4	0.100
P4KA39A	37.1	41.0	1.0	33.3	1.0	10.0	8.0	53.9	0.100
P4KA43	38.7	47.3	1.0	34.8	1.0	10.0	7.0	61.9	0.101
P4KA43A	40.9	45.2	1.0	36.8	1.0	10.0	7.3	59.3	0.101

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300 μs, I_T=Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derated per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIG.1-PEAK PULSE POWER RATING CURVE

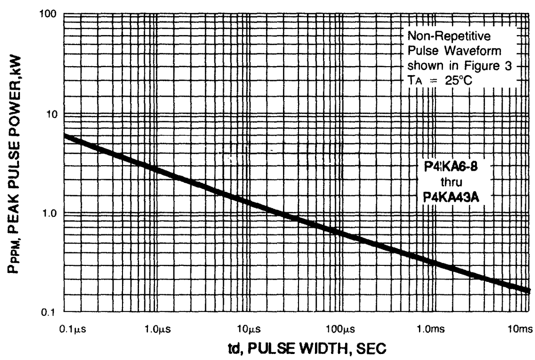


FIGURE 2 — PULSE DERATING CURVE

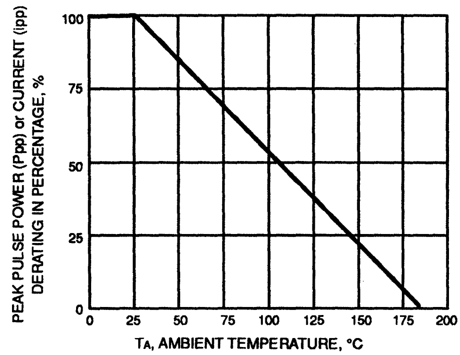


FIGURE 3 — PULSE WAVEFORM

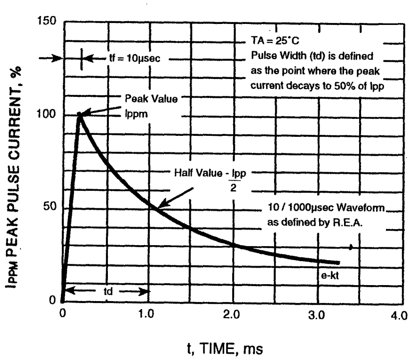


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

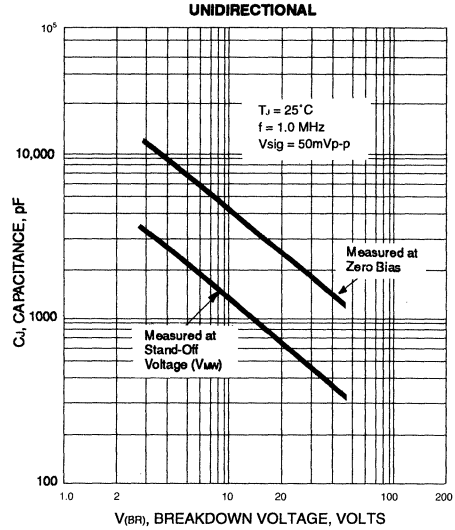


FIG. 5-STEADY STATE POWER DERATING CURVE

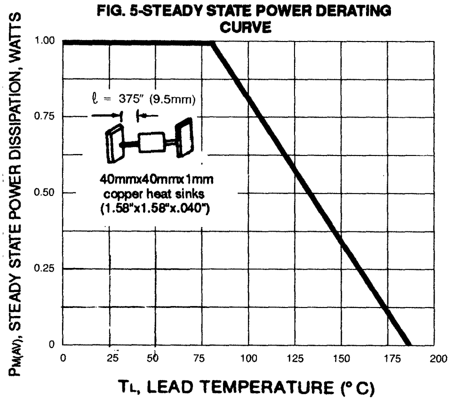
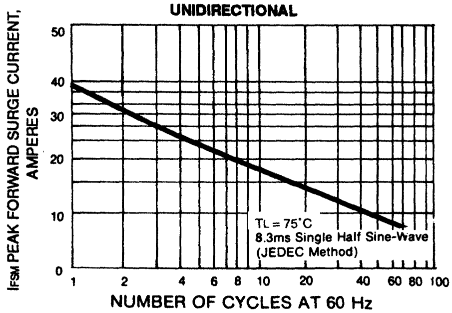


FIG.6-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL



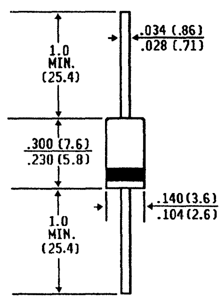
P6KA6.8 THRU P6KA43A

AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE** - 6.8 to 43 Volts* *600 Watt Peak Pulse Power*

FEATURES

DO-204AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- Exclusive G.I. PAR construction
- 600W Peak Pulse Power surge capability on 10/1000 µs waveform
- Excellent clamping capability
- Repetition Rate (duty cycle): 0.01%
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional.
- Typical I_D less than 10µA above 10V at 175°C
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension
- Designed to handle under the hood applications

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.015 ounce, 0.4 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation at Tp=1ms (NOTE 1, FIGURE 1)	P_{PPM}	Minimum 600	Watts
Pulse Pulse Current on 10/1000 µs waveform (NOTE 1, FIG.3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3) Unidirectional Only	I_{FSM}	70.0	Amps
Maximum Instantaneous Forward Voltage at 50 A (NOTE 3) Unidirectional Only	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2.
2. Mounted on Copper Leaf area of 1.57 in^2 (40mm^2) per Figure 5.
3. Measured on 8.3ms single half sine-wave, or equivalent square wave, duty cycle = 4 pulses per minutes maximum.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

DEVICE TYPE	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	T_C=150°C Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
P6KA6.8	6.12	7.48	10	5.50	500	1000	59.7	10.8	0.057
P6KA6.8A	6.45	7.14	10	5.80	500	1000	61.4	10.5	0.057
P6KA7.5	6.75	8.25	10	6.05	250	500	58.1	11.7	0.061
P6KA7.5A	7.13	7.88	10	6.40	250	500	57.1	11.3	0.061
P6KA8.2	7.38	9.02	10	6.63	100	200	51.6	12.5	0.065
P6KA8.2A	7.79	8.61	10	7.02	100	200	53.3	12.1	0.065
P6KA9.1	8.19	10.0	1.0	7.37	25	100	46.7	13.8	0.068
P6KA9.1A	8.65	9.55	1.0	7.78	25	100	48.1	13.4	0.068
P6KA10	9.00	11.0	1.0	8.10	10	50	43.0	15.0	0.073
P6KA10A	9.50	10.5	1.0	8.55	10	50	44.5	14.5	0.073
P6KA11	9.90	12.1	1.0	8.92	5	20.0	39.8	16.2	0.075
P6KA11A	10.5	11.6	1.0	9.40	5	20.0	41.3	15.6	0.076
P6KA12	10.8	13.2	1.0	9.72	2.0	10.0	37.3	17.3	0.076
P6KA12A	11.4	12.6	1.0	10.2	2.0	10.0	38.6	16.7	0.078
P6KA13	11.7	14.3	1.0	10.5	2.0	10.0	35.9	19.0	0.081
P6KA13A	12.4	13.7	1.0	11.1	2.0	10.0	35.4	18.2	0.081
P6KA15	13.5	16.3	1.0	12.1	2.0	10.0	29.3	22.0	0.084
P6KA15A	14.3	15.8	1.0	12.8	2.0	10.0	30.4	21.2	0.084
P6KA16	14.4	17.6	1.0	12.9	2.0	10.0	27.4	23.5	0.086
P6KA16A	15.2	16.8	1.0	13.6	2.0	10.0	28.7	22.5	0.086
P6KA18	16.2	19.8	1.0	14.5	2.0	10.0	24.3	26.5	0.088
P6KA18A	17.1	18.9	1.0	15.3	2.0	10.0	25.6	25.2	0.088
P6KA20	18.0	22.0	1.0	16.2	2.0	10.0	22.2	29.1	0.090
P6KA20A	19.0	21.0	1.0	17.1	2,0	10.0	23.3	27.7	0.090
P6KA22	19.8	24.2	1.0	17.8	2.0	10.0	20.2	31.9	0.092
P6KA22A	20.9	23.1	1.0	18.8	2.0	10.0	21.1	30.6	0.092
P6KA24	21.6	26.4	1.0	19.4	2.0	10.0	18.6	34.7	0.094
P6KA24A	22.8	25.2	1.0	20.5	2.0	10.0	19.4	33.6	0.094
P6KA27	24.3	29.7	1.0	21.8	2.0	10.0	16.5	39.1	0.096
P6KA27A	25.7	28.4	1.0	23.1	2.0	10.0	17.2	37.5	0.096
P6KA30	27.0	33.0	1.0	24.3	2.0	10.0	14.8	43.5	0.097
P6KA30A	28.5	31.5	1.0	25.6	2.0	10.0	15.6	41.4	0.097
P6KA33	29.7	36.3	1.0	26.8	2.0	10.0	13.5	47.7	0.098
P6KA33A	31.4	34.7	1.0	28.2	2.0	10.0	14.1	45.7	0.098
P6KA36	32.4	39.6	1.0	29.1	2.0	10.0	12.4	52.0	0.099
P6KA36A	34.2	37.8	1.0	30.8	2.0	10.0	12.9	49.9	0.099
P6KA39	35.1	42.9	1.0	31.6	2.0	10.0	11.4	56.4	0.100
P6KA39A	37.1	41.0	1.0	33.3	2.0	10.0	12.0	53.9	0.100
P6KA43	38.7	47.3	1.0	34.8	2.0	10.0	10.4	61.9	0.101
P6KA43A	40.9	45.2	1.0	36.8	2.0	10.0	10.9	59.3	0.101

NOTES:

1. V_{BR} measured after I_T applied for 300 µs. I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIGURE 1 - PEAK PULSE POWER RATING VERSUS PULSE TIME CURVE

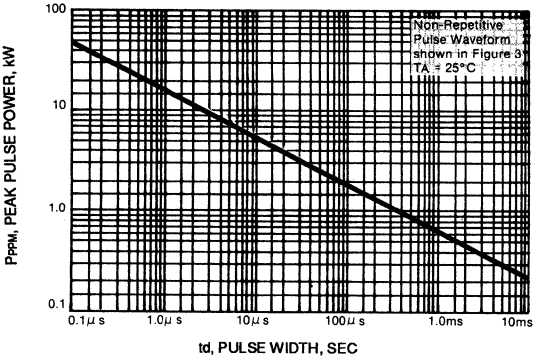


FIGURE 2 — PULSE DERATING CURVE

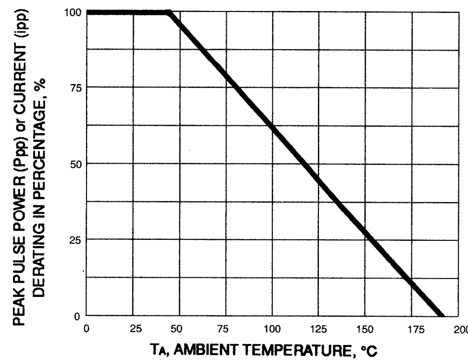


FIGURE 3 — PULSE WAVEFORM

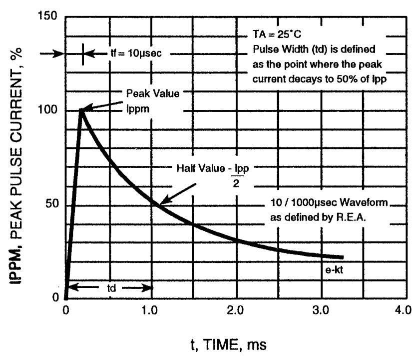


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

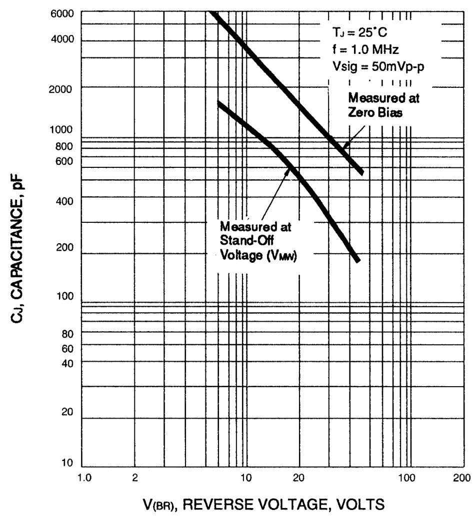


FIG. 5-STEADY STATE POWER DERATING CURVE

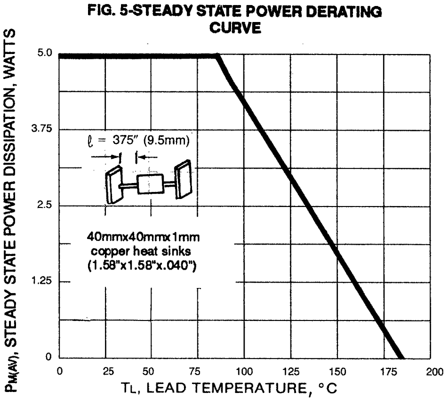
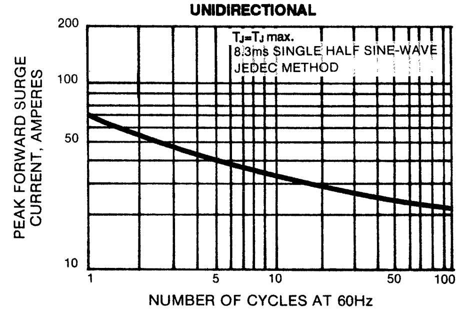


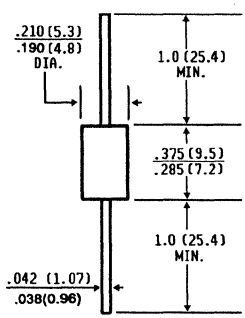
FIG.6-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL



1.5KA6.8 THRU 1.5KA43A

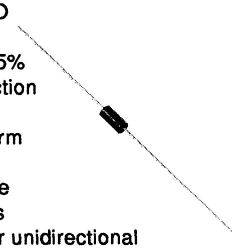
AUTOMOTIVE TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE-** 6.8 to 43 Volts 1500 Watt Peak Pulse Power*



Dimensions in inches and (millimeters)

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- Repetition Rate (duty cycle): 0.05%
- Exclusive G.I. PAR chip construction
- 1500W Peak Pulse Power capability on 10/1000 μs waveform
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional
- Typical I_D less than 20 μA above 10V at T_J=150°C
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension
- Designed to handle under the hood applications

MECHANICAL DATA

Case: Molded plastic over passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight: 0.045 ounce, 1.2 grams

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (NOTE 1, FIGURE 1)	P_{PPM}	Minimum1500	Watts
Peak Pulse Current at T_A=25°C on 10/1000 μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3)	I_{FSM}	200	Amps
Maximum Instantaneous Forward Voltage at 100A (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +185	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2.
2. Mounted on Copper Leaf area of 0.79 in^2 ($20mm^2$), Figure 5.
3. 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

DEVICE TYPE	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand-off Voltage at V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (μA)	T_J=150°C Maximum Reverse Leakage at V_{WM} I_D (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
1.5KA6.8	6.12	7.48	10	5.50	500	2000	149	10.8	0.057
1.5KA6.8A	6.45	7.14	10	5.80	500	2000	153	10.5	0.057
1.5KA7.5	6.75	8.25	10	6.05	250	1000	137	11.7	0.061
1.5KA7.5A	7.13	7.88	10	6.40	250	1000	143	11.3	0.061
1.5KA8.2	7.38	9.02	10	6.63	100	400	129	12.5	0.065
1.5KA8.2A	7.79	8.61	10	7.02	100	400	133	12.1	0.065
1.5KA9.1	8.19	10.0	1.0	7.37	25.0	100	117	13.8	0.068
1.5KA9.1A	8.65	9.55	1.0	7.78	25.0	100	120	13.4	0.068
1.5KA10	9.00	11.0	1.0	8.10	10.0	50.0	107	15.0	0.073
1.5KA10A	9.50	10.5	1.0	8.55	10.0	50.0	111	14.5	0.073
1.5KA11	9.90	12.1	1.0	8.92	5.0	20.0	99.5	16.2	0.075
1.5KA11A	10.5	11.6	1.0	9.40	5.0	20.0	103	15.6	0.076
1.5KA12	10.8	13.2	1.0	9.72	2.0	10.0	93.2	17.3	0.076
1.5KA12A	11.4	12.6	1.0	10.2	2.0	10.0	96.5	19.0	0.078
1.5KA13	11.7	14.3	1.0	10.5	2.0	10.0	84.8	18.2	0.081
1.5KA13A	12.4	13.7	1.0	11.1	2.0	10.0	88.6	22.0	0.081
1.5KA15	13.5	16.3	1.0	12.1	2.0	10.0	73.3	21.2	0.084
1.5KA15A	14.3	15.8	1.0	12.8	2.0	10.0	76.0	23.5	0.084
1.5KA16	14.4	17.6	1.0	12.9	2.0	10.0	68.6	23.5	0.086
1.5KA16A	15.2	16.8	1.0	13.6	2.0	10.0	71.6	22.5	0.086
1.5KA18	16.2	19.8	1.0	14.5	2.0	10.0	60.8	26.5	0.088
1.5KA18A	17.1	18.9	1.0	15.3	2.0	10.0	64.0	25.2	0.088
1.5KA20	18.0	22.0	1.0	16.2	2.0	10.0	55.4	29.1	0.090
1.5KA20A	19.0	21.0	1.0	17.1	2.0	10.0	58.2	27.7	0.090
1.5KA22	19.8	24.2	1.0	17.8	2.0	10.0	50.5	31.9	0.092
1.5KA22A	20.9	23.1	1.0	18.8	2.0	10.0	52.7	30.6	0.092
1.5KA24	21.6	26.4	1.0	19.4	2.0	10.0	46.5	34.7	0.094
1.5KA24A	22.8	25.2	1.0	20.5	2.0	10.0	48.6	33.2	0.094
1.5KA27	24.3	29.7	1.0	21.8	2.0	10.0	41.2	39.1	0.096
1.5KA27A	25.7	28.4	1.0	23.1	2.0	10.0	43.4	37.5	0.096
1.5KA30	27.0	33.0	1.0	24.3	2.0	10.0	37.0	43.5	0.097
1.5KA30A	28.5	31.5	1.0	25.6	2.0	10.0	38.9	41.4	0.097
1.5KA33	29.7	36.3	1.0	26.8	2.0	10.0	33.8	47.7	0.098
1.5KA33A	31.4	34.7	1.0	28.2	2.0	10.0	35.3	45.7	0.098
1.5KA36	32.4	39.6	1.0	29.1	2.0	10.0	31.0	52.0	0.099
1.5KA36A	34.2	37.8	1.0	30.8	2.0	10.0	32.3	49.9	0.099
1.5KA39	35.1	42.9	1.0	31.6	2.0	10.0	28.6	56.4	0.100
1.5KA39A	37.1	41.0	1.0	33.3	2.0	10.0	29.9	53.9	0.100
1.5KA43	38.7	47.3	1.0	34.8	2.0	10.0	26.0	61.9	0.101
1.5KA43A	40.9	45.2	1.0	36.8	2.0	10.0	27.2	59.3	0.101

NOTES:
1. V_{BR} measured after IT applied for 300 μs. IT = Square Wave Pulse or equivalent.
2. Surge current Waveform per Figure 3 and Derate per Figure 2.
3. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIGURE 1 - PEAK PULSE POWER RATING VERSUS PULSE TIME CURVE

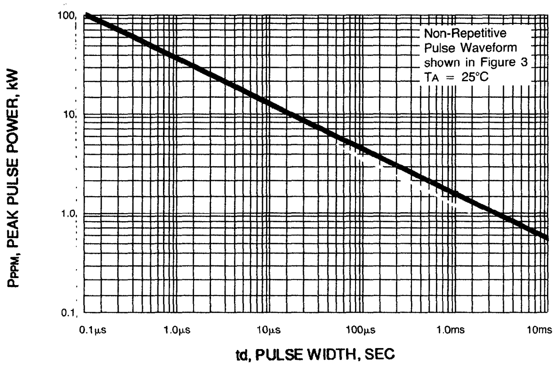


FIGURE 2—PULSE DERATING CURVE

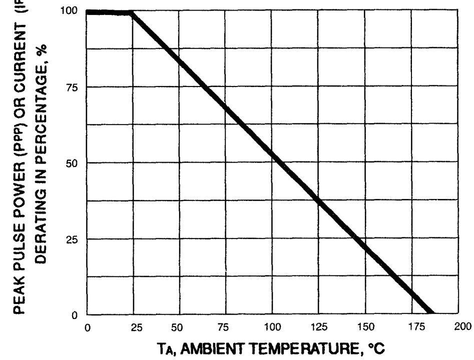


FIGURE 3 — PULSE WAVEFORM

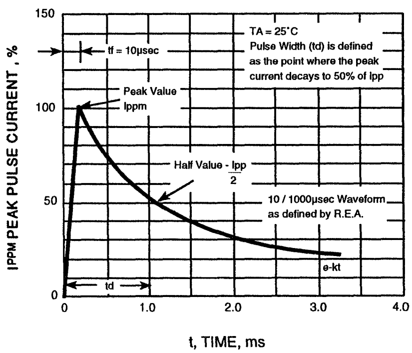


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

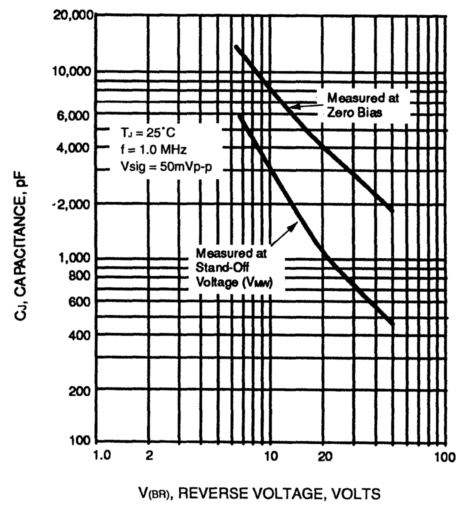


FIG. 5-STEADY STATE POWER DERATING CURVE

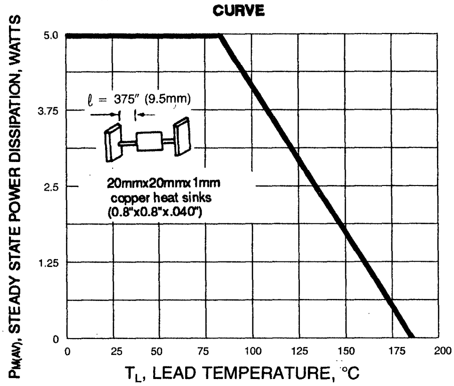
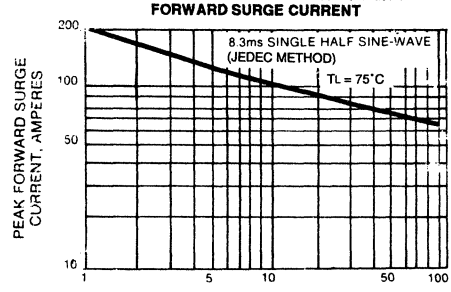


FIG. 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



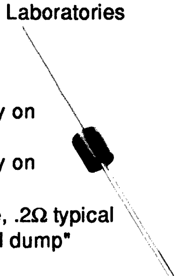
• • • • • P • R • E • L • I • M • I • N • A • R • Y • • • • • •

6KA24 TRANSIENT SUPPRESSOR

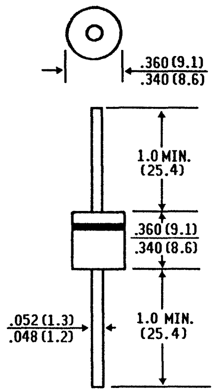
Premium Automotive Transient Voltage Suppressor

***Voltage** - 24 Volts   6500 Watts Peak Pulse Power*

FEATURES



- Plastic package has Underwriters Laboratories Flammability classification 94V-0
- Grown glass passivation
- Exclusive G.I. PAR construction
- 6500 Peak Pulse Power capability on 10/1000μs waveform
- 2000 Peak Pulse Power capability on 10μs/50ms waveform
- Low incremental surge resistance, .2Ω typical
- Ideally suited for automotive "load dump" applications
- Designed for under the hood applications



Dimensions in inches and (millimeters)

MECHANICAL DATA

Case: Molded plastic over nitride passivation
Terminals: Axial leads solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end(cathode)
Standard Packaging: Tape & Reel
Mounting Position: Any
Weight:.007 ounce, 2.10 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

RATINGS	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10μs/1000μs waveform (NOTE 1)	P_{PPM}	6500	Watts
Peak Pulse Power Dissipation on 10μs/50ms waveform (NOTE 2)	P_{PPM}	2000	Watts
Steady State Power Dissipation, (NOTE 6) Lead Lengths .375"(9.5mm), T_L=85°C	$P_{m(AV)}$	5.0	Watts
Peak Forward Surge Current, 8.3ms Single half Sine-wave on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	400	Amperes
Maximum DC Reverse Leakage Current at 24V T_A=25°C T_A=150°C	I_D	1.0 50.0	Micro-Amperes
Breakdown Voltage at 100mA T_A=25°C mininum T_A=25°C maximum T_A=150°C mininum T_A=150°C maximum	$V_{(BR)}$	26.7 32.6 29.7 36.7	Volts
Maximum Clamping Voltage at I_{PPM}=90A (NOTE 4) T_A=25°C T_A=150°C	V_C	38 40	Volts
Maximum Instantaneous Forward Voltage at 100A (NOTE 5) T_A=150°C	V_F	1.70	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +185	°C

NOTES:

1. Non Repetitive Current Pulse, per Figure 2, on 10/1000μs waveform
2. Non Repetitive Current Pulse, per Figure 5, on 10ms/50ms waveform
3. Measured on 8.3ms Half Sine-wave, or equivalent square wave, duty cycle=4 Pulses Maximum.
4. Measured on 80μ second square pulse width.
5. Measured on 300μ second square pulse width.
6. Mounted on copper leaf area of 0.79 in^2 (20mm^2).

FIGURE 1 - PEAK PULSE POWER RATING CURVE

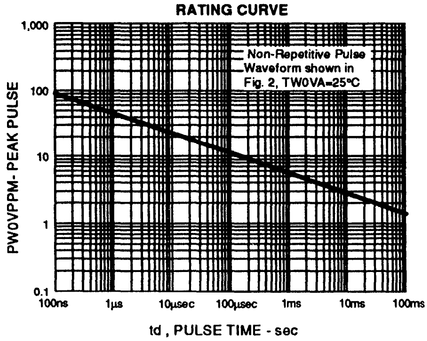


FIGURE 2 - PULSE WAVEFORM

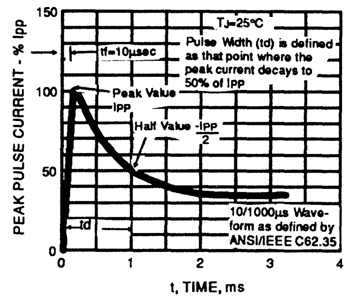


FIGURE 3 - PULSE DERATING CURVE

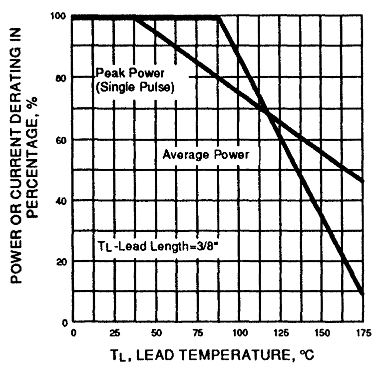


FIGURE 4 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

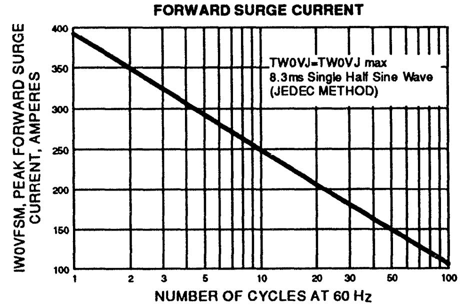
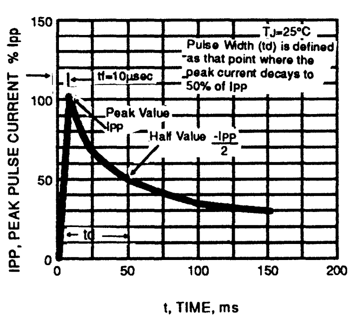


FIGURE 5 - PULSE WAVEFORM



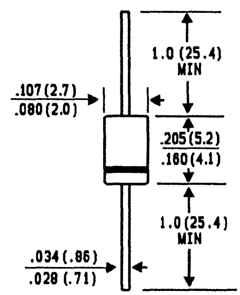
P4KE6.8 THRU P4KE400CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE-** 6.8 to 400 Volts*   *440 Watt Peak Pulse Power*

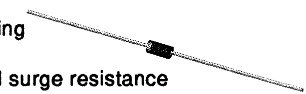
FEATURES

DO-204AL



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junction in DO-41 package
- 400W Peak Pulse Power capability on 10/1000 μs waveform
- Repetion Rate (duty cycle): 0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional and 5.0 nS for bidirectional types
- Typical I_D less than 1 μ A above 10V
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL molded plastic over passivated junction
Terminals: Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bi-directional types
Mounting Position: Any
Weight : 0.012 ounce, 0.3 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For Bi-directional use C or CA Suffix for types P4KE7.5 thru types P4KE440 (ex. P4KE7.5C, P4KE440CA). Electrical characteristics apply in both directions

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Power Dissipation at T_A=25°C 10/1000 μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 400	Watts
Peak Pulse Current at T_A=25°C on 10/1000 μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (Note 2)	$P_{M(AV)}$	1.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3) Unidirectional Only	I_{FSM}	40.0	Amps
Maximum Instantaneous Forward Voltage at 50 A for Unidirectional Only (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +175	°C

NOTES: 1. Non-repetitive current pulse, per Fig. 3 and derated above T_A = 25°C per Fig. 2.
2. Mounted on Copper Leaf area of 1.57 in^2 ($40mm^2$) per Figure 6.
3. 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per Minutes maximum.

Device	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 3) (µA)	Maximm Peak Pulse Current I_{PP} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%C)
P4KE6.8*	6.12	7.48	10	5.50	1000	38	10.8	0.057
P4KE6.8A*	6.45	7.14	10	5.80	1000	40	10.5	0.057
P4KE7.5	6.75	8.25	10	6.05	500	36	11.7	0.061
P4KE7.5A	7.13	7.88	10	6.40	500	37	11.3	0.061
P4KE8.2	7.38	9.02	10	6.63	200	33	12.5	0.065
P4KE8.2A	7.79	8.61	10	7.02	200	35	12.1	0.065
P4KE9.1	8.19	10.0	1.0	7.37	50	30	13.8	0.068
P4KE9.1A	8.65	9.55	1.0	7.78	50	31	13.4	0.068
P4KE10	9.00	11.0	1.0	8.10	10	28	15.0	0.073
P4KE10A	9.50	10.5	1.0	8.55	10	29	14.5	0.073
P4KE11	9.90	12.1	1.0	8.92	5.0	26	16.2	0.075
P4KE11A	10.5	11.6	1.0	9.40	5.0	27	15.6	0.075
P4KE12	10.8	13.2	1.0	9.72	5.0	24	17.3	0.076
P4KE12A	11.4	12.6	1.0	10.2	5.0	25	16.7	0.078
P4KE13	11.7	14.3	1.0	10.5	5.0	22	19.0	0.081
P4KE13A	12.4	13.7	1.0	11.1	5.0	23	18.2	0.081
P4KE15	13.5	16.5	1.0	12.1	5.0	19	22.0	0.084
P4KE15A	14.3	15.8	1.0	12.8	5.0	20	21.2	0.084
P4KE16	14.4	17.6	1.0	12.9	5.0	18	23.5	0.086
P4KE16A	15.2	16.8	1.0	13.6	5.0	19	22.5	0.086
P4KE18	16.2	19.8	1.0	14.5	5.0	16	26.5	0.088
P4KE18A	17.1	18.9	1.0	15.3	5.0	17	25.5	0.088
P4KE20	18.0	22.0	1.0	16.2	5.0	14	29.1	0.090
P4KE20A	19.0	21.0	1.0	17.1	5.0	15	27.7	0.090
P4KE22	19.8	24.2	1.0	17.8	5.0	13	31.9	0.092
P4KE22A	20.9	23.1	1.0	18.8	5.0	14	30.6	0.092
P4KE24	21.6	26.4	1.0	19.4	5.0	12	34.7	0.094
P4KE24A	22.8	25.2	1.0	20.5	5.0	13	33.2	0.094
P4KE27	24.3	29.7	1.0	21.8	5.0	11	39.1	0.096
P4KE27A	25.7	28.4	1.0	23.1	5.0	11.2	37.5	0.096
P4KE30	27.0	33.0	1.0	24.3	5.0	10	43.5	0.097
P4KE30A	28.5	31.5	1.0	25.6	5.0	10	41.4	0.097
P4KE33	29.7	36.3	1.0	26.8	5.0	9	47.7	0.098
P4KE33A	31.4	34.7	1.0	28.2	5.0	9	45.7	0.098
P4KE36	32.4	39.6	1.0	29.1	5.0	8	52.0	0.099
P4KE36A	34.2	37.8	1.0	30.8	5.0	8.4	49.9	0.099
P4KE39	35.1	42.9	1.0	31.6	5.0	7.4	56.4	0.100
P4KE39A	37.1	41.0	1.0	33.3	5.0	7.8	53.9	0.100
P4KE43	38.7	47.3	1.0	34.8	5.0	6.8	61.9	0.101
P4KE43A	40.9	45.2	1.0	36.8	5.0	7.1	59.3	0.101
P4KE47	42.3	51.7	1.0	38.1	5.0	6.2	67.8	0.101
P4KE47A	44.7	49.4	1.0	40.2	5.0	5.0	64.8	0.101
P4KE51	45.9	56.1	1.0	41.3	5.0	5.7	73.5	0.102
P4KE51A	48.5	53.6	1.0	43.6	5.0	6.0	70.1	0.102
P4KE56	50.4	61.6	1.0	45.4	5.0	5.2	80.5	0.103
P4KE56A	53.2	58.8	1.0	47.8	5.0	5.5	77.0	0.103
P4KE62	55.8	68.2	1.0	50.2	5.0	4.7	89.0	0.104
P4KE62A	58.9	65.1	1.0	53.0	5.0	5.0	85.0	0.104
P4KE68	61.2	74.8	1.0	55.1	5.0	4.3	98.0	0.104
P4KE68A	64.6	71.4	1.0	58.1	5.0	4.6	92.0	0.104
P4KE75	67.5	82.5	1.0	60.7	5.0	3.9	108	0.105
P4KE75A	71.3	78.8	1.0	64.1	5.0	4.1	103	0.105

** not available as bidirectional devices*

Device	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand- off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 3) (µA)	Maximm Peak Pulse Current I_{PP} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%C)
P4KE82	73.8	90.2	1.0	66.4	5.0	3.6	118	0.105
P4KE82A	77.9	86.1	1.0	70.1	5.0	3.7	113.0	0.105
P4KE91	81.9	100	1.0	73.7	5.0	3.2	131	0.106
P4KE91A	86.5	95.5	1.0	77.8	5.0	3.4	125	0.106
P4KE100	90.0	110	1.0	81.0	5.0	2.9	144	0.106
P4KE100A	95.0	105	1.0	85.5	5.0	3.1	137	0.106
P4KE110	99.0	121	1.0	89.2	5.0	2.7	158	0.107
P4KE110A	105	116	1.0	94.0	5.0	2.8	152	0.107
P4KE120	108	132	1.0	97.2	5.0	2.4	173	0.107
P4KE120A	114	126	1.0	102	5.0	2.5	165	0.107
P4KE130	117	143	1.0	105	5.0	2.2	187	0.107
P4KE130A	124	137	1.0	111	5.0	2.3	179	0.107
P4KE150	135	165	1.0	121	5.0	2.0	215	0.108
P4KE150A	143	158	1.0	128	5.0	2.0	207	0.108
P4KE160	144	176	1.0	130	5.0	1.8	230	0.108
P4KE160A	152	168	1.0	136	5.0	1.9	219	0.108
P4KE170	153	187	1.0	138	5.0	1.7	244	0.108
P4KE170A	162	179	1.0	145	5.0	1.8	234	0.108
P4KE180	162	198	1.0	146	5.0	1.6	258	0.108
P4KE180A	171	189	1.0	154	5.0	1.7	246	0.108
P4KE200	180	220	1.0	162	5.0	1.5	287	0.108
P4KE200A	190	210	1.0	171	5.0	1.53	274	0.108
P4KE220	198	242	1.0	175	5.0	1.16	344	0.108
P4KE220A	209	231	1.0	185	5.0	1.22	328	0.108
P4KE250	225	275	1.0	202	5.0	1.11	360	0.110
P4KE250A	237	267	1.0	214	5.0	1.16	344	0.110
P4KE300	270	330	1.0	243	5.0	0.93	430	0.110
P4KE300A	285	315	1.0	256	5.0	0.97	414	0.110
P4KE350	315	385	1.0	284	5.0	0.79	504	0.110
P4KE350A	332	368	1.0	300	5.0	0.83	482	0.110
P4KE400	360	440	1.0	324	5.0	0.70	574	0.110
P4KE400A	380	420	1.0	342	5.0	0.73	548	0.110
P4KE440	396	484	1.0	356	5.0	0.95	631	0.110
P4KE440A	418	462	1.0	376	5.0	1.0	602	0.110

NOTES:
1. V_{BR} measured after I_T applied for 300 µs. I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derated per Figure 2.
3. For Bidirectional types having V_R of 10 volts and less, the I_D limit is doubled.
4. All terms and symbols are consistant with ANSI/IEEE C62.35.

FIGURE 2 — PULSE DERATING CURVE

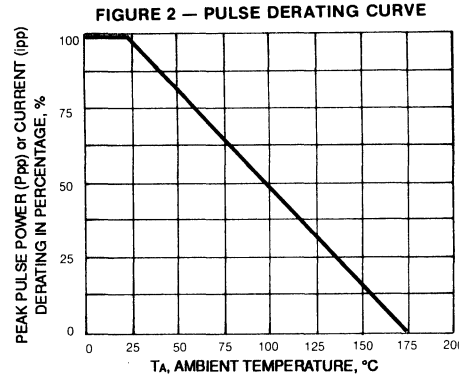


FIGURE 1 - PEAK PULSE POWER RATING VERSUS PULSE TIME CURVE

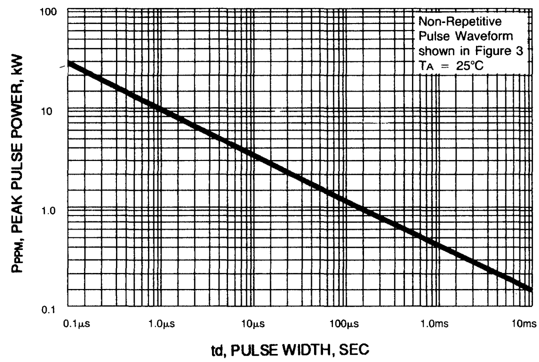


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

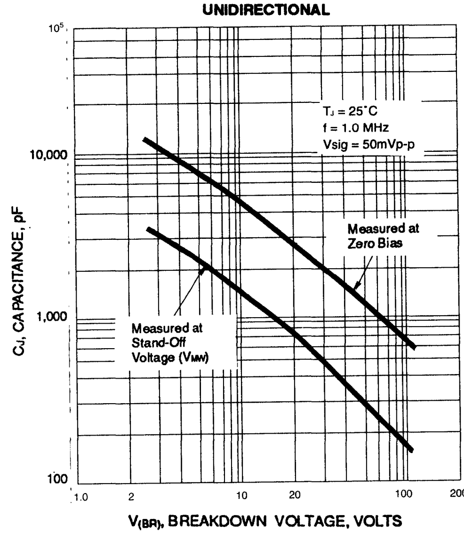


FIGURE 3 — PULSE WAVEFORM

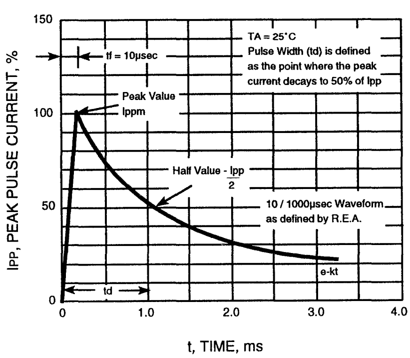


FIG. 5-STEADY STATE POWER DERATING CURVE

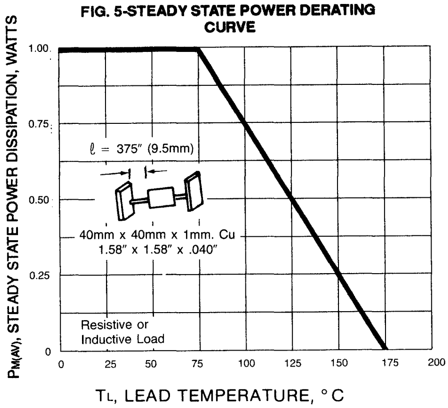
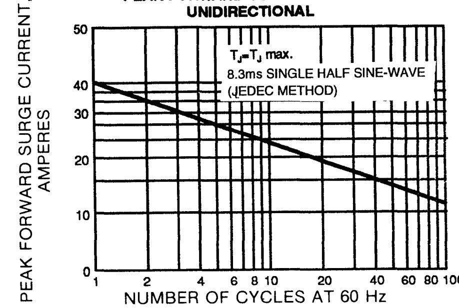


FIG.6-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL



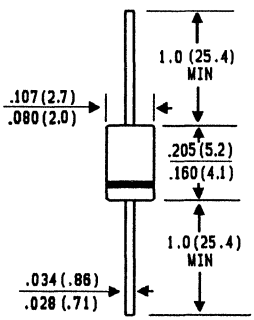
BZW04P5V8 THRU BZW04-376

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE** - 6.8 to 440 Volts   400 Watt Peak Pulse Power*

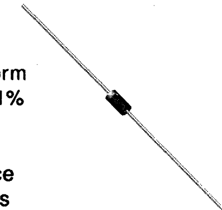
FEATURES

DO-204AL



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- 400W Peak Pulse Power capability on 10/1000 µs waveform
- Repetition Rate (duty cycle):0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional and 5.0 ns for bidirectional types
- Typical I_D less than 1 µ A above 10V
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: JEDEC DO-204AL Molded plastic over passsivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denoted positive end (cathode) except bidirectional types
Mounting Position: Any
Weight: 0.012 ounce, 0.3 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For Bidirectional use Suffix Letter "B." (ex. BZW04P5V8B)
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 µs waveform (NOTE 1, FIG. 3))	P_{PPM}	Minimum 400	Watts
Peak Pulse Current on 10/1000 µs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady Pulse State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3) Unidirectional Only	I_{FSM}	40.0	Amps
Maximum Instantaneous Forward Voltage at 50A (NOTE 3) Unidirectional Only	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Figure 2.
2. Mounted on Copper Leaf area of 1.57 in^2 (40mm^2) Figure 6.
3. 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minutes maximum

Device Type	Breakdown Voltage V(BR) Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 4) (µA)	Maximum Peak Pulse Current I_{PP} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)	Maximum Temperature Coefficient of V(BR) (%C)
BZW04P5V8	6.45	7.48	10.0	5.80	1000	38.0	10.5	.057
BZW04-5V8	6.45	7.14	10.0	5.90	1000	38.0	10.5	.057
BZW04P6V4	7.13	8.25	10.0	6.40	500	35.4	11.3	.061
BZW04-6V4	7.13	7.88	10.0	6.40	500	35.4	11.3	.061
BZW04P7V0	7.79	9.02	10.0	7.02	200	33.0	12.1	.065
BZW04-7V0	7.79	8.61	10.0	7.02	200	33.0	12.1	.065
BZW04P7V8	8.65	10.0	1.0	7.78	50.0	30.0	13.4	.068
BZW04-7V8	8.65	9.55	1.0	7.78	50.0	30.0	13.4	.073
BZW04P8V5	9.50	11.0	1.0	8.55	10.0	27.6	14.5	.073
BZW04-8V5	9.50	10.5	1.0	8.55	10.0	27.6	14.5	.075
BZW04P9V4	10.5	12.1	1.0	9.4	5.0	25.7	15.6	.075
BZW04P10	11.4	13.2	1.0	10.2	5.0	24.0	16.7	.078
BZW04-10	11.4	12.6	1.0	10.2	5.0	24.0	16.7	.078
BZW04P11	12.4	14.3	1.0	11.1	5.0	22.0	18.2	.081
BZW04-11	12.4	13.7	1.0	11.1	5.0	22.0	18.2	.081
BZW04P13	14.3	16.5	1.0	12.8	5.0	19.0	21.2	.084
BZW04-13	14.3	15.8	1.0	12.8	5.0	19.0	21.2	.084
BZW04P14	15.2	17.6	1.0	13.6	5.0	17.8	22.5	.086
BZW04-14	15.2	16.8	1.0	13.6	5.0	17.8	22.5	.086
BZW04P15	17.1	19.8	1.0	15.3	5.0	16.0	25.2	.088
BZW04-15	17.1	18.9	1.0	15.3	5.0	16.0	25.2	.088
BZW04P17	19.0	22.0	1.0	17.1	5.0	14.5	27.7	.090
BZW04-17	19.0	21.0	1.0	17.1	5.0	14.5	27.7	.090
BZW04P19	20.9	24.2	1.0	18.8	5.0	13.0	30.6	.092
BZW04-19	20.9	23.1	1.0	18.8	5.0	13.0	30.6	.092
BZW04P20	22.8	26.4	1.0	20.5	5.0	12.0	33.2	.094
BZW04-20	22.8	25.2	1.0	20.5	5.0	12.0	33.2	.094
BZW04P23	25.7	29.7	1.0	23.1	5.0	10.7	37.5	.096
BZW04-23	25.7	28.4	1.0	23.1	5.0	10.7	37.5	.096
BZW04P26	28.5	33.0	1.0	25.6	5.0	9.60	41.5	.097
BZW04-26	28.5	31.5	1.0	25.6	5.0	9.60	41.5	.097
BZW04P28	31.4	36.3	1.0	28.2	5.0	8.80	45.7	.098
BZW04-28	31.4	34.7	1.0	28.2	5.0	8.80	45.7	.098
BZW04P31	34.2	39.6	1.0	30.8	5.0	8.00	49.9	.099
BZW04-31	34.2	37.8	1.0	30.8	5.0	8.00	49.9	.099
BZW04P33	37.1	42.9	1 .0	33.3	5.0	7.40	53.9	.100
BZW04-33	37.1	41.0	1.0	33.3	5.0	7.40	53.9	.100
BZW04P37	40.9	47.3	1.0	36.8	5.0	6.70	59.3	.101
BZW04-37	40.9	45.2	1.0	36.8	5.0	6.70	59.3	.101
BZW04P40	44.7	51.7	1.0	40.2	5.0	6.20	64.8	.101
BZW04-40	44.7	49.4	1.0	40.2	5.0	6.20	64.8	.101
BZW04P44	48.5	56.1	1.0	43.6	5.0	5.70	70.1	.102
BZW04-44	48.5	53.6	1.0	43.6	5.0	5.70	70.1	.102
BZW04P48	53.2	61.6	1.0	47.8	5.0	5.20	77.0	.103
BZW04-48	53.2	58.8	1.0	47.8	5.0	5.20	77.0	.103
BZW04P53	58.9	68.2	1.0	53.0	5.0	4.70	85.0	.104
BZW04-53	58.9	65.1	1.0	53.0	5.0	4.70	85.0	.104
BZW04P58	64.6	74.8	1.0	58.1	5.0	4.30	92.0	.104
BZW04-58	64.6	71.4	1.0	58.1	5.0	4.30	92.0	.104
BZW04P64	71.3	82.5	1.0	64.1	5.0	3.90	103	.105
BZW04-64	71.3	78.8	1.0	64.1	5.0	3.90	103	.105
BZW04P70	77.9	90.2	1.0	70.1	5.0	3.50	113	.105
BZW04-70	77.9	86.1	1.0	70.1	5.0	3.50	113	.105
BZW04P78	86.5	100	1.0	77.8	5.0	3.20	125	.106
BZW04-78	86.5	95.5	1.0	77.8	5.0	3.20	125	.106

Device	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand-off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 4) (μA)	Maximum Peak Pulse Current I_{PP} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PP} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%C)
BZW04P85	95.0	110	1.0	85.5	5.0	2.90	137	.106
BZW04-85	95.0	105	1.0	85.5	5.0	2.90	137	.106
BZW04P94	105	121	1.0	94.0	5.0	2.60	152	.107
BZW04-94	105	116	1.0	94.0	5.0	2.60	152	.107
BZW04P102	114	132	1.0	102	5 .0	2.40	165	.107
BZW04-102	114	126	1.0	102	5.0	2.40	165	.107
BZW04P110	124	143	1.0	118	5.0	2.20	179	.107
BZW04-110	124	137	1.0	111	5.0	2.20	179	.107
BZW04P128	143	165	1.0	128	5.0	2.00	207	.108
BZW04-128	143	158	1.0	128	5.0	2.00	207	.108
BZW04P136	152	176	1.0	136	5.0	1.80	219	.108
BZW04-136	152	168	1.0	136	5.0	1.80	219	.108
BZW04P145	161	187	1.0	145	5.0	1.70	234	.108
BZW04-145	161	179	1.0	145	5.0	1.70	234	.108
BZW04P154	171	198	1.0	154	5.0	1.60	246	.108
BZW04-154	171	189	1.0	154	5.0	1.60	246	.108
BZW04P171	190	220	1.0	171	5.0	1.50	274	.108
BZW04-171	190	210	1.0	171	5.0	1.50	274	.108
BZW04P188	209	242	1.0	188	5.0	1.40	301	.108
BZW04-188	209	231	1.0	188	5.0	1.40	301	.108
BZW04P213	237	275	1.0	213	5.0	1.50	344	.110
BZW04-213	237	263	1.0	213	5.0	1.50	344	.110
BZW04P239	266	308	1.0	239	5.0	1.50	384	.110
BZW04-239	266	294	1.0	239	5.0	1.50	384	.110
BZW04P256	285	330	1.0	256	5.0	1.20	414	.110
BZW04-256	285	315	1.0	256	5.0	1.20	414	.110
BZW04P273	304	352	1.0	273	5.0	1.20	438	.110
BZW04-273	304	336	1.0	299	5.0	1.20	438	.110
BZW04P299	332	385	1.0	299	5.0	0.90	482	.110
BZW04-299	332	368	1.0	299	5.0	0.90	482	.110
BZW04P342	380	440	1.0	342	5.0	0.90	548	.110
BZW04-342	380	420	1.0	342	5.0	0.90	548	.110
BZW04P376	418	484	1.0	376	5.0	0.80	603	.110
BZW04-376	418	462	1.0	376	5.0	0.80	603	.110

NOTES:

1. V_{BR} measured after I_T applied for 300 μs. I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derated per Figure 2.
3. All terms and symbols are consistent with ANSI/IEEE C62.35.
4. For bidirectional devices with V_{WM} of 10 volts and less, the I_D limit is doubled.

FIGURE 1 - PEAK PULSE POWER RATING VERSUS PULSE TIME CURVE

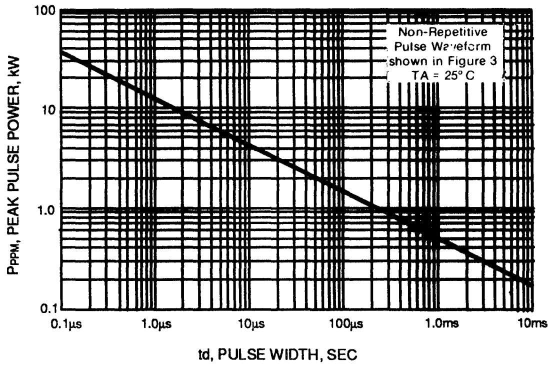


FIGURE 2 — PULSE DERATING CURVE

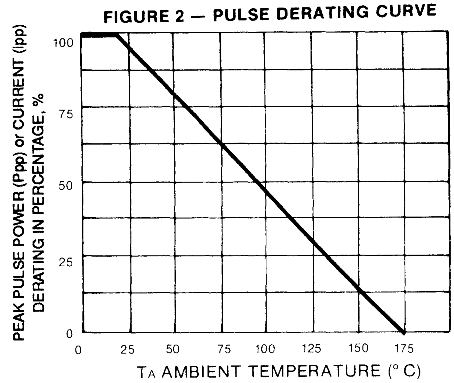


FIGURE 3 — PULSE WAVEFORM

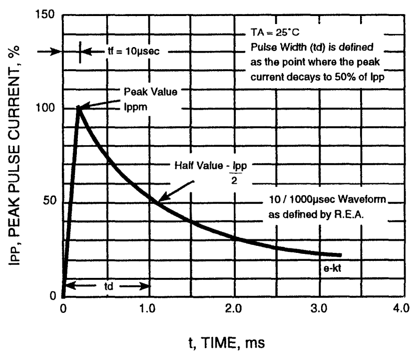


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

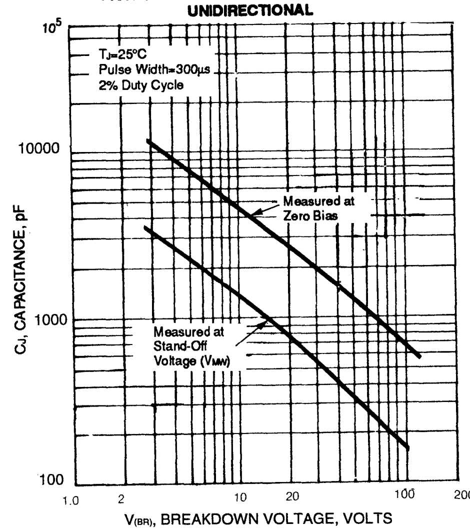


FIG. 5-STEADY STATE POWER DERATING CURVE

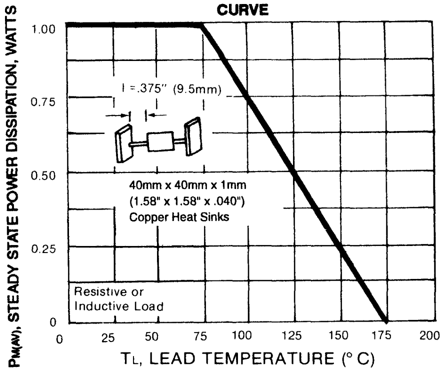
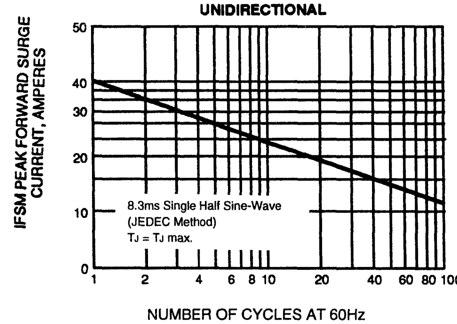


FIG.6-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL



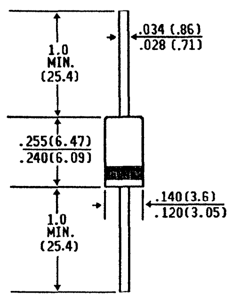
SA5.0 THRU SA170CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

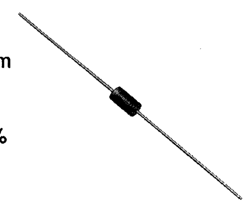
***VOLTAGE-** 5.0 to 170 Volts   500 Watt Peak Pulse Power*

FEATURES

DO-204AC



Dimensions in inches and (millimeters)



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- 500W Peak Pulse Power capability on 10/1000 μs waveform
- Excellent clamping capability
- Repetition rate (duty cycle): 0.01%
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional and 5.0ns for bidirectional types
- Typical I_D less than 1 μ A above 10V
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except Bidirectionals
Mounting Position: Any   ***Weight:*** 0.015 ounce, .4 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For Bidirectional use C or CA Suffix for types SA6.5 thru types SA170 (ex. SA6.5C, SA170CA)
Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 μs waveform (NOTE 1, FIG. 1))	P_{PPM}	Minimum 500	Watts
Peak Pulse Current of on 10/1000 μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	1.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load, Unidirectional only (JEDEC Method) (NOTE 3)	I_{FSM}	70	Amps
Maximum Instantaneous Forward Voltage at 35.0 A for unidirectional only (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +175	°C

NOTES: 1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. Mounted on Copper Leaf area of 1.57 in^2 (40mm^2) per Figure 5.
3. 8.3ms single half sine-wave or equivalent square wave, Duty Cycle=4 pulses per minute maximum.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Device	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 3) (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Voltage Variation $V_{(BR)}$ mV/°C
SA5.0*	6.40	7.30	10	5.0	600	52.0	9.60	5.0
SA5.0A*	6.40	7.00	10	5.0	600	54.3	9.20	5.0
SA6.0*	6.67	8.15	10	6.0	600	43.9	11.4	5.0
SA6.0A*	6.67	7.37	10	6.0	600	48.5	10.3	5.0
SA6.5	7.22	8.82	10	6.5	400	40.7	12.3	5.0
SA6.5A	7.22	7.98	10	6.5	400	44.7	11.2	5.0
SA7.0	7.78	9.51	10	7.0	150	37.8	13.3	6.0
SA7.0A	7.78	8.60	10	7.0	150	41.7	12.0	6.0
SA7.5	8.33	10.2	1.0	7.5	50	35.0	14.3	7.0
SA7.5A	8.33	9.21	1.0	7.5	50	38.8	12.9	7.0
SA8.0	8.89	10.9	1.0	8.0	25	33.3	15.0	7.0
SA8.0A	8.89	9.83	1.0	8.0	25	36.7	13.6	7.0
SA8.5	9.44	11.5	1.0	8.5	10	31.4	15.9	8.0
SA8.5A	9.44	10.4	1.0	8.5	10	34.7	14.4	8.0
SA9.0	10.0	12.2	1.0	9.0	5.0	29.5	16.9	9.0
SA9.0A	10.0	11.1	1.0	9.0	5.0	32.5	15.4	9.0
SA10	11.1	13.6	1.0	10.0	1.0	26.6	18.8	10.0
SA10A	11.1	12.3	1.0	10.0	1.0	29.4	17.0	10.0
SA11	12.2	14.9	1.0	11.0	1.0	24.9	20.1	11.0
SA11A	12.2	13.5	1.0	11.0	1.0	27.4	18.2	11.0
SA12	13.3	16.3	1.0	12.0	1.0	22.7	22.0	12.0
SA12A	13.3	14.7	1.0	12.0	1.0	25.1	19.9	12.0
SA13	14.4	17.6	1.0	13.0	1.0	21.0	23.8	13.0
SA13A	14.4	15.9	1.0	13.0	1.0	23.2	21.5	13.0
SA14	15.6	19.1	1.0	14.0	1.0	19.4	25.8	14.0
SA14A	15.6	17.2	1.0	14.0	1.0	21.5	23.2	14.0
SA15	16.7	20.4	1.0	15.0	1.0	18.8	26.9	16.0
SA15A	16.7	18.5	1.0	15.0	1.0	20.6	24.4	16.0
SA16	17.8	21.8	1.0	16.0	1.0	17.6	28.8	19.0
SA16A	17.8	19.7	1.0	16.0	1.0	19.2	26.0	17.0
SA17	18.9	23.1	1.0	17.0	1.0	16.4	30.5	20.0
SA17A	18.9	20.9	1.0	17.0	1.0	18.1	27.6	19.0
SA18	20.0	24.4	1.0	18.0	1.0	15.5	32.2	21.0
SA18A	20.0	22.1	1.0	18.0	1.0	17.2	29.2	20.0
SA20	22.2	27.1	1.0	20.0	1.0	13.9	35.8	25.0
SA20A	22.2	24.5	1.0	20.0	1.0	15.4	32.4	23.0
SA22	24.4	29.8	1.0	22.0	1.0	12.7	39.4	28.0
SA22A	24.4	26.9	1.0	22.0	1.0	14.1	35.5	25.0
SA24	26.7	32.6	1.0	24.0	1.0	11.6	43.0	31.0
SA24A	26.7	29.5	1.0	24.0	1.0	12.8	38.9	28.0
SA26	28.9	35.3	1.0	26.0	1.0	10.7	46.6	31.0
SA26A	28.9	31.9	1.0	26.0	1.0	11.9	42.1	30.0
SA28	31.1	38.0	1.0	28.0	1.0	9.9	50.1	35.0
SA28A	31.1	34.4	1.0	28.0	1.0	11.0	45.4	31.0
SA30	33.3	40.7	1.0	30.0	1.0	9.3	53.5	39.0
SA30A	33.3	36.8	1.0	30.0	1.0	10.3	48.4	36.0
SA33	36.7	44.9	1.0	33.0	1.0	8.6	59.0	42.0
SA33A	36.7	40.6	1.0	33.0	1.0	9.4	53.3	39.0
SA36	40.0	48.9	1.0	36.0	1.0	7.8	64.3	46.0
SA36A	40.0	44.2	1.0	36.0	1.0	8.6	58.1	41.0
SA40	44.4	54.3	1.0	40.0	1.0	7.0	71.4	51.0
SA40A	44.4	49.1	1.0	40.0	1.0	7.8	64.5	46.0
SA43	47.8	58.4	1.0	43.0	1.0	6.5	76.7	55.0
SA43A	47.8	52.8	1.0	43.0	1.0	7.2	69.4	50.0

**Not available as bidirectional devices*

ELECTRICAL CHARACTERISTICS ($T_A = 25°C$ unless otherwise noted)

Device	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 3) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Voltage at I_{PPM} Variation $V_{(BR)}$ mV/°C
SA45	50.0	61.1	1.0	45.0	1.0	6.2	80.3	58.0
SA45A	50.0	55.3	1.0	45.0	1.0	6.9	72.7	52.0
SA48	53.3	65.2	1.0	48.0	1.0	5.8	85.5	63.0
SA48A	53.3	58.9	1.0	48.0	1.0	6.5	77.4	56.0
SA51	56.7	69.3	1.0	51.0	1.0	5.5	91.1	66.0
SA51A	56.7	62.7	1.0	51.0	1.0	6.1	82.4	61.0
SA54	60.0	73.3	1.0	54.0	1.0	5.2	96.3	71.0
SA54A	60.0	66.3	1.0	54.0	1.0	5.7	87.1	65.0
SA58	64.4	78.7	1.0	58.0	1.0	4.9	103	78.0
SA58A	64.4	71.2	1.0	58.0	1.0	5.3	93.6	70.0
SA60	66.7	81.5	1.0	60.0	1.0	4.7	107	80.0
SA60A	66.7	73.7	1.0	60.0	1.0	5.2	96.8	71.0
SA64	71.1	86.9	1.0	64.0	1.0	4.4	114	86.0
SA64A	71.1	78.6	1.0	64.0	1.0	4.9	103	76.0
SA70	77.8	95.1	1.0	70.0	1.0	4.0	125	94.0
SA70A	77.8	86.0	1.0	70.0	1.0	4.4	113	85.0
SA75	83.3	102	1.0	75.0	1.0	3.7	134	101
SA75A	83.3	92.1	1.0	75.0	1.0	4.1	121	91.0
SA78	86.7	106	1.0	78.0	1.0	3.6	139	105
SA78A	86.7	95.8	1.0	78.0	1.0	4.0	126	95.0
SA85	94.4	115	1.0	85.0	1.0	3.3	151	114
SA85A	94.4	104	1.0	85.0	1.0	3.6	137	103
SA90	100	122	1.0	90.0	1.0	3.1	160	121
SA90A	100	111	1.0	90.0	1.0	3.4	146	110
SA100	111	136	1.0	100	1.0	2.8	179	135
SA100A	111	123	1.0	100	1.0	3.1	162	123
SA110	122	149	1.0	110	1.0	2.6	196	148
SA110A	122	135	1.0	110	1.0	2.8	177	133
SA120	133	163	1.0	120	1.0	2.3	214	162
SA120A	133	147	1.0	120	1.0	2.0	193	146
SA130	144	176	1.0	130	1.0	2.2	230	175
SA130A	144	159	1.0	130	1.0	2.4	209	158
SA150	167	204	1.0	150	1.0	1.9	268	203
SA150A	167	185	1.0	150	1.0	2.1	243	184
SA160	178	218	1.0	160	1.0	1.7	257	217
SA160A	178	197	1.0	160	1.0	1.9	259	196
SA170	189	231	1.0	170	1.0	1.6	304	230
SA170A	189	209	1.0	170	1.0	1.8	275	208

NOTES: 1. $V_{(BR)}$ measured after I_T applied for 300 μs. I_T = Square Wave Pulse or equivalent.
2. Surge Current waveform per Figure 3 and Derate per Figure 2.
3. For bidirectional types with VR of 10 Volts and less, the I_D limit is doubled.
4. All terms and symbols are consistent with ANSI/IEE C62.35.

FIG 1.-PEAK PULSE POWER RATING CURVE

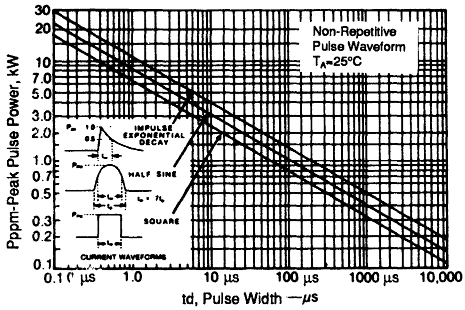


FIGURE 2 — PULSE DERATING CURVE

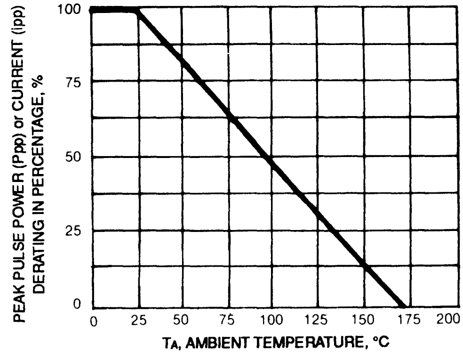


FIGURE 3 — PULSE WAVEFORM

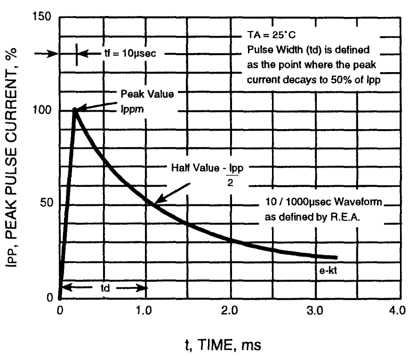


FIG. 4-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL ONLY

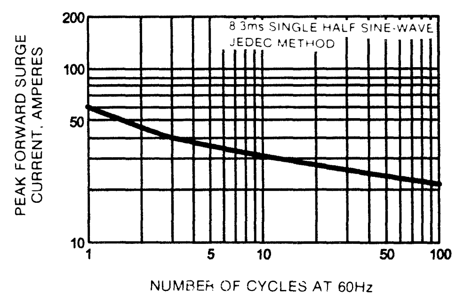
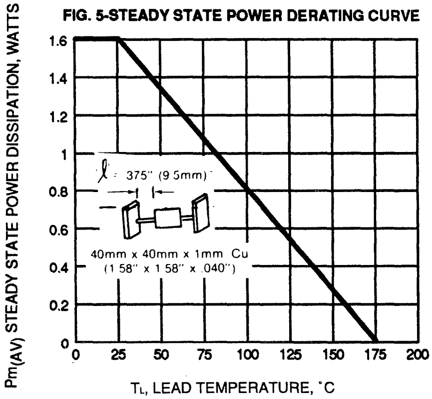


FIG. 5-STEADY STATE POWER DERATING CURVE



General Instrument

FIG. 6-INCREMENTAL CLAMPING VOLTAGE CURVE

UNIDIRECTIONAL

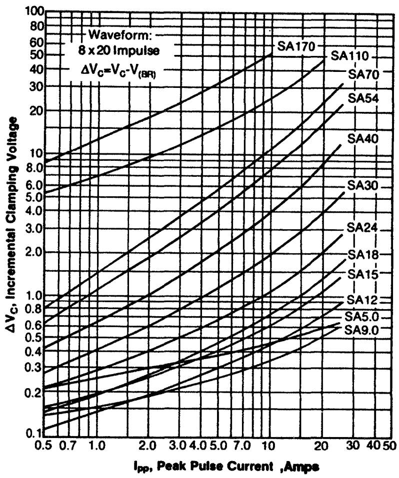


FIG. 7-INCREMENTAL CLAMPING VOLTAGE CURVE

UNIDIRECTIONAL

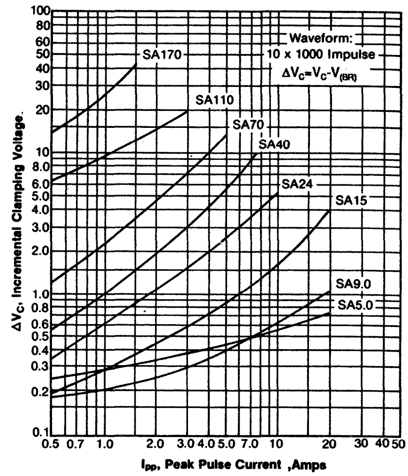


FIG. 8-INCREMENTAL CLAMPING VOLTAGE CURVE

BIDIRECTIONAL

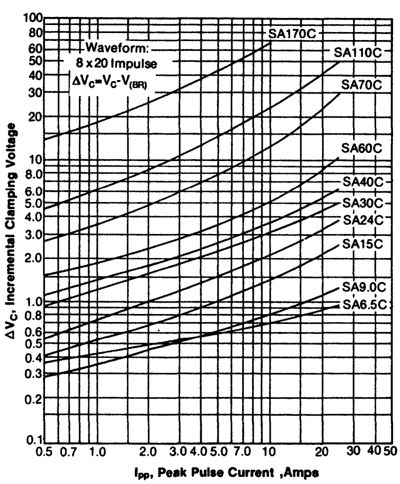


FIG. 9-INCREMENTAL CLAMPING VOLTAGE CURVE

BIDIRECTIONAL

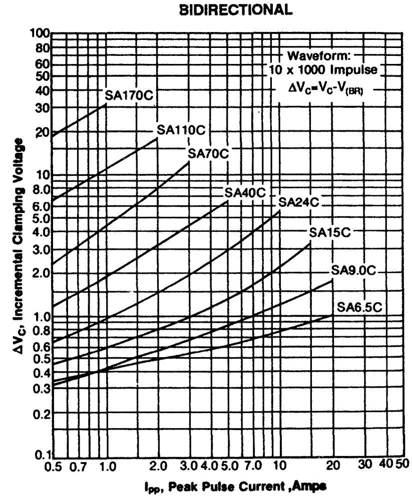


FIG. 10-INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS CURVE

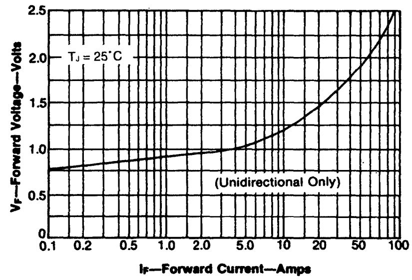
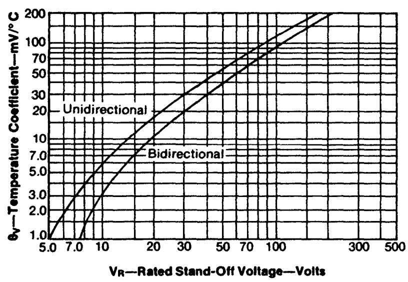


FIG. 11-BREAKDOWN VOLTAGE TEMPERATURE COEFFICIENT CURVE



APPLICATION

This TransZorb TVS series is a low cost, 500 watt commercial and industrial product for use in applications where space is a premium and where large voltage transients can permanently damage voltage-sensitive components.

The response time of TransZorb TVS clamping action is instantaneous (1 x 10^{-9} second for unidirectional and 5 x 10^{-9} for bidirectional); therefore, they can protect integrated circuits, MOS devices,hybrids, and other voltage-sensitive semiconductor components.

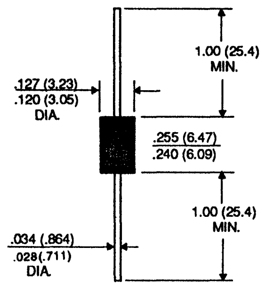
SAB5.0 THRU SAB28 SERIES

UNIDIRECTIONAL TRANSIENT VOLTAGE SUPPRESSOR

***Voltage-** 5.0 to 28 Volts 500 Watt Peak Pulse Power*

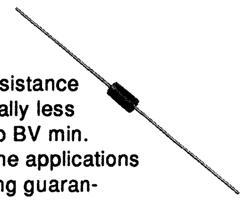
FEATURES

DO-204AC / CASE 25



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junction
- Repetition Rate (duty cycle): 0.01%
- 500W Peak Pulse Power Surge capability on 10/1000μs waveform
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV min.
- Ideal for Data and Bus Line applications
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight : 0.0353 ounce, 1.0 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (NOTE 1, FIGURE 1)	P_{PPM}	Minimum 500	Watts
Steady State Power Dissipation, T_L= 75°C at Lead Lengths .375", (9.5mm)	$P_{M(AV)}$	1.0	Watts
Peak Pulse Current at T_A=25°C on 10/1000μs waveform (NOTE 1, FIGURE 3)	I_{PPM}	SEE TABLE 1	Amps
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load for Unidirectional only (JEDEC Method) (NOTE 2)	I_{FSM}	70.0	Amps
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum.

FIGURE 1 - PEAK PULSE POWER RATING CURVE

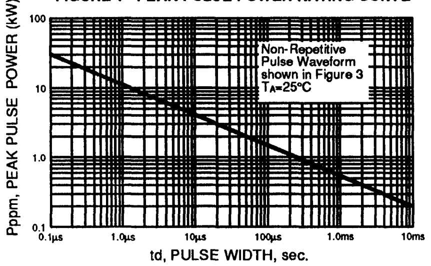


FIGURE 2 - POWER DERATING CURVE

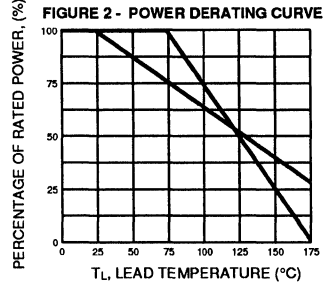


FIGURE 3 - PULSE WAVEFORM

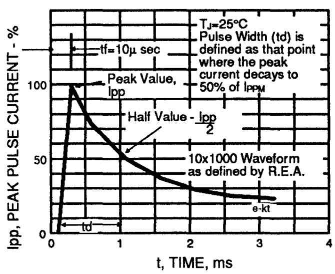


FIGURE 4 - TYPICAL JUNCTION CAPACITANCE

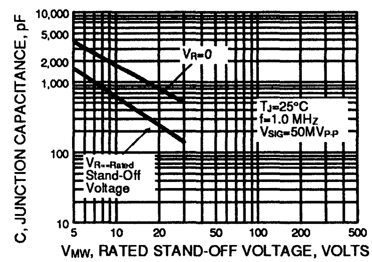


FIG. 5-TYPICAL INSTANTANEOUS FORWARD VOLTAGE

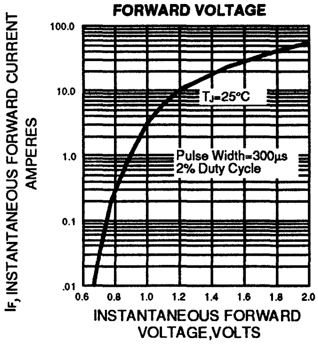
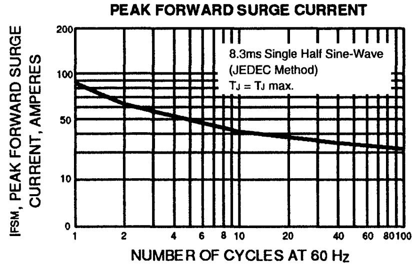


FIGURE 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



ELECTRICAL CHARACTERISTICS (T_A=25°C UNLESS OTHERWISE NOTED)

PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} (VOLTS)	MAXIMUM REVERSE LEAKAGE CURRENT I_D at V_{WM} D(uA)	MINIMUM BREAKDOWN VOLTAGE V(BR) @ (VOLTS) NOTE 1	MAXIMUM CLAMPING VOLTAGE (FIG.2) Vc at 1A (VOLTS)	TYPICAL CLAMPING VOLTAGE VC at 5A (VOLTS)	TYPICAL CLAMPING VOLTAGE VC at 10A (VOLTS)	MAXIMUM CLAMPING VOLTAGE at I_{PPM} (VOLTS)	MAXIMUM PEAK PULSE CURRENT I_{PPM} NOTE 2 (AMPS)
SAB5.0	5.0	300	6.0	7.4		7.9	9.3	53.7
SAB10	10.0	3.0	11.1	13.2		14.4	16.5	30.3
SAB12	12.0	3.0	13.8	16.5		18.5	21.0	23.8
SAB15	15.0	3.0	16.7	19.7		22.2	25.2	19.8
SAB18	18.0	3.0	20.4	23.8	26.0		30.5	16.3
SAB24	24.0	3.0	28.4	32.4	37.0		42.0	11.9
SAB28	28.0	3.0	30.0	35.0	41.0		46.5	10.7

NOTES:
1. V(BR) measured at pulse width of 300µs. sq. wave or equivalent
2. Surge current waveform per Figure 3 and derate per Figure 2.

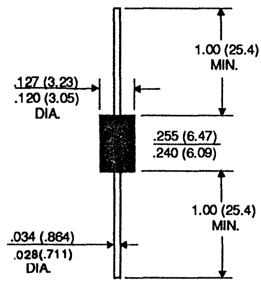
SAC5.0 THRU SAC50 SERIES

LOW CAPACITANCE TRANSIENT VOLTAGE SUPPRESSOR

***Voltage-** 5.0 to 50 Volts   500 Watt Peak Pulse Power*

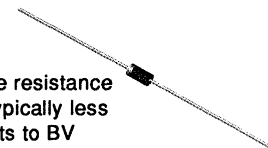
FEATURES

DO-204AL

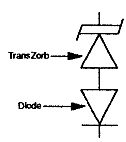


Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- Repetition Rate (duty cycle): 0.01%
- 500W Peak Pulse Power Surge capability on 10/1000μs waveform
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ns from 0 volts to BV
- Ideal for Data Line applications
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



SCHEMATIC



MECHANICAL DATA

Case: Molded plastic over a passivated junction

Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026

Polarity: Color band denotes positive end on the TransZorb

Mounting Position: Any

Weight : 0.0353 ounce, 1.0 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (NOTE 1)	P_{PPM}	Minimum 500	Watts
Steady State Power Dissipation at T_L= 75°C with Lead Lengths or .375", (9.5mm)	$P_{M(AV)}$	1.0	Watts
Peak Pulse Power Surge Current at T_A=25°C 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	See table 1	Amps
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.

FIG 1.-PEAK PULSE POWER RATING CURVE

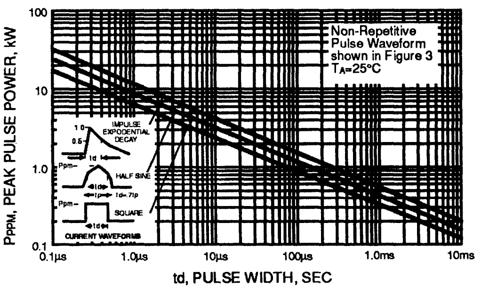


FIGURE 2 - PULSE DERATING CURVE

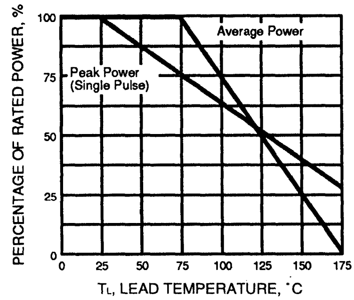


FIGURE 3 - PULSE WAVEFORM

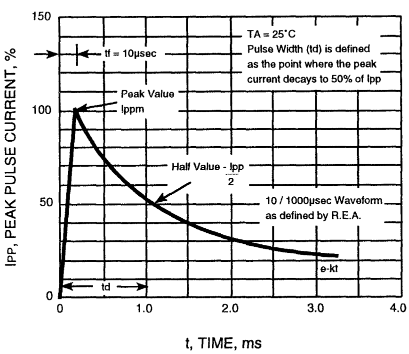
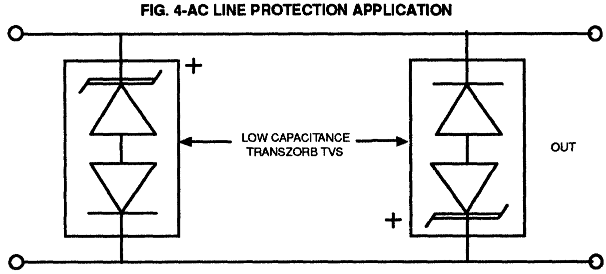


FIG. 4-AC LINE PROTECTION APPLICATION



APPLICATION NOTE: Devices must be used with two units in parallel, opposite in polarity, as shown in circuit for AC Signal Line protection

ELECTRICAL CHARACTERISTICS (T_A=25°C UNLESS OTHERWISE NOTED)

Part Number	Reverse Stand-Off Voltage (Note 1) V_{WM} (VOLTS)	Breakdown Voltage at I_T = 1.0mA $V_{(BR)}$ (VOLTS) Min.	Maximum Reverse Leakage at V_{WM} I_D (uA)	Maximum Clamping Voltage at I_{PP}=5.0A V_C (VOLTS)	Maximum Peak Pulse Current per FIG. 3 I_{PP} (AMPS)	Junction Capacitance at 0 VOLTS (pF)	Working Inverse Blocking Voltage V_{WIB} (VOLTS)	Inverse Blocking Leakage Current at V_{WIB} I_{IB} (mA)	Peak Inverse Blocking Voltage V_{PIB} (VOLTS)
SAC5.0	5.0	7.60	300	10.0	44	50	75	1	100
SAC6.0	6.0	7.90	300	11.2	41	50	75	1	100
SAC7.0	7.0	8.33	300	12.6	38	50	75	1	100
SAC8.0	8.0	8.89	100	13.4	36	50	75	1	100
SAC8.5	8.5	9.44	50	14.0	34	50	75	1	100
SAC10	10	11.10	5.0	16.3	29	50	75	1	100
SAC12	12	13.30	5.0	19.0	25	50	75	1	100
SAC15	5	16.70	5.0	23.6	20	50	75	1	100
SAC18	18	20.00	5.0	28.8	15	50	75	1	100
SAC22	22	24.40	5.0	35.4	14	50	75	1	100
SAC26	26	28.90	5.0	42.3	11.1	50	75	1	100
SAC30	30	33.30	5.0	48.6	10.0	50	75	1	100
SAC36	36	40.00	5.0	60.0	8.6	50	75	1	100
SAC45	45	50.00	5.0	77.0	6.8	50	150	1	200
SAC50	50	55.50	5.0	88.0	5.8	50	150	1	200

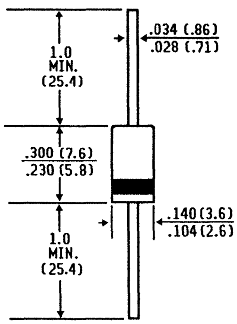
P6KE6.8 THRU P6KE400CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE-** 6.8 to 440 Volts 600 Watt Peak Pulse Power*

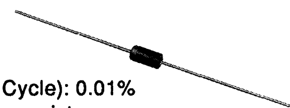
FEATURES

DO-204AC



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junction in DO-15 package
- 600W Peak Pulse Power capability on 10/1000 μs waveform
- Excellent clamping capability



- Repetition rate (Duty Cycle): 0.01%
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional and 5.0 nS for bidirectional types
- Typical I_D less than 1 μ A above 10V
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension

MECHANICAL DATA

Case: JEDEC DO-204AC molded plastic over passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except Bidirectional
Mounting Position: Any ***Weight:*** 0.015 ounce, .4 gram

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For Bidirectional use C or CA Suffix for types P6KE6.8 thru types P6KE 440. (ex. P6KE6.8C, P6KE400CA) Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified. Resistive or inductive load.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 600	Watts
Peak Pulse Current on 10/1000 μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3) unidirectional only	I_{FSM}	100.0	Amps
Maximum Instantaneous Forward Voltage at 50.0A for unidirectional only (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175	°C

NOTES:

1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. Mounted on Copper Leaf area of 1.57 in^2 ($40mm^2$) per Fig. 5.
3. 8.3ms single half sine-wave or equivalent squarewave, duty cycle = 4 pulses per minutes maximum.

Device	Breakdown Voltage $V_{(BR)}$ Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 3) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of (V_{BR}) (%°C)
+P6KE6.8	6.12	7.48	10	5.50	1000	56	10.8	0.057
+P6KE6.8A	6.45	7.14	10	5.80	1000	57	10.5	0.057
+P6KE7.5	6.75	8.25	10	6.05	500	51	11.7	0.061
+P6KE7.5A	7.13	7.88	10	6.40	500	53	11.3	0.061
+P6KE8.2	7.38	9.02	10	6.63	200	48	12.5	0.065
+P6KE8.2A	7.79	8.61	10	7.02	200	50	12.1	0.065
+P6KE9.1	8.19	10.0	1.0	7.37	50	44	13.8	0.068
+P6KE9.1A	8.65	9.55	1.0	7.78	50	45	13.4	0.068
+P6KE10	9.00	11.0	1.0	8.10	10	40	15.0	0.073
+P6KE10A	9.50	10.5	1.0	8.55	10	41	14.5	0.073
+P6KE11	9.90	12.1	1.0	8.92	5.0	37	16.2	0.075
+P6KE11A	10.5	11.6	1.0	9.40	5.0	38	15.6	0.075
+P5KE12	10.8	13.2	1.0	9.72	5.0	35	17.3	0.078
+P6KE12A	11.4	12.6	1.0	10.2	5.0	36	16.7	0.078
+P6KE13	11.7	14.3	1.0	10.5	5.0	32	19.0	0.061
+P6KE13A	12.4	13.7	1.0	11.1	5.0	33	18.2	0.081
+P6KE15	13.5	16.5	1.0	12.1	5.0	27	22.0	0.084
+P6KE15A	14.3	15.8	1.0	12.8	5.0	28	21.2	0.084
+P6KE16	14.4	17.6	1.0	12.9	5.0	26	23.5	0.086
+P6KE16A	15.2	16.8	1.0	13.6	5.0	27	22.5	0.086
+P6KE18	16.2	19.8	1.0	14.5	5.0	23	26.5	0.088
+P6KE18A	17.1	18.9	1.0	15.3	5.0	24	25.2	0.088
+P6KE20	18.0	22.0	1.0	16.2	5.0	21	29.1	0.090
+P6KE20A	19.0	21.0	1.0	17.1	5.0	22	27.7	0.090
+P6KE22	19.8	24.2	1.0	17.8	5.0	19	31.9	0.092
+P6KE22A	20.9	23.1	1.0	18.8	5.0	20	30.6	0.092
+P6KE24	21.6	26.4	1.0	19.4	5.0	17	34.7	0.094
+P6KE24A	22.8	252.	1.0	20.5	5.0	18	33.2	0.094
+P6KE27	24.3	29.7	1.0	21.8	5.0	15	39.1	0.096
+P6KE27A	25.7	28.4	1.0	23.1	5.0	16	37.5	0.096
+P6KE30	27.0	33.0	1.0	24.3	5.0	14	43.5	0.097
+P6KE30A	28.5	31.5	1.0	25.6	5.0	14.4	41.4	0.097
+P6KE33	29.7	36.3	1.0	26.8	5.0	12.6	47.7	0.098
+P6KE33A	31.4	34.7	1.0	28.2	5.0	13.2	45.7	0.098
+P6KE36	32.4	39.6	1.0	29.1	5.0	11.6	52.0	0.099
+P6KE36A	34.2	37.8	1.0	30.8	5.0	12.0	49.9	0.099
+P6KE39	35.1	42.9	1.0	31.6	5.0	10.6	56.4	0.100
+P6KE39A	37.1	41.0	1.0	33.3	5.0	11.2	53.9	0.100
+P6KE43	38.7	47.3	1.0	34.8	5.0	9.6	61.9	0.101
+P6KE43A	40.9	45.2	1.0	36.8	5.0	10.1	59.3	0.101
+P6KE47	42.3	51.7	1.0	38.1	5.0	8.9	67.8	0.101
+P6KE47A	44.7	49.4	1.0	40.2	5.0	9.3	64.8	0.101
P6KE51	45.9	56.1	1.0	41.3	5.0	8.2	73.5	0.102
P6KE51A	48.5	53.6	1.0	43.6	5.0	8.6	70.1	0.102
P6KE56	50.4	61.6	1.0	45.4	5.0	7.4	80.5	0.103
P6KE56A	53.2	58.8	1.0	47.8	5.0	7.8	77.0	0.103
P6KE62	55.8	68.2	1.0	50.2	5.0	6.8	89.0	0.104
P6KE62A	58.9	65.1	1.0	53.0	5.0	7.1	85.0	0.104
P6KE68	61.2	74.8	1.0	55.1	5.0	6.1	98.0	0.104
P6KE68A	64.6	71.4	1.0	58.1	5.0	6.5	92.0	0.104
P6KE75	67.5	82.5	1.0	60.7	5.0	5.5	108	0.105
P6KE75A	71.3	78.8	1.0	64.1	5.0	5.8	103	0.105
P6KE82	73.8	90.2	1.0	66.4	5.0	5.1	118	0.105
P6KE82A	77.9	86.1	1.0	70.1	5.0	5.3	113	0.105
P6KE91	81.9	100	1.0	73.7	5.0	4.5	131	0.106

Device	Breakdown Voltage V(BR) Volts (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand off Voltage VWM (Volts)	Maximum Reverse Leakage at VWM ID (NOTE 3) (µA)	Maximum Peak Pulse Current IPPM (NOTE 2) (Amps)	Maximum Clamping Voltage at IPPM Vc (Volts)	Maximum Temperature Coefficient of V(BR) (%C)
P6KE91A	86.5	95.5	1.0	77.8	5.0	4.8	125	0.106
P6KE100	90.0	110	1.0	81.0	5.0	4.2	144	0.106
P6KE100A	95.0	105	1.0	85.5	5.0	4.4	137	0.106
P6KE110	99.0	121	1.0	89.2	5.0	3.8	158	0.107
P6KE110A	105	116	1.0	94.0	5.0	4.0	152	0.107
P6KE120	108	132	1.0	97.2	5.0	3.5	173	0.107
P6KE120A	114	126	1.0	102	5.0	3.6	165	0.107
P6KE130	117	143	1.0	105	5.0	3.2	187	0.107
P6KE130A	124	137	1.0	111	5.0	3.3	179	0.107
P6KE150	135	165	1.0	121	5.0	2.8	215	0.108
P6KE150A	143	158	1.0	128	5.0	2.9	207	0.108
P6KE160	144	176	1.0	130	5.0	2.6	230	0.108
P6KE160A	152	168	1.0	136	5.0	2.7	219	0.108
P6KE170	153	187	1.0	138	5.0	2.5	244	0.108
P6KE170A	162	179	1.0	145	5.0	2.6	234	0.108
P6KE180	162	198	1.0	146	5.0	2.3	258	0.108
P6KE180A	171	189	1.0	154	5.0	2.4	246	0.108
P6KE200	180	220	1.0	162	5.0	2.1	287	0.108
P6KE200A	190	210	1.0	171	5.0	2.2	274	0.108
P6KE220	198	242	1.0	175	5.0	1.75	344	0.108
P6KE220A	209	231	1.0	185	5.0	1.83	328	0.108
P6KE250	225	275	1.0	202	5.0	1.67	360	0.110
P6KE250A	237	263	1.0	214	5.0	1.75	344	0.110
P6KE300	270	330	1.0	243	5.0	1.40	430	0.110
P6KE300A	285	315	1.0	256	5.0	1.45	414	0.110
P6KE350	315	385	1.0	284	5.0	1.20	504	0.110
P6KE350A	332	368	1.0	300	5.0	1.25	482	0.110
P6KE400	360	440	1.0	324	5.0	1.05	574	0.110
P6KE400A	380	420	1.0	342	5.0	1.10	548	0.110
P6KE440	396	484	1.0	356	5.0	0.95	631	0.110
P6KE440A	418	462	1.0	376	5.0	1.0	602	0.110

NOTES:

1. $V_{(BR)}$ measured after I_T applied for 300µs, I_T = Square Wave Pulse or equivalent.
2. Surge Current Waveform per Figure 3 and Derate per Figure 2.
3. For bidirectional types with V_R of 10 volts and less, the I_D limit is doubled.
4. All terms and symbols are consistant with ANSI/IEEE C62.35.

\+ UL listed for Telecom application protection 497B, file number E136766 for both unidirectional and bidirectional devices.

DESCRIPTION

This P6KE TVS series is a low cost commercial product for use in applications where large voltage transients can permanently damage voltage-sensitive components.

The P6KE series device types are designed in a small package size where power and space is a consideration. They are characterized by their high surge capability, extremely fast response time, and low impedance, (R_{on}). Because of the unpredictable nature of transients, and the variation of the impedance with respect to these transients, impedance, per se, is not specified as a parametric value. However, a minimum voltage at low current conditions (BV) and a maximum clamping voltage (V_C) at a maximum peak pulse current is specified.

In some instances, the thermal effect (see V_C Clamping Voltage) may be responsible for 50% to 70% of the observed voltage differential when subjected to high current pulses for several duty cycles, thus making a maximum impedance specification insignificant. In case of a severe current overload or abnormal transient beyond the maximum ratings, the TransZorb will initially fail "short" thus tripping the system's circuit breaker or fuse while protecting the entire circuit. Curves depicting clamping voltage vs. various current pulses are available from the factory. Extended power curves vs. pulse time are also available.

FIG.1-PEAK PULSE POWER RATING CURVE

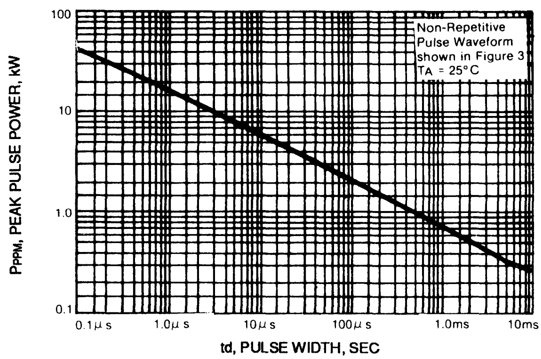


FIGURE 2 — PULSE DERATING CURVE

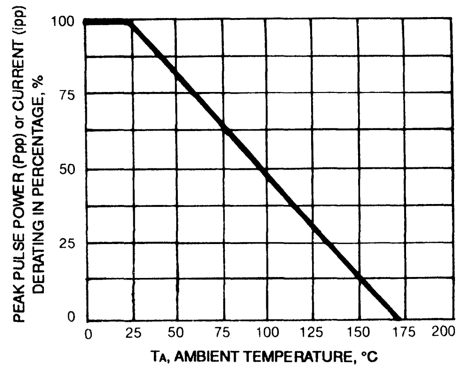


FIGURE 3 — PULSE WAVEFORM

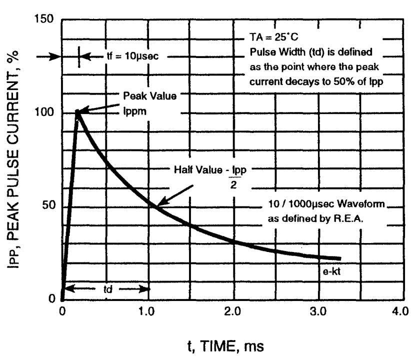


FIG.4-TYPICAL JUNCTION CAPACITANCE UNIDIRECTIONAL

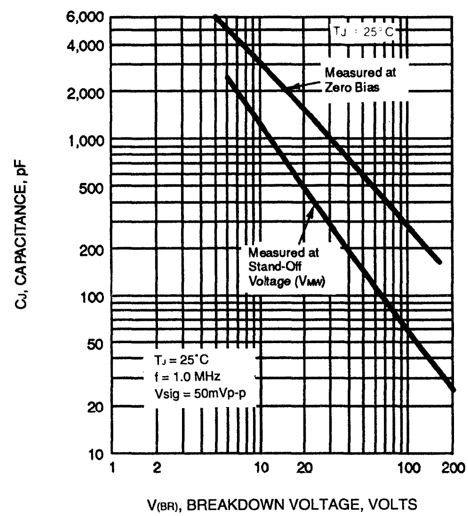


FIG. 5-STEADY STATE POWER DERATING CURVE

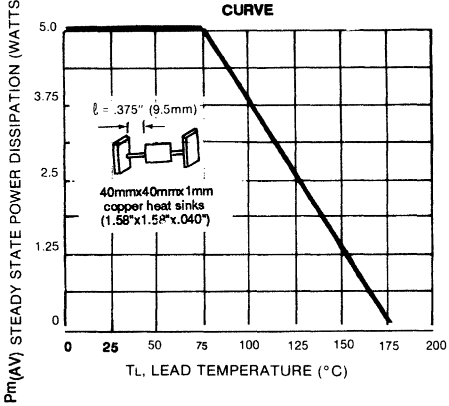
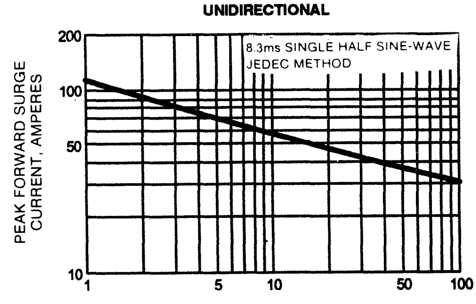


FIG.6-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT UNIDIRECTIONAL



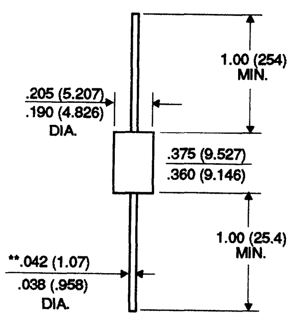
1.5KE6.8 THRU 1.5KE400CA

GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE** - 6.8 to 440 Volts   1500 Watt Peak Pulse Power*

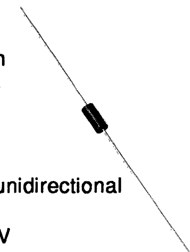
FEATURES

1.5KE



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction in Molded Plastic package
- 1500W Peak Pulse Power capability on 10/1000 µs waveform
- Repetition rate (duty cycle): 0.05%
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional and 5.0 nS for bidirectional types
- Typical I_D less than 1µA above 10V
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic over passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode) except bidirectional
Mounting Position: Any
Weight : 0.045 ounce, 1.2 grams

DEVICES FOR BIDIRECTIONAL APPLICATIONS

For Bidirectional use C or CA Suffix for types 1.5KE6.8 thru types 1.5KE440 (ex. 1.5KE6.8C, 1.5KE400CA). Electrical characteristics apply in both directions.

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 µs waveform (NOTE 1)	P_{PPM}	Minimum 1500	Watts
Peak Pulse Current on 10/1000 µs waveform (NOTE 1, FIG. 1)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	$P_{M(AV)}$	5.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load (JEDEC Method) (NOTE 3) unidirectional	I_{FSM}	200	Amps
Maximum Instantaneous Forward Current at 50.0A for uniddirectional only (NOTE 3)	V_F	3.5/5.0	Volts
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to +175	°C

NOTES: 1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. Mounted on Copper Leaf area of 0.79 in^2 (20mm^2) per Figure 5.
3. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle =4 pulses per minutes maximum.

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

JEDEC TYPE NUMBER	GENERAL PART NUMBER	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min	Max	at I_T (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 5) (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficinet of $V_{(BR)}$ (%/°C)
1N6267	+1.5KE6.8	6.12	7.48	10	5.50	1000	139	10.8	0.057
1N6267A	+1.5KE6.8A	6.45	7.14	10	5.80	1000	143	10.5	0.057
1N6268	+1.5KE7.5	6.75	8.25	10	6.05	500	128	11.7	0.061
1N6268A	+1.5KE7.5A	7.13	7.88	10	6.40	500	132	11.3	0.061
1N6269	+1.5KE8.2	7.38	9.02	10	6.63	200	120	12.5	0.065
1N6269A	+1.5KE8.2A	7.79	8.0	10	7.02	200	124	12.1	0.065
1N6270	+1.5KE9.1	8.19	10.0	1.0	7.37	50	109	13.8	0.068
1N6270A	+1.5KE9.1A	8.65	9.55	1.0	7.78	50	112	13.4	0.068
1N6271	+1.5KE10	9.00	11.0	1.0	8.10	10	100	15.0	0.073
1N6271A	+1.5KE10A	9.50	10.5	1.0	8.55	10	103	14.5	0.073
1N6272	+1.5KE11	9.90	12.1	1.0	8.92	5.0	93.0	16.2	0.075
1N6272A	+1.5KE11A	10.5	11.6	1.0	9.40	5.0	96.0	15.6	0.075
1N6273	+1.5KE12	10.8	13.2	1.0	9.72	5.0	87.0	17.3	0.076
1N6273A	+1.5KE12A	11.4	12.6	1.0	10.2	5.0	90.0	16.7	0.078
1N6274	+1.5KE13	11.7	14.3	1.0	10.5	5.0	79.0	19.0	0.081
1N6274A	+1.5KE13A	12.4	13.7	1.0	11.1	5.0	82.0	18.2	0.061
1N6275	+1.5KE15	13.5	16.5	1.0	12.1	5.0	68.0	22.0	0.084
1N6275A	+1.5KE15A	14.3	15.8	1.0	12.8	5.0	71.0	21.2	0.084
1N6276	+1.5KE16	14.4	17.6	1.0	12.9	5.0	64.0	23.5	0.066
1N6276A	+1.5KE16A	15.2	16.8	1.0	13.6	5.0	67.0	22.5	0.066
1N6277	+1.5KE18	16.2	19.8	1.0	14.5	5.0	56.5	26.5	0.068
1N6277A	+1.5KE18A	17.1	18.9	1.0	15.3	5.0	59.5	26.2	0.089
1N6278	+1.5KE20	18.0	22.0	1.0	16.2	5.0	51.5	29.1	0.090
1N6278A	+1.5KE20A	19.0	21.0	1.0	17.1	5.0	54.0	27.7	0.090
1N6279	+1.5KE22	19.8	24.2	1.0	17.8	5.0	47.0	31.9	0.092
1N6279A	+1.5KE22A	20.9	23.1	1.0	18.8	5.0	49.0	30.6	0.092
1N6280	+1.5KE24	21.6	26.4	1.0	19.4	5.0	43.0	34.7	0.094
1N6280A	+1.5KE24A	22.8	25.2	1.0	20.5	5.0	45.0	33.2	0.094
1N6281	+1.5KE27	24.3	29.7	1.0	21.8	5.0	38.5	39.1	0.096
1N6281A	+1.5KE27A	25.7	28.4	1.0	23.1	5.0	40.0	37.5	0.096
1N6282	+1.5KE30	27.0	33.0	1.0	24.3	5.0	34.5	43.5	0.097
1N6282A	+1.5KE30A	28.5	31.5	1.0	25.6	5.0	36.0	41.4	0.097
1N6283	+1.5KE33	29.7	36.3	1.0	26.8	5.0	31.5	47.7	0.098
1N6283A	+1.5KE33A	31.4	34.7	1.0	28.2	5.0	33.0	45.7	0.098
1N6284	+1.5KE36	32.4	39.6	1.0	29.1	5.0	29.0	52.0	0.099
1N6284A	+1.5KE36A	34.2	37.8	1.0	30.8	5.0	30.0	49.9	0.099
1N6285	+1.5KE39	35.1	42.9	1.0	31.6	5.0	26.5	56.4	0.100
1N6285A	+1.5KE39A	37.1	41.0	1.0	33.3	5.0	28.0	53.9	0.100
1N6286	+1.5KE43	38.7	47.3	1.0	34.8	5.0	24.0	61.9	0.101
1N6286A	+1.5KE43A	40.9	45.2	1.0	36.8	5.0	25.3	59.3	0.101
1N6287	+1.5KE47	42.3	51.7	1.0	36.1	5.0	22.2	67.8	0.101
1N6287A	+1.5KE47A	44.7	49.4	1.0	40.2	5.0	23.2	64.8	0.101
1N6288	1.5KE51	45.9	56.1	1.0	41.3	5.0	20.4	73.5	0.102
1N6288A	1.5KE51A	48.5	53.6	1.0	43.6	5.0	21.4	70.1	0.102
1N6289	1.5KE56	50.4	61.8	1.0	45.4	5.0	18.6	80.5	0.103
1N6289A	1.5KE56A	53.2	58.8	1.0	47.8	5.0	19.5	77.0	0.103
1N6290	1.5KE62	55.8	68.2	1.0	50.2	5.0	16.9	89.0	0.104
1N6290A	1.5KE62A	58.9	65.1	1.0	53.0	5.0	17.7	85.0	0.104
1N6291	1.5KE68	61.2	74.8	1.0	55.1	5.0	15.3	98.0	0.104
1N6291A	1.5KE68A	64.6	71.4	1.0	58.1	5.0	16.3	92.0	0.104
1N6292	1.5KE75	67.5	82.5	1.0	60.7	5.0	13.9	109	0.105
1N6292A	1.5KE75A	71.3	78.8	1.0	64.1	5.0	14.6	104	0.105
1N6293	1.5KE82	73.8	90.2	1.0	66.4	5.0	12.7	118	0.105
1N6293A	1.5KE82A	77.9	86.1	1.0	70.1	5.0	13.3	113	0.105
1N6294	1.5KE91	81.9	100.0	1.0	73.7	5.0	11.4	131	0.106
1N6294A	1.5KE91A	86.5	95.5	1.0	77.8	5.0	12.0	125	0.106
1N6295	1.5KE100	90.0	110	1.0	81.0	5.0	10.4	144	0.106

ELECTRICAL CHARACTERISTICS at (T_A=25°C unless otherwise noted)

JEDEC TYPE NUMBER	GENERAL PART NUMBER	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) Min	Max	at I_T (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (NOTE 5) (μA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
1N6295A	1.5KE100A	95.0	105	1.0	85.5	5.0	11.0	137	0.106
1N6296	1.5KE110	99.0	121	1.0	89.2	5.0	9.5	158	0.107
1N6296A	1.5KE110A	106	116	1.0	94.0	5.0	9.9	152	0.107
1N6297	1.5KE120	108	132	1.0	97.2	5.0	8.7	173	0.107
1N6297A	1.5KE120A	114	126	1.0	102	5.0	9.1	165	0.107
1N6298	1.5KE130	117	143	1.0	106	5.0	8.0	187	0.107
1N6298A	1.5KE130A	124	137	1.0	111	5.0	8.4	179	0.107
1N6299	1.5KE150	136	165	1.0	121	5.0	7.0	215	0.108
1N6299A	1.5KE150A	143	158	1.0	128	5.0	7.2	207	0.106
1N6300	1.5KE160	144	176	1.0	130	5.0	6.5	230	0.106
1N6300A	1.5KE160A	152	168	1.0	136	5.0	6.8	219	0.108
1N6301	1.5KE170	153	167	1.0	138	5.0	6.2	244	0.108
1N6301A	1.5KE170A	162	179.	1.0	145	5.0	6.4	234	0.108
1N6302	1.5KE180	162	198	1.0	146	5.0	5.8	258	0.108
1N6302A	1.5KE180A	171	189	1.0	154	5.0	6.1	246	0.108
1N6303	1.5KE200	180	220	1.0	162	5.0	5.2	287	0.108
1N6303A	1.5KE200A*	190	210	1.0	171	5.0	5.5	274	0.108
	1.5KE220	196	242	1.0	175	5.0	4.3	344	0.108
	1.5KE220A*	209	231	1.0	185	5.0	4.6	328	0.108
	1.5KE250	225	275	1.0	202	5.0	5.0	360	0.110
	1.5KE250A	237	263	1.0	214	5.0	5.0	344	0.110
	1.5KE300	270	330	1.0	243	5.0	5.0	430	0.110
	1.5KE300A	285	315	1.0	256	5.0	5.0	414	0.110
	1.5KE350	315	385	1.0	284	5.0	4.0	504	0.110
	1.5KE350A	333	368	1.0	300	5.0	4.0	482	0.110
	1.5KE400	360	440	1.0	324	5.0	4.0	574	0.110
	1.5KE400A	380	420	1.0	342	5.0	4.0	548	0.110
	1.5KE440	396	484	1.0	356	5.0	2.38	631	0.110
	1.5KE440A	418	462	1.0	376	5.0	2.50	602	0.110

NOTES:

1. V_{BR} measured after I_T applied for 300 us. I_T=Square Wave Pulse or equivalent.
2. Surge current Waveform per Figure 3 and Derate per Figure 2.
3. V_F=3.5V max., I_F=100A (1.5KE6.8 thru 1.5KE91A)
   V_F=5.0 V max., I_F=100A (1.5KE100 thru 1.5KE440A) per 1/2 Square or equivalent Sine Wave.
   PW-8.3ms, Duty Cycle - 4 Pulses per minute maximum.
4. All terms and symbols are consistent with ANSI/IEEE CA62.35.
5. For bidirectional types with V_R 10 volts and less, the I_D limit is doubled.

* Bidirectional versions are UL approved under component across the line protection, ULV1414 file number E108274. (1.5KE200CA, 1.5KE220CA)

+ UL listed for Telecom applications protection, 497B, file number E133766 for both unidirectional and bidirectional devices

APPLICATION

This series of Silicon Transient Suppressors is used in applications where large voltage transients can permanently damage voltage-sensitive components.

The TransZorb diode can be used in applications where induced lighting on rural or remote transmission lines presents a hazard to electronic circuitry (ref: R.E.A. specification P.E. 60).

This TransZorb TVS diode has a pulse power rating of 1500 watts for one millisecond. The response time of TransZorb TVS diode clamping action is effectively instantaneous (1 x 10^{-9} seconds bidirectional) ; therefore, they can protect integrated circuits, MOS devices, hybrids, and other voltage sensitive semiconductors and components. TransZorb TVS diodes can also be used in series or parallel to increase the peak power ratings.

FIG.1-PEAK PULSE POWER RATING CURVE

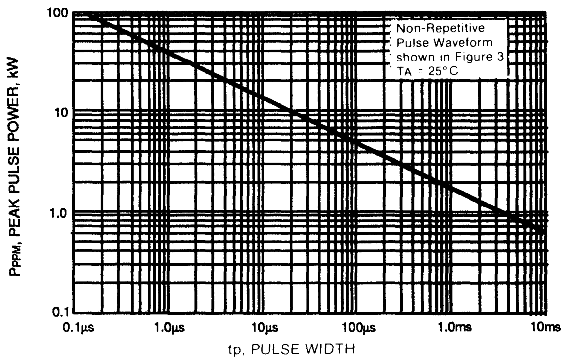


FIGURE 2 — PULSE DERATING CURVE

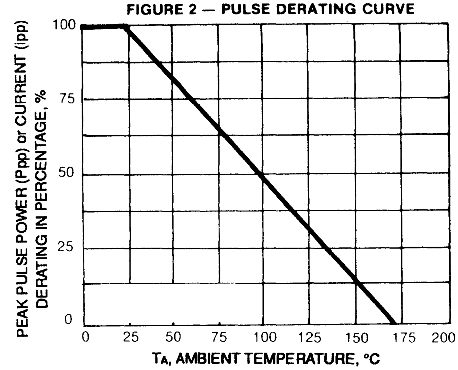


FIGURE 4 — TYPICAL JUNCTION CAPACITANCE

FIGURE 3 — PULSE WAVEFORM

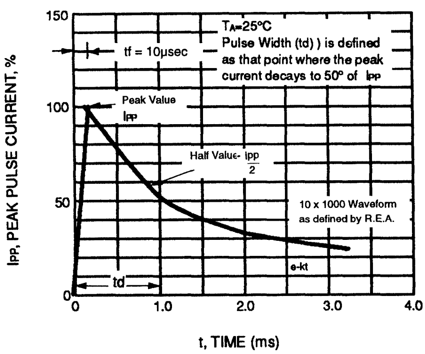


FIG.4-TYPICAL JUNCTION CAPACITANCE

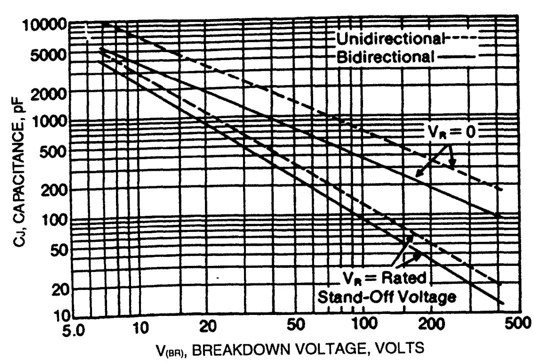


FIG. 5-STEADY STATE POWER DERATING CURVE

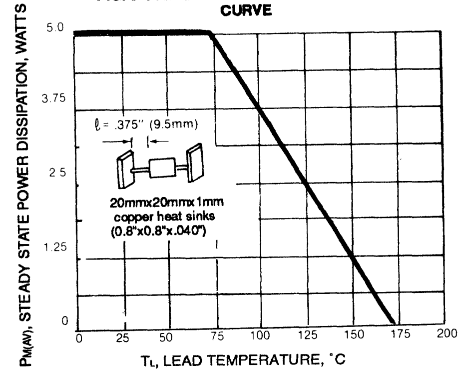


FIG.6-MAXIMUM NON-REPETITIVE
PEAK FORWARD SURGE CURRENT
UNIDIRECTIONAL

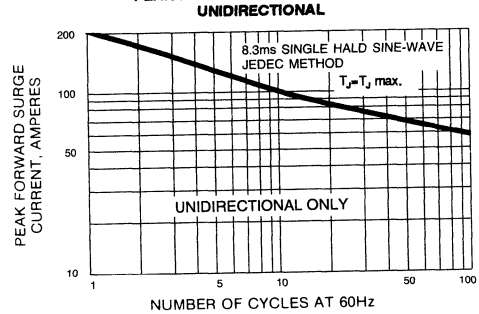


FIG. 7-INCREMENTAL CLAMPING VOLTAGE CURVE UNIDIRECTIONAL

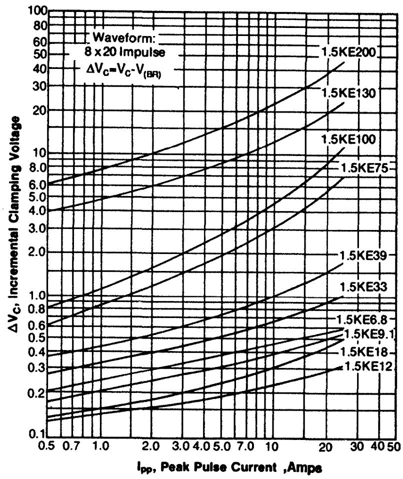


FIG. 8-INCREMENTAL CLAMPING VOLTAGE CURVE UNIDIRECTIONAL

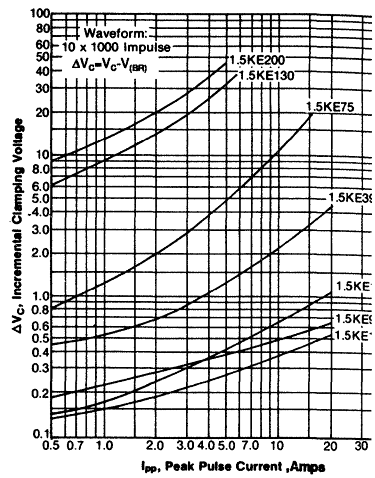


FIG. 9-INCREMENTAL CLAMPING VOLTAGE CURVE BIDIRECTIONAL

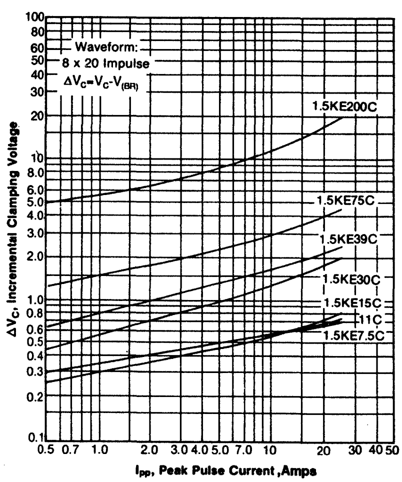


FIG. 10-INCREMENTAL CLAMPING VOLTAGE CURVE BIDIRECTIONAL

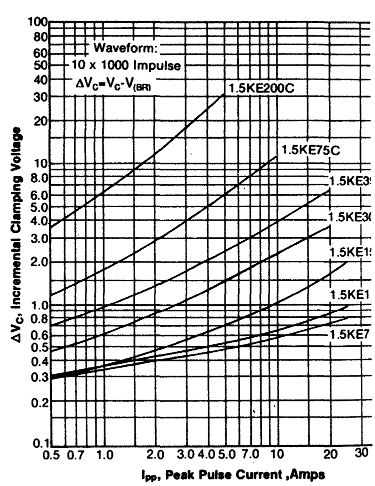


FIG. 11-INSTANTANEOUS FORWARD VOLTAGE CHARACTERISTICS CURVE

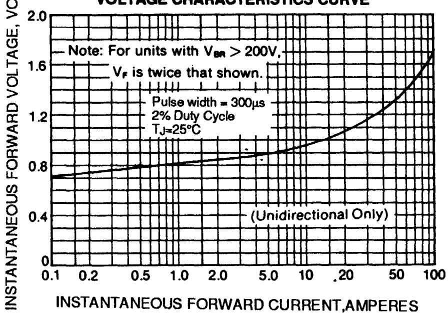
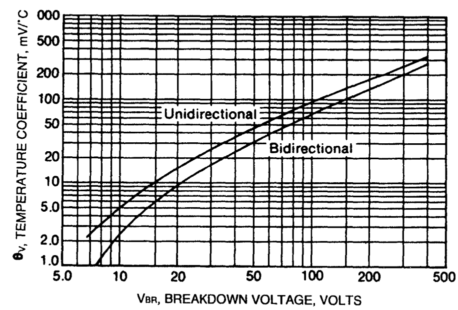


FIG. 12-BREAKDOWN VOLTAGE TEMPERATURE COEFFICIENT CURVE

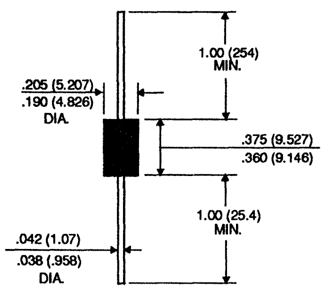


ICTE5.0 THRU ICTE15C SERIES

TRANSIENT VOLTAGE SUPPRESSOR

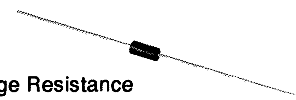
***Voltage-** 5.0 to 15 Volts   1500 Watt Peak Pulse Power*

FEATURES



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated chip junction
- Repitition Rate (duty cycle): 0.05%
- 1500W Peak Pulse Power Surge capability on 10/1000μs waveform
- Excellent clamping capability
- Low Incremental Surge Resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV for unidirectional and 5.0ns for bidirectional
- Ideal for Data and Bus Line applications
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



MECHANICAL DATA

Case: Molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end except for bidirectional types
Mounting Position: Any
Weight : 0.053 ounce, 1.5 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000μs waveform (NOTE 1, FIGURE 1)	P_{PPM}	Minimum 1500	Watts
Steady State Power Dissipation, T_L= 75°C at Lead Lengths .375", (9.5mm)	$P_{M(AV)}$	5.0	Watts
Peak Pulse Current on 10/1000μs waveform (NOTE 1, FIGURE 3)	I_{PPM}	See Table 1	Amps
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on Rated Load for Unidirectional only (JEDEC Method) (NOTE 2)	I_{FSM}	200.0	Amps
Maximum Instantaneous Forward Voltage at 100 Amps for unidirectional only (NOTE 2)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-65 to +175	°C

NOTES:

1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. 8.3ms single half sine-wave, duty cycle = 4 pulses per minute maximum.

FIGURE 1 - PEAK PULSE POWER RATING CURVE

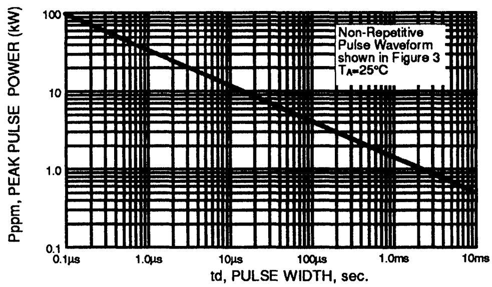


FIGURE 2 - PULSE DERATING CURVE

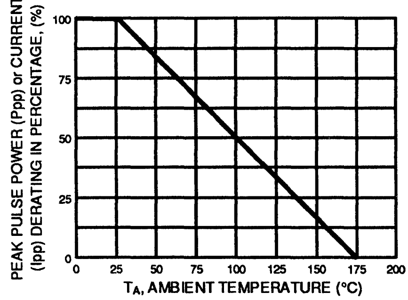


FIGURE 3 - PULSE WAVEFORM

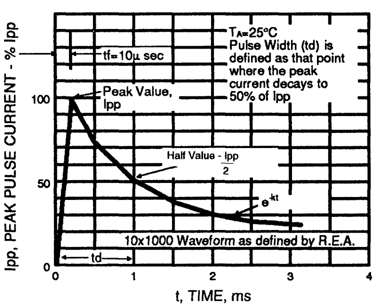


FIGURE 4 - TYPICAL JUNCTION CAPACITANCE (Uni-directional Type)

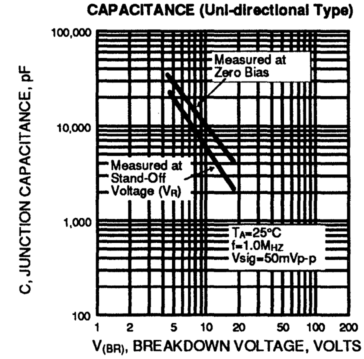


FIGURE 5 - TYPICAL JUNCTION CAPACITANCE (Bi-directional Type)

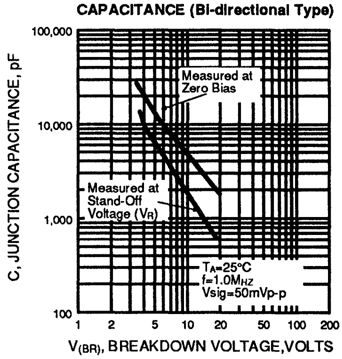


FIGURE 6 - MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

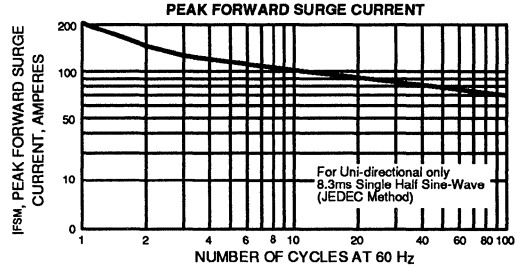
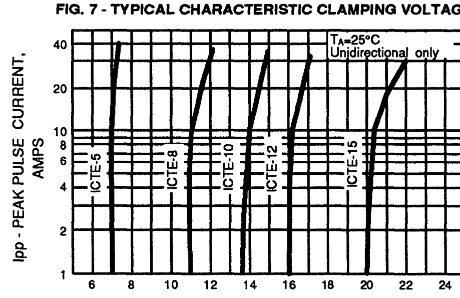


FIG. 7 - TYPICAL CHARACTERISTIC CLAMPING VOLTAGE



ELECTRICAL CHARACTERISTICS AT 25°C (JEDEC REGISTERED DATA)

JEDEC TYPE NUMBER	GENERAL INSTRUMENT PART NUMBER	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM** BREAKDOWN VOLTAGE at 1mA. $V_{(BR)}$ VOLTS	MAXIMUM REVERSE LEAKAGE at V_{WM} I_D uA	MAXIMUM CLAMPING VOLTAGE at I_{PP}=1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE at I_{PP}=10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT I_{PP} Amps
1N6373	ICTE-5*	5.0	6.0	300	7.1	7.5	160
1N6374	ICTE-8	8.0	9.4	25	11.3	11.5	100
1N6375	ICTE-10	10.0	11.7	2	13.7	14.1	90
1N6376	ICTE-12	12.0	14.1	2	16.1	16.5	70
1N6377	ICTE-15	15.0	17.6	2	20.1	20.6	60

ELECTRICAL CHARACTERISTICS AT 25°C (TEST BOTH POLARITIES)

JEDEC TYPE NUMBER	GENERAL INSTRUMENT PART NUMBER (Note 1,2)	REVERSE STAND-OFF VOLTAGE V_{WM} VOLTS	MINIMUM** BREAKDOWN VOLTAGE at 1mA. $V_{(BR)}$ VOLTS	MAXIMUM REVERSE LEAKAGE at V_{WM} I_D uA	MAXIMUM CLAMPING VOLTAGE at I_{PP}=1A V_C VOLTS	MAXIMUM CLAMPING VOLTAGE at I_{PP}=10A V_C VOLTS	MAXIMUM PEAK PULSE CURRENT I_{PP} Amps
1N6382	ICTE-8C*	8.0	9.4	50	11.4	11.6	100
1N6383	ICTE-10C	10.0	11.7	2	14.1	14.5	90
1N6384	ICTE-12C	12.0	14.1	2	16.7	17.1	70
1N6385	ICTE-15C	15.0	17.6	2	20.8	21.4	60

NOTES:
1. C Suffix indicates bidirectional
2. ICTE-5 not available as bidirectional.
3. The minimum breakdown voltage as shown takes into consideration the =1 volt tolerance normally specifie for power supply regulation on most intergrated circuit manufacturers data sheets. Similar TransZorb devices are available with reduced clamping voltages where tighter regulated power supply voltages are employed.
4. Clamping Factor: 1.33 at fullo rated power; 1.20 at 50% rated power; Clamping Factor: the ratio of the actual Vc(Clamping Voltage) to the $V_{(BR)}$ (Breakdown Voltage) as measured on a specific device.

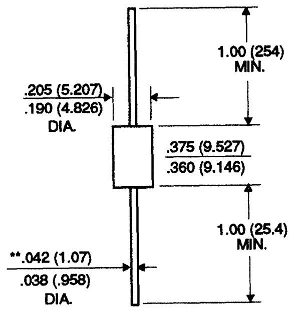
LCE6.5 THRU LCE90A SERIES

LOW CAPACITANCE TRANSIENT VOLTAGE SUPPRESSOR

***Voltage-** 6.5 to 90 Volts   1500 Watt Peak Pulse Power*

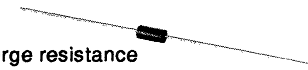
FEATURES

1.5KE

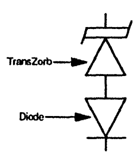


Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junction
- Repetition Rate (duty cycle): 0.05%
- 1500W Peak Pulse Power Surge reverse capability on 10/1000μs waveform
- Excellent clamping capability
- Low incremental surge resistance
- Fast response time: typically less than 5.0ns from 0 volts to BV
- Ideal for Data Line applications
- High temperature soldering guaranteed: 265°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



SCHEMATIC



MECHANICAL DATA

Case: Molded plastic over a passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end on the Transorb (cathode)
Mounting Position: Any
Weight : 0.053 ounce, 1.5 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 μs waveform (NOTE 1, FIGURE 1)	P_{PPM}	Minimum 1500	Watts
Steady State Power Dissipation, T_L= 75°C with at Lead Lengths .375", (9.5mm)	$P_{M(AV)}$	5.0	Watts
Peak Power Pulse Surge Current on 10/1000 μs waveform (FIG.3 ,NOTE 1)	I_{PPM}	SEE TABLE 1	Amps
Operating Junction and Storage Temperature Range	$T_J T_{STG}$	-65 to +175	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A= 25°C per Fig. 2.
2. 8.3ms single half sine-wave, duty cycle=4 pulses per minute maximum.

FIGURE 1 - PEAK PULSE POWER RATING CURVE

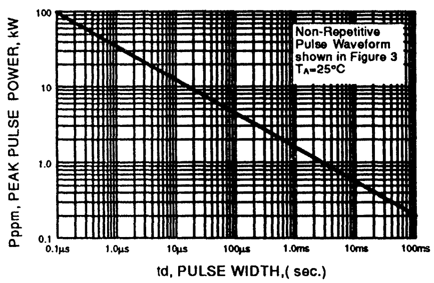


FIGURE 2 - POWER DERATING CURVE

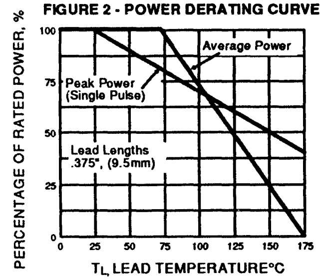


FIGURE 3 - PULSE WAVEFORM

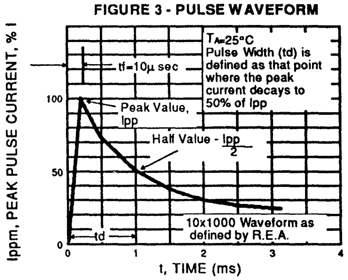
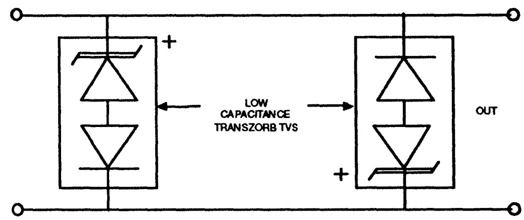


FIGURE 4 - AC LINE PROTECTION APPLICATION



APPLICATION NOTE: Devices must be used with two units in parallel, opposite in polarity, as shown in circuit for AC Signal Line protection

ELECTRICAL CHARACTERISTICS at T_A=25°C(UNLESS OTHERWISE NOTED)

PART NUMBER	RVERSE STAND-OFF VOLAGE Vmv (VOLTS)	BREAKDOWN VOLTAGE V(BR) (VOLTS) MIN./MAX	I_T mA	MAXIMUM REVERSE LEAKAGE AT VMW ID (µA)	MAXIMUM CLAMPING VOLTAGE AT IPP VC (VOLTS)	MAXIMUM PEAK PULSE CURRENT (FIG.2) IPPM (AMPS)	MAXIMUM JUNCTION CAPACITANCE AT 0 VOLTS (pF)	WORKING INVERSE BLOCKING VOLTAGE VWIB VOLTS	MAXIMUM INVERSE BLOCKING LEAKAGE CURRENT AT VWIB I_B(mA)	PEAK INVERSE BLOCKING VOLTAGE VPIB VOLTS
*LCE6.5	6.5	7.22-8.82	10.0	1000	12.3	100	100	75	1.0	100
*LCE6.5A	6.5	7.22-7.98	10.0	1000	11.2	100	100	75	1.0	100
*LCE7.0	7.0	7.78-9.51	10.0	500	13.3	100	100	75	1.0	100
*LCE7.0A	7.0	7.78-8.60	10.0	500	12.0	100	100	75	1.0	100
*LCE7.5	7.5	8.33-10.2	10.0	250	14.3	100	100	75	1.0	100
*LCE7.5A	7.5	8.33-9.21	10.0	100	12.9	100	100	75	1.0	100
*LCE8.0	8.0	8.89-10.9	1.0	100	15.0	100	100	75	1.0	100
*LCE8.0A	8.0	8.89-9.83	1.0	100	13.6	100	100	75	1.0	100
*LCE8.5	8.5	9.44-11.5	1.0	50.0	15.9	94	100	75	1.0	100
*LCE8.5A	8.5	9.44-10.4	1.0	50.0	14.4	100	100	75	1.0	100
*LCE9.0	9.0	10.0-12.2	1.0	10.0	16.9	89	100	75	1.0	100
*LCE9.0A	9.0	10.0-11.1	1.0	10.0	15.4	97	100	75	1.0	100
*LCE10	10	11.1-13.6	1.0	5.0	18.8	80	100	75	1.0	100
*LCE10A	10	11.1-12.3	1.0	5.0	17.0	88	100	75	1.0	100
*LCE11	11	12.2-14.9	1.0	5.0	20.1	74	100	75	1.0	100
*LCE11A	11	12.2-13.5	1.0	5.0	18.2	82	100	75	1.0	100
*LCE12	12	13.3-16.3	1.0	5.0	22.0	68	100	75	1.0	100
*LCE12A	12	13.3-14.7	1.0	5.0	19.9	75	100	75	1.0	100
*LCE13	13	14.4-17.6	1.0	5.0	23.8	63	100	75	1.0	100
*LCE13A	13	14.4-15.9	1.0	5.0	21.5	70	100	75	1.0	100
*LCE14	14	15.6-19.1	1.0	5.0	25.8	58	100	75	1.0	100
*LCE14A	14	15.6-17.2	1.0	5.0	23.2	65	100	75	1.0	100
*LCE15	15	16.7-20.4	1.0	5.0	26.9	56	100	75	1.0	100
*LCE15A	15	16.7-18.5	1.0	5.0	24.4	61	100	75	1.0	100
*LCE16	16	17.8-21.8	1.0	5.0	28.8	52	100	75	1.0	100
*LCE16A	16	17.8-19.7	1.0	5.0	26.0	57	100	75	1.0	100
*LCE17	17	18.9-23.1	1.0	5.0	30.5	49	100	75	1.0	100
*LCE17A	17	18.9-20.9	1.0	5.0	27.6	54	100	75	1.0	100

ELECTRICAL CHARACTERISTICS at T_A=25°C UNLESS OTHERWISE NOTED

PART NUMBER	REVERSE STAND-OFF VOLAGE Vmv (VOLTS)	BREAKDOWN VOLTAGE V(BR) (VOLTS) MIN./MAX	at I_T mA	MAXIMUM REVERSE LEAKAGE AT VMW ID (µA)	MAXIMUM CLAMPING VOLTAGE AT IPP VC (VOLTS)	MAXIMUM PEAK PULSE CURRENT (FIG.2) IPPM (AMPS)	MAXIMUM JUNCTION CAPACITANCE AT 0 VOLTS (pF)	WORKING INVERSE BLOCKING VOLTAGE VWIB (VOLTS)	MAXIMUM INVERSE BLOCKING LEAKAGE CURRENT AT VWIB I_{IB} (mA)	PEAK INVERSE BLOCKING VOLTAGE VPIB (VOLTS)
+LCE18	18	20.0-24.4	1.0	5.0	32.2	46.0	100	75	1.0	100
+LCE18A	18	20.0-22.1	1.0	5.0	29.2	51.0	100	75	1.0	100
+LCE20	20	22.2-27.1	1.0	5.0	35.8	42.0	100	75	1.0	100
+LCE20A	20	22.2-24.5	1.0	5.0	32.4	46.0	100	75	1.0	100
+LCE22	22	24.4-29.8	1.0	5.0	39.4	38.0	100	75	1.0	100
+LCE22A	22	24.4-26.9	1.0	5.0	35.5	42.0	100	75	1.0	100
+LCE24	24	26.7-32.6	1.0	5.0	43.0	35.0	100	75	1.0	100
+LCE24A	24	26.7-29.5	1.0	5.0	38.9	39.0	100	75	1.0	100
+LCE26	26	28.9-35.3	1.0	5.0	46.6	32.0	100	75	1.0	100
+LCE26A	26	28.9-31.9	1.0	5.0	42.1	36.0	100	75	1.0	100
+LCE28	28	31.1-38.0	1.0	5.0	50.1	30.0	100	75	1.0	100
+LCE28A	28	31.1-34.4	1.0	5.0	45.5	33.0	100	75	1.0	100
+LCE30	30	33.3-40.7	1.0	5.0	53.5	28.0	100	75	1.0	100
+LCE30A	30	33.3-36.8	1.0	5.0	48.4	31.0	100	75	1.0	100
+LCE33	33	36.7-44.9	1.0	5.0	59.0	25.4	100	75	1.0	100
+LCE33A	33	36.7-40.6	1.0	5.0	53.3	28.1	100	75	1.0	100
+LCE36	36	40.0-48.9	1.0	5.0	64.3	23.3	100	75	1.0	100
+LCE36A	36	40.0-44.2	1.0	5.0	58.1	25.8	100	75	1.0	100
+LCE40	40	44.4-54.3	1.0	5.0	71.4	21.0	100	75	1.0	100
+LCE40A	40	44.4-49.1	1.0	5.0	64.5	23.3	100	75	1.0	100
LCE43	43	47.8-58.4	1.0	5.0	76.7	19.5	100	150	1.0	200
LCE43A	43	47.8-52.8	1.0	5.0	69.4	21.6	100	150	1.0	200
LCE45	45	50.0-61.1	1.0	5.0	80.3	18.7	100	150	1.0	200
LCE45A	45	50.0-55.3	1.0	5.0	72.7	20.6	100	150	1.0	200
LCE48	48	53.3-65.1	1.0	5.0	85.5	17.5	100	150	1.0	200
LCE48A	48	53.3-58.9	1.0	5.0	77.4	19.4	100	150	1.0	200
LCE51	51	56.7-69.3	1.0	5.0	91.1	16.5	100	150	1.0	200
LCE51A	51	56.7-62.7	1.0	5.0	82.4	18.2	100	150	1.0	200
LCE54	54	60.0-73.3	1.0	5.0	96.3	15.6	100	150	1.0	200
LCE54A	54	60.0-66.3	1.0	5.0	87.1	17.2	100	150	1.0	200
LCE58	58	64.4-78.7	1.0	5.0	103.0	14.6	100	150	1.0	200
LCE58A	58	64.4-71.2	1.0	5.0	93.6	16.0	100	150	1.0	200
LCE60	60	66.7-81.5	1.0	5.0	107.0	14.0	90	150	1.0	200
LCE60A	60	66.7-73.7	1.0	5.0	96.8	15.5	90	150	1.0	200
LCE64	64	71.1-86.9	1.0	5.0	114.0	13.2	90	150	1.0	200
LCE64A	64	71.1-78.6	1.0	5.0	103.0	14.6	90	150	1.0	200
LCE70	70	77.8-95.1	1.0	5.0	125	12.0	90	150	1.0	200
LCE70A	70	77.8-86.0	1.0	5.0	113	13.3	90	150	1.0	200
LCE75	75	83.3-102.0	1.0	5.0	134	11.2	90	150	1.0	200
LCE75A	75	83.3-92.1	1.0	5.0	121	12.4	90	150	1.0	200
LCE80	80	88.7-108	1.0	5.0	142	10.6	90	150	1.0	200
LCE80A	80	88.7-98.0	1.0	5.0	129	11.6	90	150	1.0	200
LCE90	90	100-122	1.0	5.0	160	9.4	90	300	1.0	200
LCE90A	90	100-111	1.0	5.0	146	10.3	90	300	1.0	200

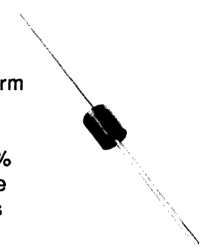
+UL listed for Telecom application protection 497B, file number E136766

5KP5.0 THRU 5KP110A

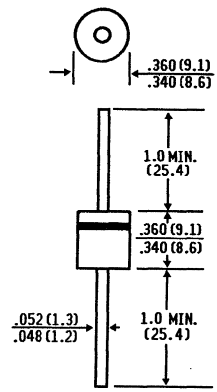
GLASS PASSIVATED JUNCTION TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE-** 5.0 to 110 Volts 5000 Watt Peak Pulse Power*

FEATURES



- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junction
- 5000W Peak Pulse Power capability on 10/1000 μs waveform
- Excellent clamping capability
- Repetition rate (Duty Cycle): .05%
- Low incremental surge resistance
- Fast response time: typically less than 1.0 ps from 0 volts to BV
- Typical I_D less than 1 μ A above 10V
- High temperature soldering guaranteed: 300°C/10 seconds/.375", (9.5mm) lead length/5lbs., (2.3 kg) tension



Dimensions in inches and (millimeters)

MECHANICAL DATA

Case: Molded plastic over glass passivated junction
Terminals: Plated Axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes positive end (cathode)
Mounting Position: Any
Weight : 0.007 ounce, 2.1 gram

MAXIMUM RATINGS AND CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING	*SYMBOL*	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 10/1000 μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 5000	Watts
Peak Pulse Current on 10/1000μs waveform (NOTE 1, FIG. 3)	I_{PPM}	SEE TABLE 1	Amps
Steady State Power Dissipation at T_L=75°C Lead Lengths .375", (9.5mm) (NOTE 2)	P_M(AV)	8.0	Watts
Peak Forward Surge Current, 8.3ms Single Half Sine-Wave Superimposed on rated load (JEDEC Method) (NOTE 3)	I_{FSM}	400	Amps
Instantaneous Forward Voltage at 100A, (NOTE 3)	V_F	3.5	Volts
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 to +175	°C

NOTES:
1. Non-repetitive current pulse, per Fig. 3 and derated above T_A=25°C per Fig. 2.
2. Mounted on Copper Leaf area of 0.79 in^2 (20mm^2).
3. Measured on 8.3ms single half sine-wave or equivalent square wave, duty cycle= 4 pulses per minutes maximum.

ELECTRICAL CHARACTERISTICS at T_A = 25°C unless otherwise noted

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1)		at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D(μA)	Maximm Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperatuure Coefficient of $V_{(BR)}$ (%/°C)
	MIN	MAX						
5KP5.0	6.40	7.30	50	5.0	2000	520	9.6	0.057
5KP5.0A	6.40	7.00	50	5.0	2000	543	9.2	0.057
5KP6.0	6.67	8.15	50	6.0	5000	439	11.4	0.061
5KP6.0A	6.67	7.37	50	6.0	5000	485	10.3	0.061
5KP6.5	7.22	8.82	50	6.5	2000	407	12.3	0.065
5KP6.5A	7.22	7.98	50	6.5	2000	447	11.2	0.065
5KP7.0	7.78	9.51	50	7.0	1000	378	13.3	0.068
5KP7.0A	7.78	8.60	50	7.0	1000	417	12.0	0.068
5KP7.5	8.33	10.2	5.0	7.5	250	350	14.3	0.073
5KP7.5A	8.33	9.21	5.0	7.5	250	388	12.9	0.073
5KP8.0	8.89	10.9	5.0	8.0	150	333	15.0	0.075
5KP8.0A	8.89	9.83	5.0	8.0	150	367	13.6	0.075
5KP8.5	9.44	11.5	5.0	8.5	50.0	314	15.9	0.078
5KP8.5A	9.44	10.4	5.0	8.5	50.0	347	14.4	0.078
5KP9.0	10.0	12.2	5.0	9.0	20.0	295	16.9	0.081
5KP9.0A	10.0	11.1	5.0	9.0	20.0	325	15.4	0.081
5KP10	11.1	13.6	5.0	10.0	15.0	266	18.8	0.084
5KP10A	11.1	12.3	5.0	10.0	15.0	294	17.0	0.084
5KP11	12.2	14.9	5.0	11.0	10.0	249	20.1	0.086
5KP11A	12.2	13.5	5.0	11.0	10.0	274	18.2	0.086
5KP12	13.3	16.3	5.0	12.0	10.0	227	22.0	0.088
5KP12A	13.3	14.7	5.0	12.0	10.0	251	19.9	0.088
5KP13	14.4	17.6	5.0	13.0	10.0	210	23.8	0.090
5KP13A	14.4	15.9	5.0	13.0	10.0	232	21.5	0.090
5KP14	15.6	19.1	5.0	14.0	10.0	194	25.8	0.092
5KP14A	15.6	17.2	5.0	14.0	10.0	215	23.2	0.092
5KP15	16.7	20.4	5.0	15.0	10.0	188	26.9	0.094
5KP15A	16.7	18.5	5.0	15.0	10.0	206	24.4	0.094
5KP16	17.8	21.8	5.0	16.0	10.0	176	28.8	0.096
5KP16A	17.8	19.7	5.0	16.0	10.0	176	28.8	0.096
5KP17	18.9	23.1	5.0	17.0	10.0	164	30.5	0.097
5KP17A	18.9	20.9	5.0	17.0	10.0	161	27.6	0.097
5KP18	20.0	24.4	5.0	18.0	10.0	155	32.2	0.098
5KP18A	20.0	22.1	5.0	18.0	10.0	172	29.2	0.098
5KP20	22.2	27.1	5.0	20.0	10.0	139	35.8	0.099
5KP20A	22.2	24.5	5.0	20.0	10.0	154	32.4	0.099
5KP22	24.4	29.8	5.0	22.0	10.0	127	39.4	0.100
5KP22A	24.4	26.9	5.0	22.0	10.0	141	35.5	0.100
5KP24	26.7	32.6	5.0	24.0	10.0	116	43.0	0.101
5KP24A	26.7	29.5	5.0	24.0	10.0	128	38.9	0.101
5KP26	28.9	35.3	5.0	26.0	10.0	107	46.6	0.101
5KP26A	28.9	31.9	5.0	26.0	10.0	119	42.1	0.101
5KP28	31.1	38.0	5.0	28.0	10.0	99	50.1	0.102
5KP28A	31.1	34.4	5.0	28.0	10.0	110	45.4	0.102
5KP30	33.3	40.7	5.0	30.0	10.0	93	53.5	0.103
5KP30A	33.3	36.8	5.0	30.0	10.0	103	48.4	0.103
5KP33	36.7	44.9	5.0	33.0	10.0	85	59.0	0.104
5KP33A	36.7	40.6	5.0	33.0	10.0	94	53.3	0.104
5KP36	40.0	48.9	5.0	36.0	10.0	78	64.3	0.104
5KP36A	40.0	44.2	5.0	36.0	10.0	85	58.1	0.104
5KP40	44.4	54.3	5.0	40.0	10.0	70	71.4	0.105
5KP40A	44.4	49.1	5.0	40.0	10.0	78	64.5	0.105
5KP43	47.8	58.4	5.0	43.0	10.0	65	76.7	0.105

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Device Type	Breakdown Voltage $V_{(BR)}$ (Volts) (NOTE 1) MIN	MAX	at IT (mA)	Reverse Stand off Voltage V_{WM} (Volts)	Maximum Reverse Leakage at V_{WM} I_D (µA)	Maximum Peak Pulse Current I_{PPM} (NOTE 2) (Amps)	Maximum Clamping Voltage at I_{PPM} V_C (Volts)	Maximum Temperature Coefficient of $V_{(BR)}$ (%/°C)
5KP43A	47.8	52.8	5.0	43.0	10.0	72	69.4	0.105
5KP45	50.0	61.1	5.0	45.0	10.0	62	80.3	0.106
5KP45A	50.0	55.3	5.0	45.0	10.0	69	72.7	0.106
5KP48	53.3	65.2	5.0	48.0	10.0	58	85.5	0.106
5KP48A	53.3	58.9	5.0	48.0	10.0	65	77.4	0.106
5KP51	56.1	69.3	5.0	51.0	10.0	55	91.1	0.107
5KP51A	56.7	62.7	5.0	51.0	10.0	61	82.4	0.107
5KP54	60.0	73.3	5.0	54.0	10.0	52	96.3	0.107
5KP54A	60.0	66.3	5.0	54.0	10.0	57	87.1	0.107
5KP58	64.4	78.7	5.0	58.0	10.0	49	103	0.107
5KP58A	64.4	71.2	5.0	58.0	10.0	53	94	0.107
5KP60	66.7	81.5	5.0	60.0	10.0	47	107	0.108
5KP60A	66.7	73.7	5.0	60.0	10.0	52	97	0.108
5KP64	71.1	96.9	5.0	64.0	10.0	44	114	0.108
5KP64A	71.1	78.6	5.0	64.0	10.0	49	103	0.108
5KP70	77.6	95.1	5.0	70.0	10.0	40	125	0.108
5KP70A	77.8	86.0	5.0	70.0	10.0	44	113	0.108
5KP75	83.3	102	5.0	75.0	10.0	37	134	0.108
5KP75A	83.3	92.1	5.0	75.0	10.0	41	121	0.108
5KP78	86.7	106.0	5.0	78.0	10.0	36	126	0.108
5KP78A	86.7	95.8	5.0	78.0	10.0	40	126	0.108
5KP85	94.9	115	5.0	85.0	10.0	33	151	0.108
5KP85A	94.4	104	5.0	85.0	10.0	36	137	0.110
5KP90	100	122	5.0	90.0	10.0	31	160.	0.110
5KP90A	100	111	5.0	90.0	10.0	34	146	0.110
5KP100	111	136	5.0	100	10.0	28	179	0.110
5KP100A	111	123	5.0	100	10.0	31	162	0.110
5KP110	122	149	5.0	110	10.0	26	196	0.112
5KP110A	122	135	5.0	110	10.0	28	177	0.112

NOTES:
1. V_{BR} measured after I_T applied for 300 ms. I_T = Square Wave Pulse or equivalent.
2. Surge Current waveform per Figure 3 and Derate per Figure 2.
3. All items and symbols are consistant with ANSI / IEEE C62.35

APPLICATION

The 5KP series of high power transient voltage suppressors were designed to be used on the output of switching power supplies. These devices may be used to replace crowbar circuits. Both the 5 and 10 percent voltage tolerances are referenced to the power supply output voltage level.

They are able to withstand high levels of peak current while allowing a circuit breaker to trip or a fuse blow before shorting. This will enable the user to reset the breaker or replace the fuse and continue operation. For this type operation, it is recommended that a sufficient mounting surface be used for dissipating the heat generated by the TransZorb during the transient or over-voltage condition.

TransZorbs are Silicon PN Junction devices designed for absorbtion of high voltage transients associated with power disturbances, switching and induced lighting effects. This series is available from 5.0 volts thru 110 volts.

FIG.1-PEAK PULSE POWER RATING CURVE

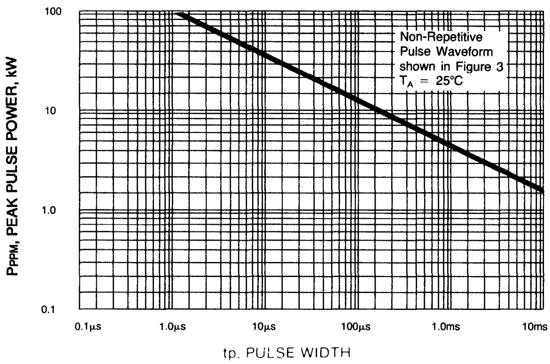


FIGURE 2 — PULSE DERATING CURVE

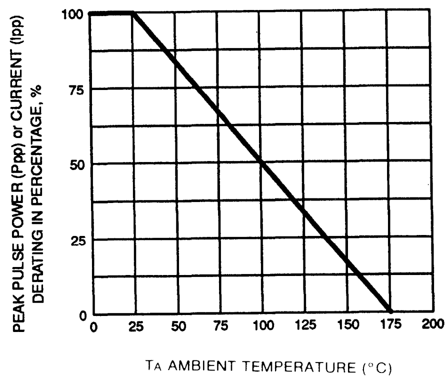


FIGURE 3 — PULSE WAVEFORM

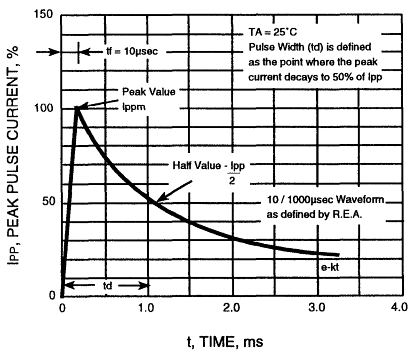


FIGURE 4 — TYPICAL JUNCTION CAPACITANCE

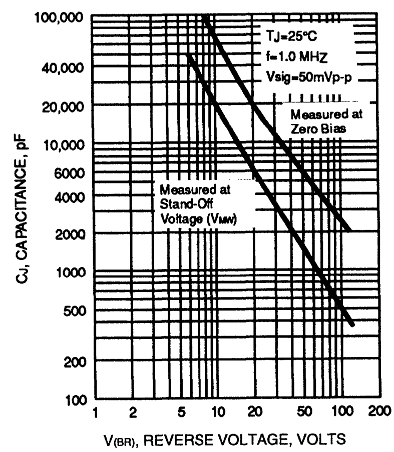


FIGURE 5 — STEADY STATE POWER DERATING

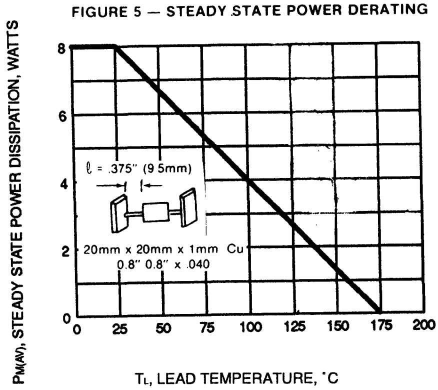
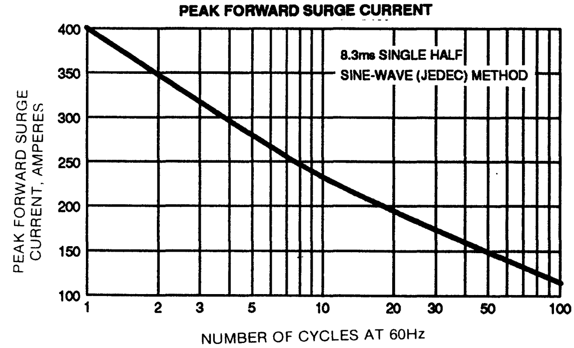


FIG.6-MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT



Transient Voltage Suppressors may be used at various points in a circuit to provide various degrees of protection. The following is a typical linear power supply with transient voltage suppressor units placed at different points. All provide protection of the load.

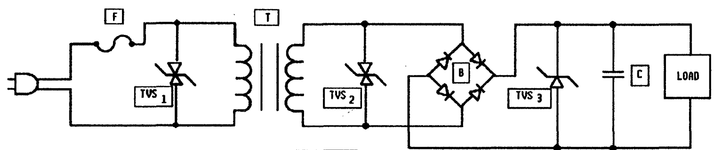


FIGURE 1

Transient Voltage Suppressor 1 provides maximum protection. However, the system will probably require replacement of the line fuse (F) since it provides a dominant portion of the series impedance when a surge is encountered.

Transient Voltage Suppressor 2 provides excellent protection of circuitry excluding the transformer (T). However, since the transformer is a large part of the series impedance, the chance of the line fuse opening during the surge condition is reduced.

Transient Voltage Suppressor 3 provides the load with complete protection. It uses a unidirectional Transient Voltage Suppressor, which is a cost advantage. The series impedance now includes the line fuse, transformer, and bridge rectifier (B) so failure of the line fuse is further reduced. If only Transient Voltage Suppressor 3 is in use, then the bridge rectifier is unprotected and would require a higher voltage and current rating to prevent failure by transients.

Any combination of these three, or any one of these applications, will prevent damage to the load. This would require varying trade-offs in power supply protection versus maintenance (time changing the fuse).

An additional method is to utilize the Transient Voltage Suppressor units as a controlled avalanche bridge. This reduces the parts count and incorporates the protection within the bridge rectifier.

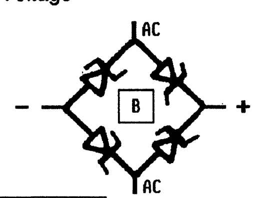


FIGURE 2

The wattage ratings are available in
400 watts (P4KE, BZW04)
500 watts (SA series),
600 watts (P6KE),
1500 watts (1.5KE Series) and
5000 watts (5KP Series).

For voltage ranges not seen on specification sheet, please consult factory or the nearest sales office.

TRANSIENT VOLTAGE SUPPRESSOR ARRAYS

300 WATTS TO 500 WATTS
5.0 VOLTS TO 24.0 VOLTS

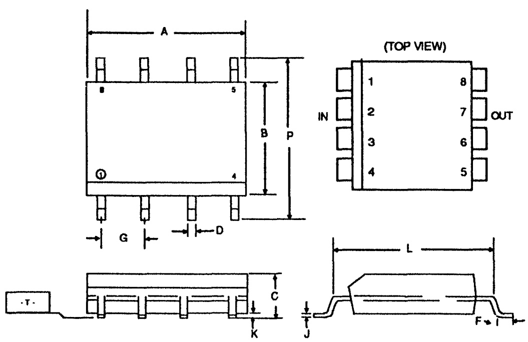
SMDA05 THRU SMDA24 SERIES

SURFACE MOUNT DIODE ARRAY
TRANSIENT VOLTAGE SUPPRESSOR

***VOLTAGE** - 5.0 to 24.0 Volts   300 Watt Peak Pulse Power*

FEATURES

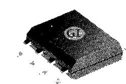
MS-012AA



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX	DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.78	5.00	0.188	0.197	G	1.27 BSC		0.050 BSC	
B	3.81	4.01	0.150	0.158	J	0.19	0.22	0.007	0.009
C	1.35	1.75	0.053	0.069	K	0.10	0.20	0.004	0.008
D	0.35	0.46	0.014	0.018	L	4.82	5.21	0.189	0.206
F	0.67	0.77	0.026	0.030	P	5.79	6.20	0.228	0.244

NOTES:
1. -T- is seating plane.
2. Dimension "A" is datum.
3. Positional tolerance for leads: 0.25 (0.010) M A S
4. Controlling dimensions is in inches but shown in millimeters.

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junctions in a surface mount array package



- Repetition Rate (duty cycle): .01%
- 300W Peak Pulse Power surge capability on 8.0/20μs waveform
- Excellent clamping capability
- Low incremental surge resistance
- Ideal for Data and Bus Line Applications
- Fast response time: typically less than 1.0ps from 0 volts to BV for unidirectional and 5.0ns for bidirectional
- High temperature soldering guaranteed: 265°C for 5 seconds

MECHANICAL DATA

Case: JEDEC MS-012AA molded plastic surface mount
Terminal: Solderable per MIL-STD-750, Method 2026
Polarity: Beveled side denotes cathode side for unidirectional only, Pin number 1 marked with a colored dot on top of case
Mounting Position: Any
Weight: .04 ounces, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

Rating	*Symbol*	*Value*	*Units*
Peak Power Dissipation at T_A=25°C on 8.0/20μs waveform (NOTE 1, FIG. 1)	P_{PPM}	Minimum 300	Watts
Peak Power Pulse Current at T_A=25°C, on 8.0/20μs waveform (NOTE 1, FIG. 3)	I_{PPM}	See Table 1	Amps
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150	°C

NOTES:
1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on Copper Leaf areas of .045"x.030" (1.14x.076mm) per leg.
3. 8.3ms single half sine-wave, duty cycle = 4 pulses per minute maximum.

DEVICES FOR BIPOLAR APPLICATIONS

For Bi-directional application use devices with suffix C.
All electrical characteristics apply in both directions.

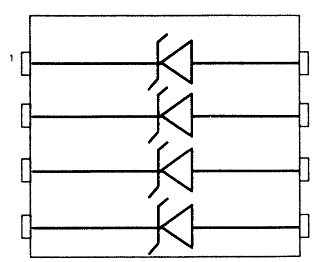
ELECTRICAL CHARACTERISTICS AT T_A=25°C

PART NUMBER	DEVICE MARKING CODE	WORKING PEAK REVERSE STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE AT I_T = 1mA (NOTE 1)	MAXIMUM CLAMPING VOLTAGE AT I_{PP}=1A	MAXIMUM CLAMPING VOLTAGE AT I_{PP}=5A	MAXIMUM REVERSE LEAKAGE CURRENT AT V_{RWM}	MAXIMUM JUNCTION CAPACITANCE (NOTE 3)
UNIDIRECTIONAL **BI-DIRECTIONAL**		V_{RWM} Volts	B_{VR} Volts	V_C (NOTE 2) Volts	V_C (NOTE 2) Volts	ID µA	CJ pF
SMDA05	SDA	5.0	6.0	9.8	11.0	100	550
SMD05C	**SDB**	5.0	6.0	9.8	11.0	100	400
SMDA12	SDC	12.0	13.3	19.0	24.0	1.0	185
SMDA12C	**SDD**	12.0	13.3	19.0	24.0	1.0	150
SMDA15	SDE	15.0	16.7	24.0	30.0	1.0	140
SMDA15C	**SDF**	15.0	16.7	24.0	30.0	1.0	100
SMDA24	SDG	24.0	26.7	43.0	55.0	1.0	88
SMDA242C	**SDH**	24.0	26.7	43.0	55.0	1.0	63

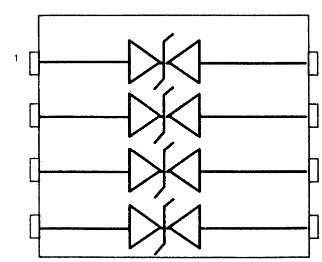
NOTES: 1. V_{BR} measured at pulse width of 300µs. sq. wave or equivalent.
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. Junction capacitance measured at 1.0 MHz and applied V_R=0 volts.

CIRCUIT DIAGRAM

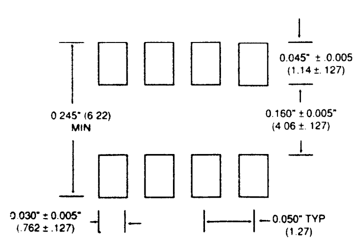
UNIDIRECTIONAL
SMDA05 SMDA12
SMDA15 SMDA24



BI-DIRECTIONAL
SMDA05C SMDA12C
SMDA15C SMDA24C



SOLDER PAD GEOMETRY



NOTES:
1. Controlling dimension is in inches, but shown in (millimeters).

FIGURE 1 - PEAK PULSE POWER RATING CURVE

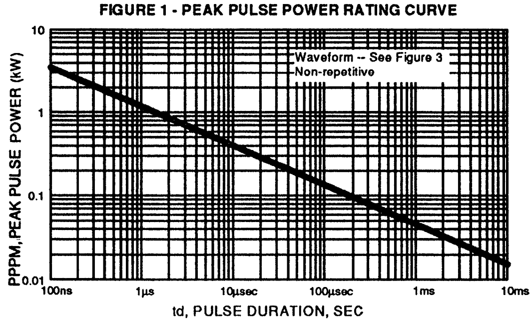


FIGURE 2 - PULSE DERATING CURVE

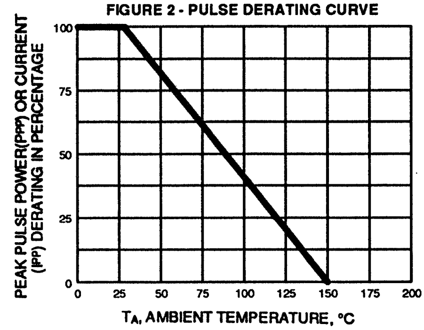


FIGURE 3 - PULSE WAVEFORM

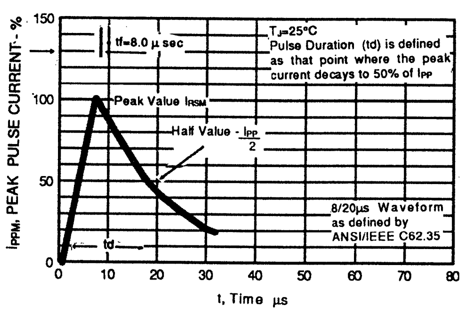
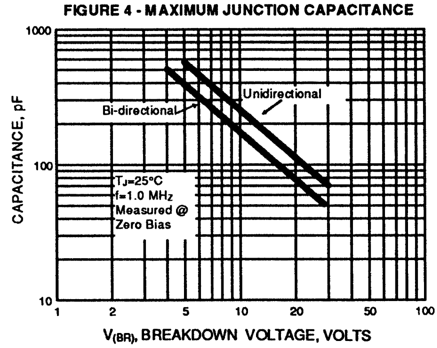


FIGURE 4 - MAXIMUM JUNCTION CAPACITANCE



APPLICATION NOTES (CONT.)

Typical applications for SMDA series include protecting signal lines from electrostatic discharge and similar transient voltage threats. The SMDA suppressor can be used for both common mode and differential mode protection as illustrated below. Its compact size makes it ideal for high density circuits, such as laptop computers and hand held terminals.

Fig. 1 - Common Mode Protection - Protects Line to Ground

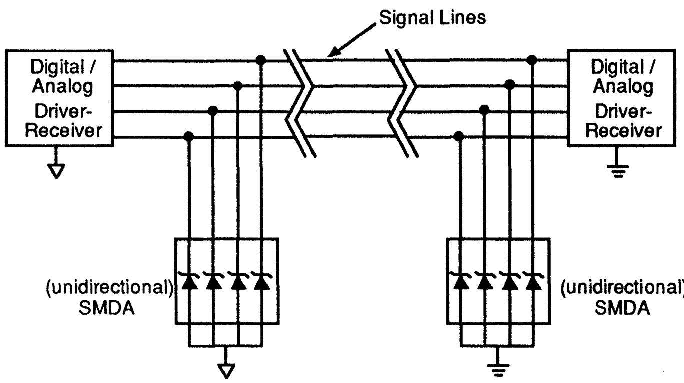
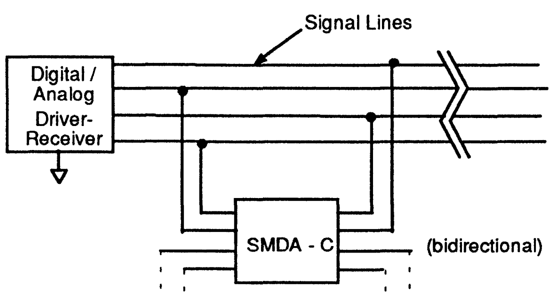


Fig. 2 - Differential Mode Protection - Protects Line-to-Line



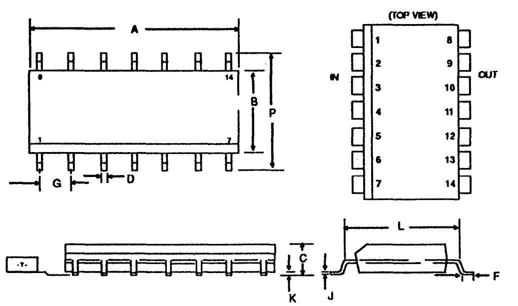
• • • • • • • P • R • E • L • I • M • I • N • A • R • Y • • • • • •

SMDA05C-8 THRU SMDA24C-8

SURFACE MOUNT DIODE ARRAY
TRANSIENT VOLTAGE SUPPRESSOR

VOLTAGE - 5.0 - 24 Volts   300 Watt Peak Power

MS-012BA

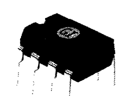


	MILLIMETERS		INCHES				MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX		DIM	MIN	MAX	MIN	MAX
A	8.56	8.74	0.337	0.344		G	1.27 BSC		0.050 BSC	
B	3.81	4.01	0.150	0.158		J	0.19	0.22	0.007	0.009
C	1.35	1.75	0.053	0.069		K	0.10	0.20	0.004	0.008
D	0.35	0.46	0.014	0.018		L	4.82	5.21	0.189	0.206
F	0.67	0.77	0.026	0.030		P	5.79	6.20	0.228	0.244

NOTES:
1. -T- is seating plane.
2. Dimension "A" is datum.
3. Positional tolerance for leads: ⊕ 0.25 (0.010) Ⓜ A Ⓢ
4. Controlling dimensions are in inches but shown in millimeters.

FEATURES

- ◆ Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- ◆ Monolithic TVS junctions in a SO-14 package (JEDEC MS-012-AB)
- ◆ Repetition Rate (duty cycle): .01%
- ◆ 300W Peak Power reverse surge capability
- ◆ Excellent clamping capability



- ◆ Protection for eight data lines
- ◆ Fast response time: typically less than 5.0ns from 0 volts to BV.
- ◆ High temperature soldering guaranteed: 265°C for 5 seconds

MECHANICAL DATA

Case: JEDEC MS-012-AB molded plastic surface mount array
Terminal: Solderable per MIL-STD-750, Method 2026
Polarity: Bidirectional
Mounting Position: Any
Weight: .07 ounces, 1.75 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

RATING		*SYMBOL*	*VALUE*	*UNITS*
Peak Power Dissipation at T_A=25°C 8.0/20µs wave form		P_{PPM}	Minimum 300	Watts
Peak Power Pulse Current at T_A=25°C, 8.0/20µs waveform	SMDA05C - 8	I_{PPM}	20.0	Amps
	SMDA12C - 8		15.0	
	SMDA15C - 8		12.0	
	SMDA24C - 8		7.5	
Operating Junction and Storage Temperature Range		T_J,T_{STG}	-50 to +125	°C

NOTES:
1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. Mounted on Copper Leaf areas of .045"x.030" (1.14x.076mm) per leg.

BIPOLAR APPLICATIONS

All electrical characteristics apply in both directions.

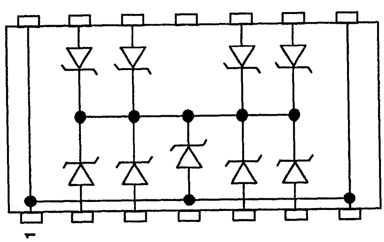
TABLE 1 — ELECTRICAL CHARACTERISTICS @ 25°C

PART NUMBER	DEVICE MARKING CODE	REVERSE STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE @ 1.0mA (NOTE 1)	MAXIMUM CLAMPING VOLTAGE at I_{PP}=1A	MAXIMUM CLAMPING VOLTAGE at I_{PP}=5A	MAXIMUM REVERSE LEAKAGE CURRENT at V_{WM}	MAXIMUM JUNCTION CAPACITANCE (NOTE 3)
BI-DIRECTIONAL		*V_{WM} Volts	*$V_{(BR)}$ Volts	V_C (NOTE 2) Volts	V_C (NOTE 2) Volts	ID µA	CJ pF
SMDA05C - 8	SEB	5.0	6.0	9.8	11.0	100.0	350
SMDA12C - 8	SED	12.0	13.4	19.0	24.0	1.0	150
SMDA15C - 8	SEF	15.0	16.7	24.0	30.0	1.0	120
SMDA24C - 8	SEH	24.0	26.7	43.0	55.0	1.0	100

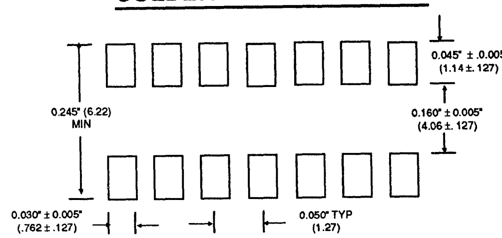
NOTES: 1. $V_{(BR)}$ measured at pulse width of 300µs. sq. wave or equivalent.
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. Junction capacitance measured at 1.0 MHZ and applied VR=0 volts.

*Application note: Due to the topology of the SMDA array the Vrwm and V(br) specifications also apply to the **differential voltage between any two data line pins**. Hence, the SMDA12C-8 is designed to "see" a maximum voltage excursion of +/- 6 volts between any two data lines.

CIRCUIT DIAGRAM



SOLDER PAD GEOMETRY



NOTES:
1. Controlling dimension are in inches, but shown in (millimeters).

RATING AND CHARACTERISTIC CURVES FOR SMDA05C-8 THRU SMDA24C-8

FIGURE 1 - PEAK PULSE POWER RATING CURVE

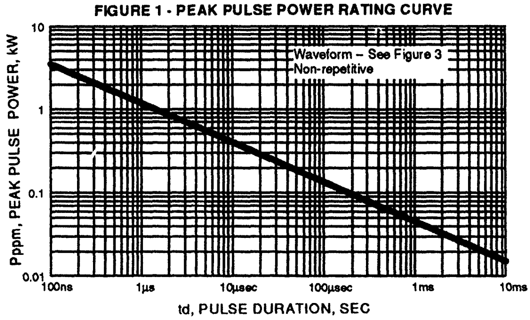


FIGURE 2 - PULSE DERATING CURVE

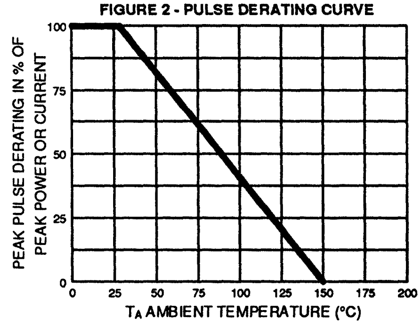
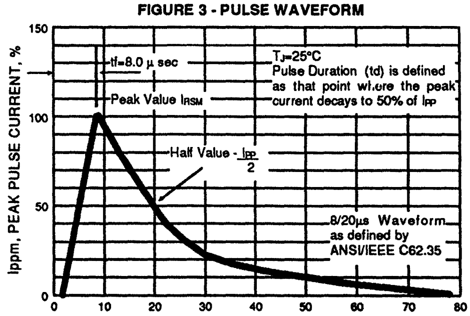


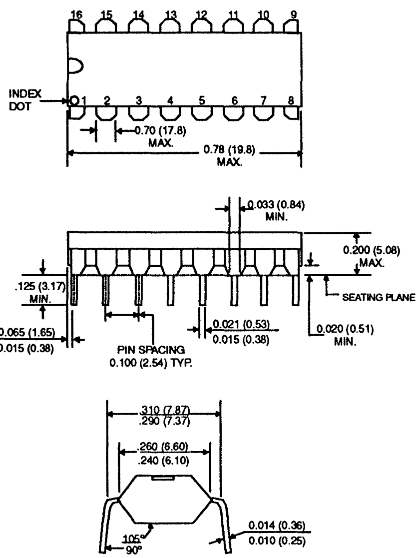
FIGURE 3 - PULSE WAVEFORM



DA05P THRU DA24P

UNIDIRECTIONAL 16-PIN DIP
TRANSIENT VOLTAGE SUPPRESSOR ARRAY
VOLTAGE - 5.0 - 24.0 Volts 500 Watt Peak Pulse Power

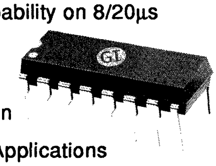
MS-001BB



Dimensions in inches and (millimeters)

FEATURES

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junctions in 16-pin DIP
- Repetition Rate (duty cycle): 0.01%
- 500W Peak Pulse Power capability on 8/20μs waveform
- Excellent clamping capability
- Common ground configuration
- Ideal for Data and Bus Line Applications
- Fast response time: typically less than 1.0ps from 0 volts to BV min.
- High temperature soldering guaranteed; 250°Cfor 5 seconds



MECHANICAL DATA

Case: JEDEC MS-001-BB Molded plastic 16-pin DIP

Terminals: Solder plated solderable per MIL-STD-750 Method 2026

Polarity: Unidirectional only. Pin number 1 marked with a colored dot on top of case. Pins #'s 1,8,9, and 16 are common ground.

Mounting Position: *Any*

Weight: 0.04 ounces, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak Pulse Power Dissipation at T_A=25°C, 8.0/20μs waveform, (NOTE 1, FIG. 1)	P_{PPM}	Minimum 500	Watts
Peak Power Pulse Current at T_A=25°C, on 8.0/20μs waveform (FIGURE 3, NOTE 1)	I_{PPM}	See Table	Amps
Peak Forward Surge Current , 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) (NOTE 2)	I_{FSM}	10.0	Amps
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.
2. 8.3ms single half sine-wave, duty cycle = 4 pulses per minute maximum.

FIG. 1 - PEAK PULSE POWER RATING CURVE

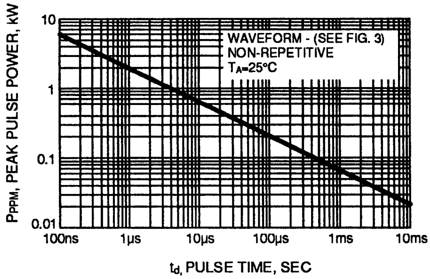


FIG. 2 - PULSE DERATING CURVE

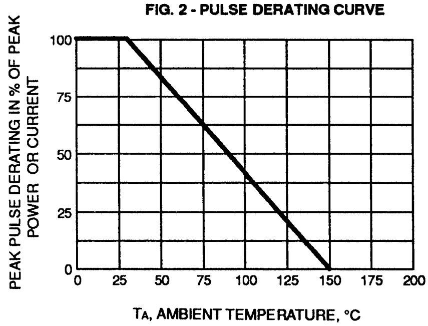


FIG. 3 - PULSE WAVEFORM

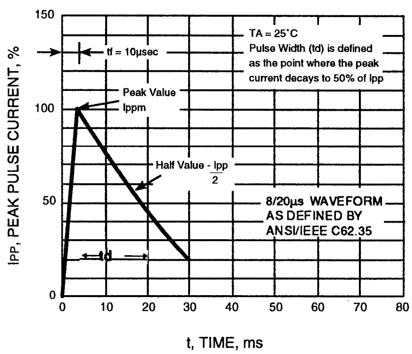
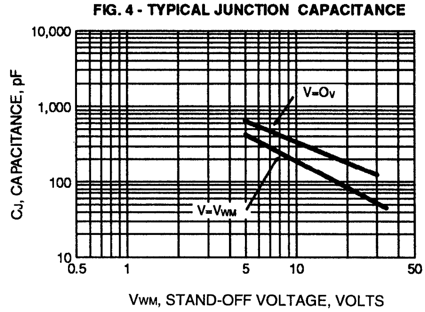


FIG. 4 - TYPICAL JUNCTION CAPACITANCE

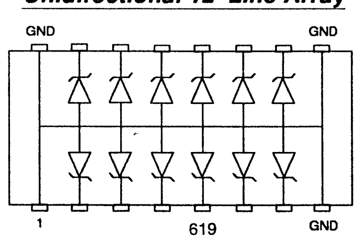


ELECTRICAL CHARACTERISTICS AT $T_A=25°C$

PART NUMBER	STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE AT 1mA	MAXIMUM REVERSE LEAKAGE CURRENT AT V_{WM}	MAXIMUM CLAMPING VOLTAGE AT I_{PP}=10A NOTE 2	MAXIMUM JUNCTION CAPACITANCE NOTE 3
	V_{WM} VOLTS	$V_{(BR)}$ VOLTS	I_D μA	V_C VOLTS	C pF
DA05P	5.0	6.0	200	12.5	880
DA12P	12.0	13.3	2	25.0	440
DA15P	15.0	16.7	2	33.0	400
DA24	24.0	26.7	2	52.1	275

NOTES
1. $V_{(BR)}$ measured at pulse width of 300μs. sq. wave or equivalent
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. Junction capacitance measured at 1.0 MHz and applied V_R=0 volts.

Unidirectional 12 Line Array — CIRCUIT DIAGRAM

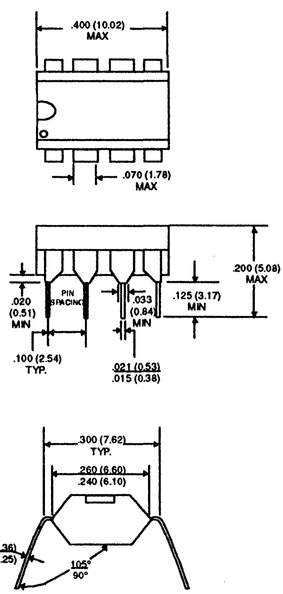


DA05CM THRU DA24CM

BIDIRECTIONAL 8-PIN DIP
TRANSIENT VOLTAGE SUPPRESSOR ARRAY
VOLTAGE - 5.0 - 24.0 Volts 500 Watt Peak Pulse Power

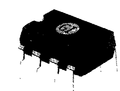
FEATURES

MS-001BA



Dimensions in inches and (millimeters)

- Plastic package has Underwriters Laboratory Flammability Classification 94V-O
- Glass passivated junctions in 8-pin DIP
- Repetition Rate (duty cycle): 0.01%
- 500W Peak Pulse Power capability on 8/20μs waveform
- Excellent clamping capability
- Common ground configuration
- Ideal for Data and Bus Line Applications
- Fast response time: typically less than 5.0ns from 0 volts to BV min. for unidirectional
- High temperature soldering guaranteed; 250°C for 5 seconds



MECHANICAL DATA

Case: JEDEC MS-001AB molded plastic 8-pin DIP

Terminals: Solder plated solderable per MIL-STD-750 Method 2026

Polarity: Bidirectional only. Pin number 1 marked with a colored dot on top of case. Pins 1 and 8 are common ground (Notched end)

Mounting Position: *Any*

Weight: 0.04 ounces, 1.0 gram

MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25°C ambient temperature unless otherwise specified.

	SYMBOLS	*VALUE*	*UNITS*
Peak Pulse Power Dissipation on 8.0/20μs waveform, (FIGURE 1, NOTE 1)	P_{PPM}	Minimum 500	Watts
Peak Power Pulse Current on 8.0/20μs waveform (FIGURE 3, NOTE 1)	I_{PPM}	See Table	Amps
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-50 to +150	°C

NOTES:

1. Non-repetitive current pulse, per Fig.3 and derated above T_A=25°C per Fig. 2.

FIG. 1 - PEAK PULSE POWER RATING CURVE

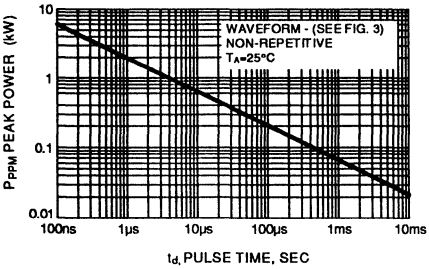


FIG. 2 - PULSE DERATING CURVE

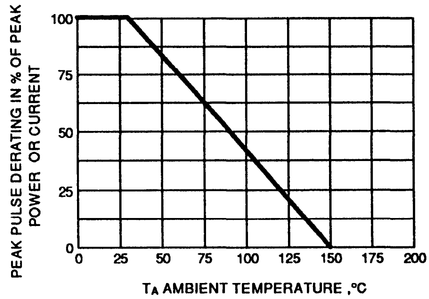


FIG. 3 - PULSE WAVEFORM

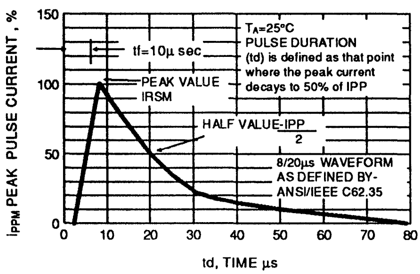
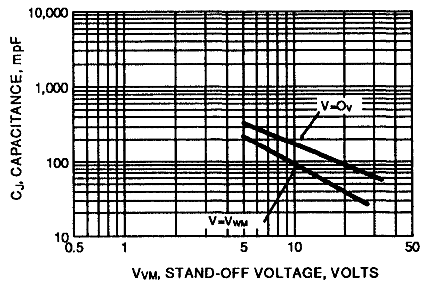


FIG. 4 - TYPICAL CAPACITANCE
DA05CM - BIDIRECTIONAL



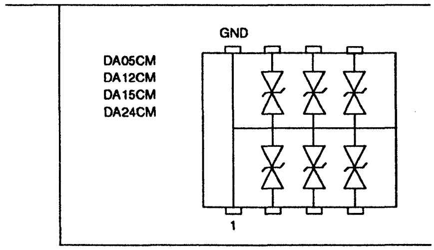
ELECTRICAL CHARACTERISTICS @ 25°C

PART NUMBER	REVERSE STAND-OFF VOLTAGE	MINIMUM BREAKDOWN VOLTAGE AT 1.0mA NOTE 1	MAXIMUM REVERSE LEAKAGE CURRENT AT V_{MW}	MAXIMUM CLAMPING VOLTAGE AT Ipp=10A NOTE 2	MAXIMUM JUNCTION CAPACITANCE NOTE 3
	V_{MW} VOLTS	$V_{(BR)}$ VOLTS	I_D μA	V_C VOLTS	C_J pF
DA05CM	5.0	6.0	400.0	12.5	500
DA12CM	12.0	13.3	4.0	25.0	385
DA15CM	15.0	16.7	4.0	33.0	300
DA24CM	24.0	26.7	4.0	52.1	200

NOTES
1. $V_{(BR)}$ measured at pulse width of 300μs. sq. wave or equivalent.
2. Surge current waveform per Figure 3 and derate per Figure 2.
3. Junction capacitance measured at 1.0 MHZ and applied VR=0 volts.

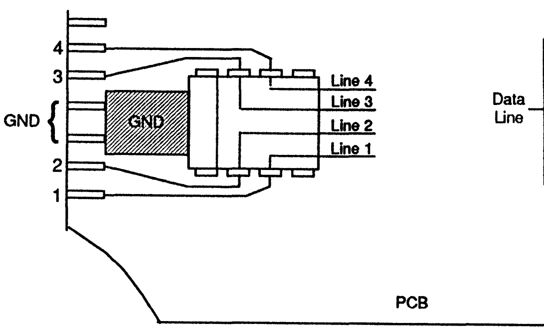
CIRCUIT DIAGRAM

Bidirectional 6 Line Array

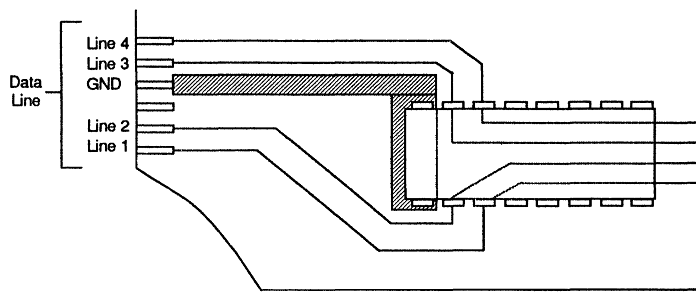


APPLICATION NOTES

Figure 1 - Data Line - Bidirectional Protection/Unidirectional Line Protection

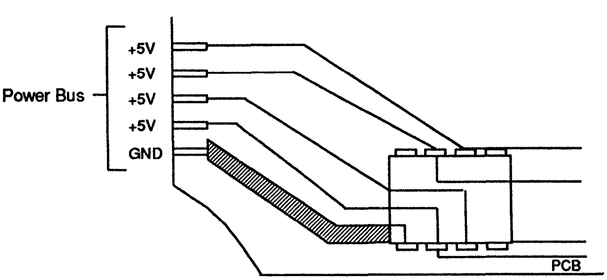


Data Line Protection
Suggested Trace Layout for a Single-Layer Board

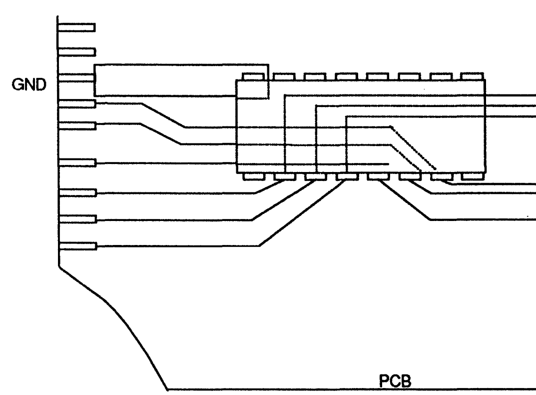


Suggested Trace Layout for a Single-Layer Board

Figure 2 - Power Bus - Bidirectional Protection/Unidirectional Line Protection



Power Bus Protection
Suggested Trace Layout for a Double-Sided Board



Suggested Trace Layout for a Single-Layer Board

APPLICATION NOTES

GENERAL INSTRUMENT

DESIGN GUIDELINES FOR SCHOTTKY RECTIFIERS

Known limitations of Schottky rectifiers -- including limited high temperature operation, high leakage and limited voltage range -- can be measured and controlled, allowing wide application on switch mode power supplies.

Jon R. Schleisner
Senior Marketing Engineer

Schottky rectifiers have been used in the power supply industry for approximately 15 years. During this time, significant fiction as well as fact has been associated with this type of rectifier. The primary assets of Schottky devices are switching speeds approaching zero-time and very low forward voltage drop (Vf). This combination makes Schottky barrier rectifiers ideal for the output stages of switching power supplies. On the negative side, Schottky devices are also known for limited high-temperature operation, high leakage and limited voltage range (BVR). Though these limitations exist, they are quantifiable and controllable, allowing wide application of these devices in switch mode power supplies.

High leakage, when associated with standard P-N junction rectifiers, usually indicates "badness," implying poor reliability. In a Schottky device, leakage at high temperature (75 °C and greater) is often on the order to several milliamps, depending on chip size. In the case of Schottky barrier rectifiers, high-temperature leakage and forward voltage drop are controlled by two primary factors: the size of the chip's active area and the barrier height (ϕ B).

Design of a Schottky rectifier can be viewed as a tradeoff. A high barrier height device exhibits low leakage at high temperature, however, the forward voltage drop increases. These parameters are also controlled by the die size and resistivity of the starting material. A larger die will lower the Vf but raise the leakage if all other parameters are held constant. The resistivity of the starting material must be chosen in a range where the breakdown voltage (BVR) is not degraded at the low end and the forward end of the resistivity range. Since a larger chip size is obviously more expensive, this is not the primary method for controlling these parameters. Chip size is usually set to a dimension where the current density through the die is kept at a safe level.

Barrier Height (ϕ B), A Factor

General Instrument produces two product lines of Schottky barrier rectifiers. One line is referred to as the "MBR" series, a high-temperature, low-leakage, relatively high V_f type of Schottky device with a high barrier height (ϕ B). The second line is the "SBL" series, designed to operate at lower temperature (125°C or less); however, while leakage current is higher, forward voltage drop (V_f) is significantly lower and they are designed with

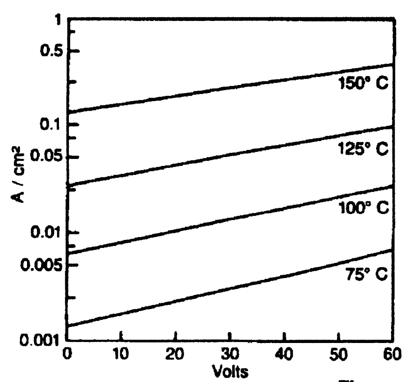


Figure 1

Voltage versus die area leakage barrier height = 0.71 volts

a low- ϕB barrier height.The low- ϕB- line SBL series uses a nichrome battier metal with a barrier height of ϕ B = 0.64 eV. The high- ϕ B MBR series uses a nichrome-platinum barrier metal to achieve barrier height (ϕ B = 0.71 eV). Both series are guard-ring protected against excessive transient voltages.

Both the low- and high-barrier-height Schottky devices are valuable in a variety of applications. When the true operating temperature of the Schottky rectifier exceeds 125°C, the high-barrier-height series must be used to avoid thermal runaway. This occurs when excessive self-heating of the rectifier causes large leakage currents, resulting in additional self-heating. The process becomes a form of positive thermal feedback and may lead to damage in the rectifier or inappropriate functioning of the circuit utilizing the device.

Using a high-barrier-height (MBR) component prevents this anomaly, but sacrifices higher forward voltage. Operating the low barrier height (SBL) series at a junction temperature of 125° C or less prevents thermal runaway from occurring. If the junction temperature (Tj) in the application can be kept below 125° C, a decision on the use of a low- or high-barrier-height Schottky device must be made.

The following procedure has been developed to provide an analytical method of selecting the most efficient Schottky barrier device for a given application.

Calculating The Barrier Height (ϕB) of Schottky Rectifiers

Calculating the barrier height of a Schottky rectifier where ϕ B is not given is a straightforward process. The following two equations will yield an excellent engineering approximation of the barrier height, ϕ B:

$$\phi B = (-KT/q)\, LN\, (J\, /\, R^*T) \qquad (1)$$

$$J_o = I_o\, / ACTIVE\ AREA\ (cm^2)$$

ϕ *B = barrier height (eV)* (2)

K = Boltsman's constant = 8.62 x 105 eV/°K

T = ambient temperature in degrees Kelvin

J_o = current density at zero volts

R = Richardon's constant = 112 /cm^2 k^2*

I_o = forward current at zero volts

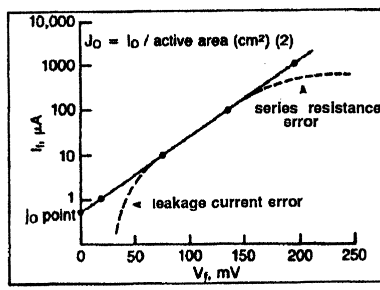
To solve Equation One, the current density J_o (Equation Two) must be found first:

$$J_o = I_o\, / ACTIVE\ AREA\ (cm^2) \qquad (2)$$

General Instrument provides the active area of its Schottky die in its product literature. If a manufacturer does not supply this information, decapsulating the device under question and measuring it with a precision caliper can provide an approximation of the active Schottky area, assuming 90% of the total chip area is active.

Total die area x 0.9 = active area (3_)

The calculation of I_o is done graphically (Graph 1). A minimum of three low-current room-temperature forward voltage drop Vf measurements are needed. This data is graphed on semi-log paper (Graph 1) where the vertical axis (log scales) is the current and the horizontal axis (linear scale) is the measured V_f. When these points are graphed, the result should be a true straight line. If the graph curves downward (see the dotted line on the left side of Graph 1), it indicates that the lowest measurement current is being affected by the rectifier's room temperature leakage. In this case, the current level at which the Vf measurements are taken should be increased to "swamp" out the contribution of low level leakage on the measurement. If the current levels are raised excessively, the series resistance of the device in question will influence the measurements. This causes a downward curve as represented by the dotted line on the right side of ***Graph 1.*** Again, the results should yield a true straight line.



Graph 1

Calculation of J_o (current density at zero volts)

The point where the line intercepts the vertical axis is the current at zero volts (I_o). J_o is then calculated:

$$J_o = I_o\, / ACTIVE\ AREA\ (cm^2) \qquad (2)$$

This result is then placed into the first equation:

$$\phi B = (-KT/q) LN\, (J_o\, / R^*T^2) \qquad (1)$$

The results of the calculation are usually in the range of 0.6 eV to 0.8 eV. Results well outside this range indicate either a defective rectifier, measurement, or calculation error.

Selecting Efficient Schottky Devices

Normalized graphs of the low (SBL) and high (MBR) barrier height processes are provided. The vertical axis on all graphs is in amperes per square centimeter (A/cm^2). The horizontal axis provides forward voltage drop for the low and high barrier parts. Two additional graphs have the horizontal axis labeled for reverse voltage (Vr) for both the low and high barrier series. The graphs for the low barrier (SBL) series parts have curves for operation at 75 °C, 100 °C and 125 °C.

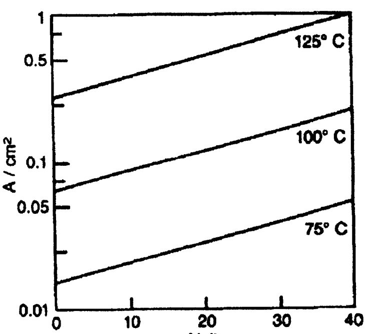


Figure 2

Voltage versus die area leakage barrier height = 0.64 volts

These curves may be used in two ways. If the die size, barrier height, temperature and forward current (I_f) are known, V_f can be graphically calculated. Using the leakage curves, and knowing the reverse voltage (V_r) to which the device will be subjected, it is possible to find the leakage current. Conversely, if the circuit parameters are set, the curves will provide the die size in A/cm^2 equations, making it possible to analytically select either a low- or high-barrier-height rectifier for maximum circuit efficiency. Most Schottky rectifiers are used in switch mode power supplies.

To select a Schottky rectifier that yields maximum efficiency, it is necessary to determine the "duty cycle equilibrium point," or the duty cycle point at which both a low- and high-barrier-height part will dissipate precisely the same amount of power:

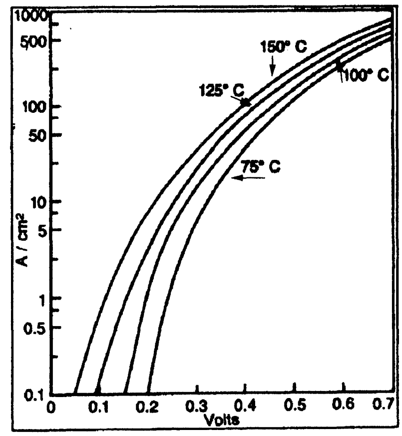


Figure 3

Die area current versus forward voltage drop barrier height = 0.71

$$D\,(P_{df}\phi BL) + (1-D)(P_{dr}\phi BL\,) + =$$

$$D\,(P_{dr}\phi BH + \;(1-D)\,(D_{dr}\phi BH) \qquad (1)$$

$$P_{dt} = P_{df} + P_{dr} \qquad (2)$$

$$P_{df} \;= I_f \times V_f \qquad (3)$$

$$P_{dr} = I_r \times V_r \qquad (4)$$

D = duty cycle forward conduction

1-D = duty cycle reverse blocking

I_f = forward current

I_r = reverse current

P_{df} = power dissipation in forward

P_{dr} = power dissipation in reverse

P_{dt} = total power dissipation

V_f = forward voltage drop

V_r = reverse voltage

ϕ BL = low barrier height

ϕ BH = high barrier height

The following is an example of the use of this equation :

Given the need for a 30-volt Schottky capable of operating at 10 amperes, the choice is between a SBL1040 ($\phi BL = 0.64$) or a MBR1045 ($\phi BH = 0.71$). These two devices were chosen for convenience in this example because of their equal die size ($0.0477 cm^2$ active area).

The equilibrium point must be calculated for 75°C, 100°C and 125° C. For demonstration purposes, only the 75°C equilibrium point will be calculated in detail; the other two points are calculated in the same manner. The reverse leakage (I_r) and forward voltage drop (V_f) are derived from **Graphs 1** through **4** using the temperature, die size and ϕ B given above.

For the low-barrier-height SBL1040:

$P_{dr} = V_r \times I_r = watts$ (4)

$30\ V \times (1.9 \times 10^{-3}\ A) = 0.057\ W$

$P_{dr} = I_f \times V_f = watts$ (3) (3)

$10\ A \times 0.46\ V = 4.6\ W$

For the high-barrier-height MBR1045:

$P_{dr} = V_r \times I_r = watts$ (4)--30

$V \times (1.43 \times 10^{-4}\ A) = 4.29 \times 10^{-3}\ W$

$P_{df} = I_f \times V_f = watts$ (3)

$10\ A \times 0.565\ V = 5.65\ W$

Solving for the equilibrium point at 75° C:

LOW BARRIER ***HIGH BARRIER***

$(D \times P_{df\phi BL}) + [(1-D) \times P_{dr\phi BL}] =$

$(D \times P_{df\phi BH}) + [(1-D) x_{dr\phi BH}]$

$(D \times 4.6\ W) + [(1-D)\ 0.057 W] =$

$(D \times 5.65 W) + [(1-D) 0.00429 W]$

$0.05271 = 1.1027\ D$

$D = 0.0478$

$D\% = 0.0478 \times 100$

duty cycle equilibrium point, D = 4.78%

Switching loss is assumed to be equal on both sides of the equation and thus is ignored. This procedure is then repeated for 100°C and 125 °C. After calculating the equilibrium point for 100 °C and 125° C, the results are:

TEMP	*DUTY CYCLE EQUIBRIUM POINT %*
75°C	*4.78%*
100°C	*15.93%*
125°C	*52.42%*

The results of these calculations are graphed in Figure 5.To the left of the equilibrium curve, the high-barrier-height

MBR1045 is most efficient; to the right of the equilibrium curve, the low-barrier-height SBL1040 is more efficient. This is easy to understand because the high-barrier-height part exhibits lower reverse power loss and at a low duty cycle more time is spent in the reverse mode.

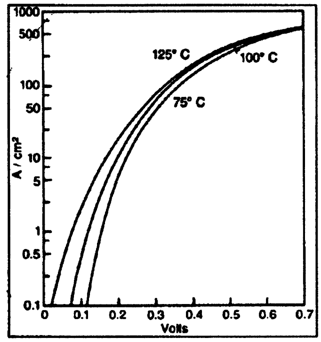


Figure 4

Die area current versus forward voltage drop barrier height = 0.64

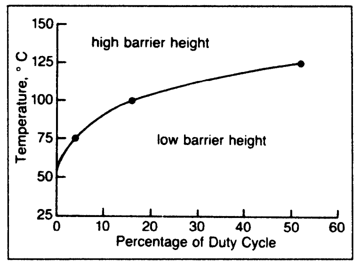


Figure 5

Duty cycle equilibrium point MBR1045 versus SBL1040

With the duty cycle higher than the equilibrium point, the part spends a larger percentage of time in the forward mode, and the low-barrier-height type part has a lower Vf and the forward power losses are reduced.

With knowledge of the application, including expected duty cycle and temperature, it is possible to choose the most efficient Schottky barrier rectifier, constructing a graph similar to Figure 1.

It is thus easy to graph the duty cycle versus temperature, as in Figure 5, and by knowing the application (expected duty cycle and temperature), make the intelligent choice of the most efficient Schottky rectifier for the application in question.

This analysis technique enables the design engineer to make an efficient and cost-effective choice of Schottky rectifier in duty-cycle-based systems. In addition, light has hopefully been shed on the difference in design philosophies between the low- and high- ϕB style of Schottky rectifiers.

SELECTING THE OPTIMUM VOLTAGE TRANSIENT SUPPRESSOR

Although the published data for several transient suppressors may appear similar enough to make the devices seem interchangeable, careful analysis can rule out nearly identical parts whose use could prove disastrous.

Jon R. Schleisner, Senior Marketing Engineer

Transient voltage suppressors (TVS) are specialized zener diodes intended to clamp the voltage appearing across a line, thereby preventing transient spikes from damaging sensitive components. They accomplish this conducting when the voltage across the line exceeds the zener-avalanche rating. Because transient voltages can be quite high, suppressors must be able to handle large avalanche currents. This means that care must be taken in the construction of the package and assembly process to ensure that the suppressor can tolerate high energy levels for short periods.

Typical transient voltage suppressors carry peak ratings of 400, 600, 1500 or 5000 watts. These wattages translate to 0.55, 0.80, 2.10 or 7.00 joules of energy during a 1-millisecond period. Avalanche ratings generally range from a few volts to several hundred volts. Key operating parameters include:

◆ ***Breakdown voltage ($V_{(BR)}$),*** the voltage at which a given device breaks down in its avalanche mode. This voltage is usually characterized at a test current (I_t) of 1 milliamp and is often specified as a range with minimum ($V_{(BR)}$ min) and maximum ($V_{(BR)}$ max) voltages listed.

◆ ***Working stand off reverse voltage $V_{(BR)}$*** the voltage at which the device's leakage current is measured. This voltage is always at least 10 percent lower than the mimimum breakdown voltage. Suppressors with a breakdown-voltage rating of less than 10 volts can exhibit leakage currents as high as 1 milliamp, but suppressors with higher breakdown ratings typically exhibit leakage currents of 5 microamps or less.

◆ ***Maximum peak pulse surge current (IPPM),*** the maximum current that the suppressor is guaranteed to withstand without incurring damage. This parameter is usually characterized with a 1 millisecond exponential waveform.

Maximum clamping voltage (V_C), The maximum voltage that can appear across the suppressor when the maximum rated surge current is flowing through it.

◆ ***Maximum breakdown-voltage temperature coefficient ($\%V_{(BR)}/{}^\circ C$),*** the maximum allowable change in the breakdown voltage as a function of the temperature.

Design Criteria

The best way to demonstrate the selection process is through a hypothetical example. In this example, the device to be protected is an integrated circuit, IC_x , which is designed to operate on a nominal rail voltage of 15 volts, and which has an absolute maximum voltage rating of 22 volts. The first step in the selection process is to determine the energy (joules) or power (watts) contained in the surge against which the device is to be protected, and the duration of that surge.

Transients are by definition nonrepetitive, with energy levels that are difficult to ascertain. Moreover, they generally result from an unexpected failure elsewhere in the system or from natural phenomenon such as lightning. Because of this, determining energy content and duration of the surge is the most difficult step in the transient-suppressor selection process.

Some surges, however, are predictable. The surge produced by a solenoid driver is a good example. If the inductance of the coil is known and the load on the solenoid is defined, it is possible to calculate or measure the duration and magnitude of the surge. Whenever possible, a "hands

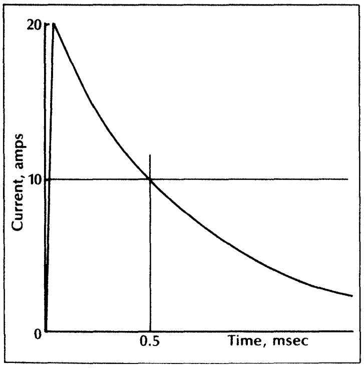


Figure 1

Waveform of an exponential -decay transient pulse with a peak current and a 0.5-millisecond pulse width at the half-peak-current point

on" measurement of the worst-case transient condition should be made. For the sake of discussion, assume that the transient being presented to IC_X has a peak current of 20 amps with a classic exponential decay, as shown in Figure 1, and a duration of 0.5 milliseconds, measured at 50 percent of the peak current.

With this data in hand, the next step is to examine manufacturer's data sheets to find a transient suppressor able to handle the anticipated surge. The breakdown voltage and maximum reverse surge current ratings published in the data sheets are key selection criteria. Since IC_X has a nominal 15-volt operating voltage, the minimum breakdown voltage must be greater than 15 volts. However, since it carries a 22-volt absolute maximum voltage rating, the suppressor's maximum breakdown voltage must be less than 22 volts. The foregoing assumes a relatively stable ambient temperature, such as that usually experienced in an office environment. If the product in which IC_X is used is expected to see wider temperature fluctuations, the minimum breakdown voltage would have to be based on the lowest expected temperature. The resulting voltage would determined by multiplying the difference between the expected temperature and room temperature by the temperature coefficient.

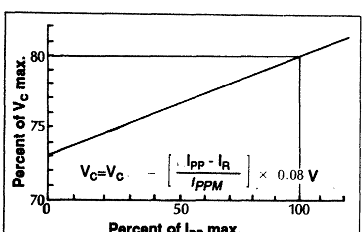
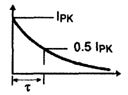
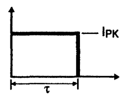
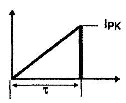
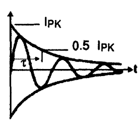
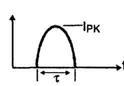


Figure 2

The clamping characateristic of a typical transient suppressor

WAVESHAPE	EQUATION	K FACTOR
	$I_{PK}\, e^{-t/1.44\tau}$	1.4
	I_{PK}	1.0
	$I_{PK}\,(t/\tau)$	0.5
	$I_{PK} \sin(\pi\ t)\, e^{-t/\tau}$	0.86
	$I_{PK} \sin([\pi/t]\ t)$	0.637

$$\text{Energy} = \int_0^{\tau} V_C(t)\, I(t)\, \Delta t = K\, V_C\, I\, \tau$$

Figure 3

The energy contained in a transient pulse depends on its wave shape

With the minumum and maximum permissible breakdown voltages in hand, examine the clamping-voltage ratings published in the manufacturer's data sheets to identify suppressors falling within the required range. It is possible that there is no device that falls well within the upper and lower limits. If the device with the closest voltage rating falls about the upper voltage limit, a very close examination of its parameters must be made. Most reputable semiconductor manufacturers apply a one-percent guardband around voltage ratings as a safety margin. In this example, the guardband raises the absolute maximum rail voltage from 22 volts to 22.22 volts.

This small increase may not seem like much, but can make the difference in selecting a transient suppressor.

Selecting the Best Transient Suppressor

Consider a situation in which the only suppressor that comes close to meeting the protection need of IC carries a maximum clamping-voltage rating of 22.5 volts. The actual voltage at which the suppressor will clamp depends on the actual current flowing through it, as shown in Figure 2, and can be predicted using the following equation:

$$V_C - [(I_{PPM} - I_R) / (I_{PPM})] \times (0.08)V = V_C$$

For the sake of discussion, consider the General Instrument type P6KE16A transient suppressor, which carries a 22.5-volt maximum clamping-voltage rating.

$$22.5 - [(27 - 20)/27] \times 0.08\ (22.5) = 22.03 \text{ volts}$$

Although the resulting clamping voltage is still greater than the 22-volt absolute maximum voltage rating carried by IC x, it is well within the 22.22-volt rating provided by the one-percent guardband. Thus, although carrying a maximum clamping-voltage rating 0.5 volt higher than the maximum voltage rating carried by IC_X, this suppressor can be safely used in this application.

The same, however, cannot be said of all 22.5-volt suppressors. Another device in the same family, the P4KE16A, has slightly different current ratings and yields considerably different results:

$$22.5 - [(19 - 20)/19] \times 0.08\ (22.5) = 22.59 \text{ volts}$$

Clearly, with a 22.59-volt clamping voltage, this device cannot be used because it exceeds the maximum clamping-voltage rating plus guardband of IC_X.

The next step in the selection process is to verify the transient suppressor's power rating. There are two approaches that can be taken:

1. Since the waveform of the transient is a classic exponential decay with a 0.5-millisecond duration at the half-peak current point, a graphic plot of peak power versus time can be used. This graph is often published in manufacturer's data sheets and if it is available for the device under consideration, one need only compare the anticipated current against the current shown in the graph. Using the peak-power versus time graph published for the P6KE series suppressors, it can be seen that with a 0.5-millisecond time-constant decay, a P6KE device can handle a peak power of 792 watts.

Using Ohm's law and a 22-volt clamping voltage, this translates to:

$$I = P/V = 792/22 = 36 \text{ amps}$$

Since the anticipated peak reverse current with a 0.5-millisecond time constant is 20 amps, it is clear that a P6KE device can easily withstand the anticipated peak power of the surge.

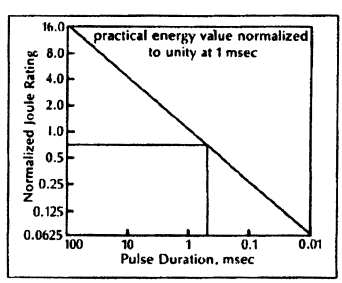
2. Calculate the energy in joules contained in the transient and compare it to the maximum energy rating of the transient suppressor. The energy in the transient, of course, depends on its wave shape, as shown in Figure 3. The amount of energy a given transient suppressor can handle, on the other hand, depends on its energy rating and the duration of the pulse, as shown in Figure 4. In this example, the waveform has an exponential shape with a 20-amp peak current and a 0.5-millisecond half-peak-power point. Using these data, the energy calculations are as follows:

$$E = V_C(t) \times I(t) \times A(t) - KV_C \times I \times \tau$$

where, in this example,

$$V_C = 2V$$
$$I = 20A$$
$$\tau = 0.5 \text{ msec}$$
$$K = 1.4 \text{ (from Figure 3)}$$
$$\text{Thus } E = 1.4 \times 22 \times 20 \times (0.5 \times 10^{-3}) = 0.308J$$

The maximum single-pulse energy rating for a P6KE series is 0.83 joules for a pulse of 1 millisecond duration. Referring to Equation 4, the energy rating for a 0.5-millisecond pulse becomes 0.7 x 0.83 J, or 0.581 joules. Clearly, then, a P6KE device can easily handle the 0.308-joule energy contained in the anticipated transient pulse.



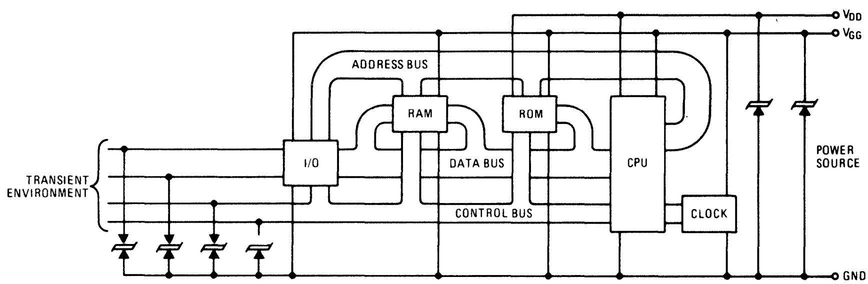
Figue 4

Enery-handling capacity of a transient volatage suppressor as a function of the transient's duration

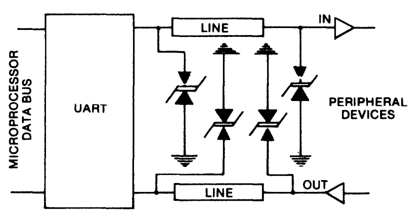
Conclusion

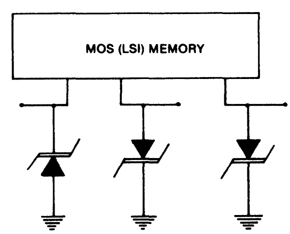
The above example assumes a non-repetitive transient, or, if repetitive, each pulse is separated from the others by an interval of least 20 seconds. Under these conditions, however, the procedures outlined provide a straightforward and reliable method of selecting the best transient voltage suppressor for a given application.

TransZorb TVs are characterized by the reverse stand-off voltage (V_{MW}). They are synonymous with the integrated or micro circuit power supply voltage. The breakdown voltage [$V_{(BR)}$] is that point at which the TransZorb TVS is in avalanche breakdown. This is temperature coellicient. Allowance has been made in establishing the minimum breakdown voltage at 25°C to provide a safe operation over the full temperature range of -65°C to +150°C.



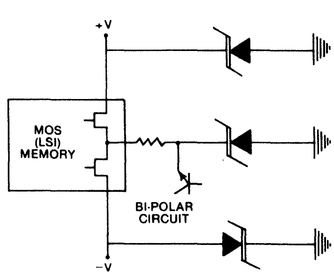
The TransZorb TVS on the signal and input power lines prevent microprocessor system failures caused by transients (electrostatic charges), AC power surges, or during switching of the power supply to ON or OFF. A static discharge can exceed 10,000V for 10 microseconds with a 60 Amp current potential. 10V applied to a typical T^2L circuit for 30 nanoseconds will cause destruction. Placing TransZorb TVSs across the signal lines to ground will keep unwanted transients out of the Data and Control Buses. TransZorb TVSs which are shunted across the power lines maintain a continuous operating voltage during AC line surges and switching transients.





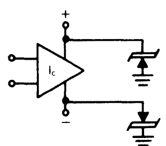
Transients generated on the line can vary from a few microseconds to several milliseconds duration and up to 10,000 volts. This threat of potential energy has given rise to high noise immunity integrated circuits. High immunity and super high immunity circuits are prone to damage by noise transients as a result of the power being dissipated by the substrate input diode. Excess current passing through the input diode can cause an open circuit condition or slow degradation of the circuit performance. TransZorb TVSs located on the signal line can absorb this excess energy. For some circuit applications a low capacitance unit may be required, which is available upon request.

The TransZorb TVSs protect the internal MOSFET from transients introduced on the power supply line. When interfaced with bipolar TTL circuits, the same power supply is often used. A common practice is to place a series protection diode from source to gate, but this does not offer protection from source to ground and is usually limited on peak power dissipation. A TransZorb TVS is required on each voltage supply line to the integrated circuit.

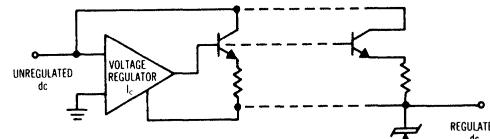


Totem pole output circuits often generate current spikes requiring decoupling capacitors. While maintaining circuit continuity, the TransZorb TVS is capable of absorbing the energy pulse as well as eliminating noise spikes due to such things as cross-talk, etc. A clamp diode in the IC substrate is limited in conduction current, <100 mA, providing a minimum protection.

DC LINE APPLICATIONS

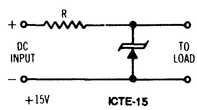


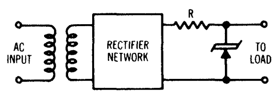
The TransZorb TVS on the power line prevents IC failures caused by transients (electrostatic discharge), power supply reversals or during switching of the power supply to on or off.



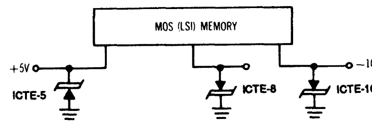
The TransZorb TVS placed in the output of a voltage regulator can often replace many components associated with a protection circuit such as a crowbar circuit. It may also be required to protect the bypass transistor from voltage spikes across the collector to emitter terminals.

Typical power sources employing the TransZorb TVS for transient protection.



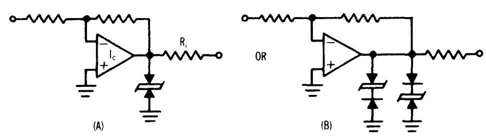


The TransZorb TVS is chosen in which the reverse stand-off voltage is equal to or greater than the DC output voltage. For certain applications it may be more desirable to replace the series resistor (R) with an inductor. In most applications, a fuse in the line is desirable. Elimination of a transformer will require an LC filter on the line for most industrial applications, when the TransZorb TVS is placed on the input to the power supply and with an input voltage greater than 40 volts.

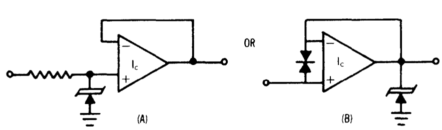


The TransZorb TVSs protect the internal MOSFET from transients introduced on the power supply line. When interfaced with bipolar TTL circuits, the same power supply is often used. A common practice is to place a series protection diode from source to gate, but this does not offer protection from source to ground and is usually limited on peak power dissipation. A TransZorb TVS is required on each voltage supply line to the integrated circuit.

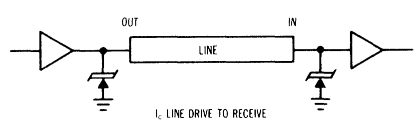
SIGNAL LINE APPLICATIONS



A TransZorb TVS on the output of an Op-amp will prevent a voltage transient, due to a short circuit or an inductive load, from being transmitted into the output stage. Fig. A is for linear circuits whereas Fig. B may be required for reducing effective capacity at the output. The TransZorb TVS and a blocking diode is available as a single unit.

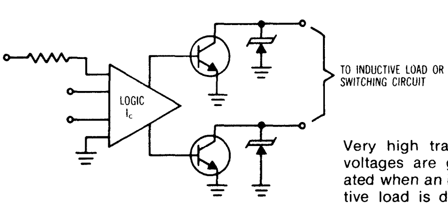


Input states are vulnerable to low energy, high voltage static discharges or crosstalk transmitted on the signal wires. Limited protection is provided by the clamp diode or an input network within the IC substrate. The diodes, however, must have a breakdown voltage greater than the supply voltage (V_{CC}) and are limited in current capacity.



Transients generated on the line can vary from a few microseconds to several milliseconds duration and up to 10,000 volts. This threat of potential energy has given rise to high noise immunity integrated circuits. An independent study* has found that high immunity and super high immunity circuits are prone to damage by noise transients as a result of the power being dissipated by the substrate input diode. Excess current passing through the input diode can cause an open circuit condition or a slow degradation of the circuit performance. TransZorb TVSs located on the signal line can absorb this excess energy.

*The Radio & Electronic Engineer, Vol. 43, No. 4, April 1973.



Very high transient voltages are generated when an inductive load is disconnected, such as motors, relay coils and solenoids. The TransZorb TVS provides protection for the output transistor as well as the IC, eliminating a resistor/capacitor network. The ICTE series TransZorb TVS is capable of dissipating the full load current for short duration pulses (<8.3 msec). For longer pulses, the TransZorb TVS is available in stud or press fit package.

TransZorb TVSs can be used in series or parallel to increase their power handling capability. No precautions are required when using TransZorb TVSs in a series string since power dissipation for two or more devices of the same type is equally shared. When using TransZorb TVSs in parallel it is necessary for the units to be closely matched (approx. 0.1 volt of each other) in order for equal sharing to take place. Matched sets can be ordered from the factory for an additional charge.

TYPICAL TRANSZORB TVS APPLICATIONS

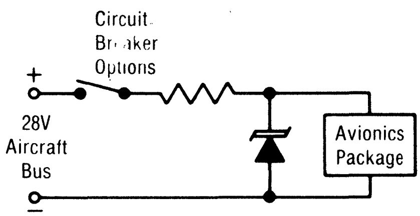


Figure 1—28V D.C. Supply Protection

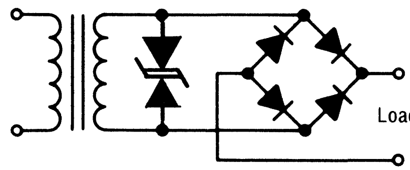


Figure 2— A.C. Supply Protection

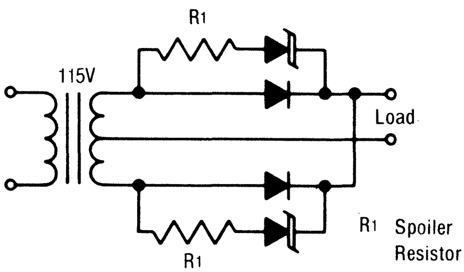


Figure 3—Breakdown Voltage Rectifier Protection

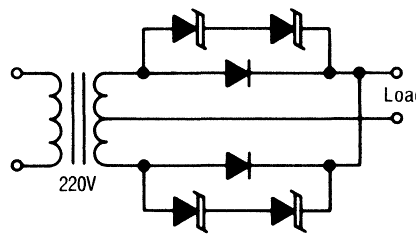


Figure 4—Breakdown Voltage Rectifier Protection*

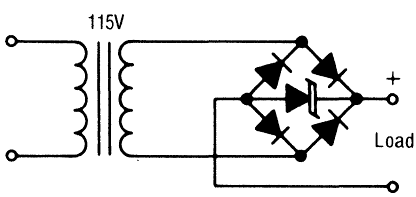


Figure 5—115V A.C. Supply Protection

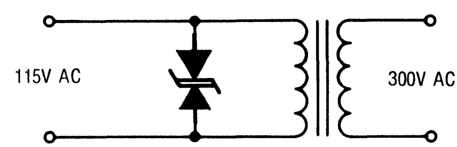


Figure 6—Circuit Protection from Overvoltage Supply Power

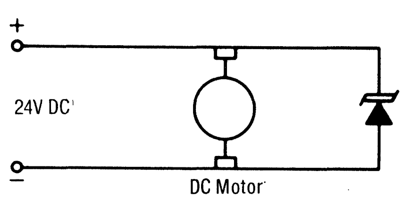


Figure 7—EMI Limiting

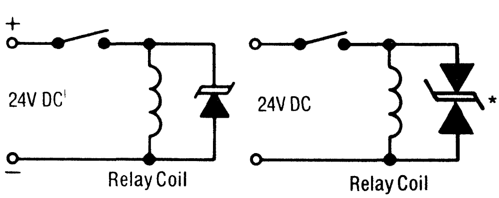


Figure 8—Relay and Contactor Transient Limiting

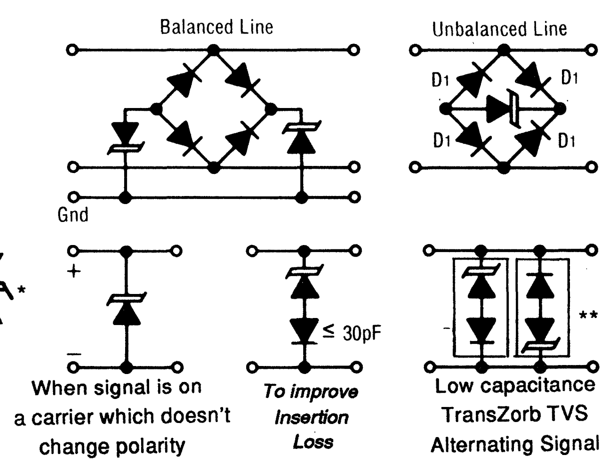


Figure 9—R.F. Coupling

**LCE/SAC

*Will not appreciably affect the "drop out" time of the relay or contactor.

** Maintain short leads on TVS devices to optimize effectiveness.

SUPERECTIFIER DESIGN BRINGS NEW LEVEL OF RELIABILITY TO SURFACE MOUNT COMPONENTS

by, Joseph M. Beck,
Sr. Applications Engineer

Surface Mount technology is here to stay. After years of plodding through cautious experimentation, many manufacturers now have fully automated production lines in place. These production lines place circuit components at speeds that until recently would have been unthinkable. Finally being realized are the benefits of what was once considered a "Voo Doo" manufacturing technology.

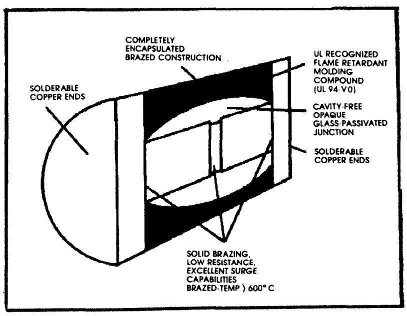


***Figure 1** - SUPERECTIFIER construction*

Component manufacturers have learned a great deal over the past several years as well. Initially most surface mount components were nothing more than retrofit, lead formed versions of their conventional leaded, through-hole counterparts. For most manufacturers this was the quickest and least costly method of "developing" a line of surface mountable components.

It was soon discovered, however, that this approach to component assembly would be unacceptable. Surface mount technology placed new demands upon circuit components. Electrically, the same power was being required from smaller and smaller packages. Package geometries and dimensions became critical in relation to pick and place equipment and circuit board mounting. In addition, the construction of these devices needed to be such that they would suffer no ill effects when subjected to the rigors of the new assembly environment that surface mount technology presented. Encountered in this environment was extremely high-speed pick and place equipment, component adhesive attachment, immersion in molten solder and rapid temperature changes associated with reflow soldering processes. All this meant that component manufacturers would have to re-think their approach to device fabrication. Yes, components needed to be smaller; but they also needed to be more reliable.

At General Instrument, the development of new surface mount components is not something that is taken lightly. It is realized that in order to produce a truly reliable surface mount product one must first consider all relevant aspects of the technology. Only when this process has been completed can a product be developed which is surface mountable, and inherently reliable.

Surface Mount Superectifier®

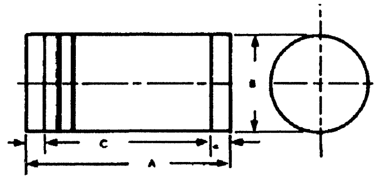
General Instrument manufactures surface mount rectifiers in the popular MELF (metalized electro face) package style. These devices, denoted as SUPERECTIFIERS, are available with a wide variety of electrical characteristics. The main difference, however, between these rectifiers and other MELF style devices lies in the area of device construction. Figure 1 shows the unique construction employed in the manufacture of the SUPERECTIFIER.

The construction of the SUPERECTIFIER does not internally utilize any soft solders. All interconnects are accomplished by the use of a high temperature brazing process (600°C). Hence, any chances of solder void occurrence or internal solder reflow during circuit board processing are eliminated. In addition, the silicon rectifier junction is completely encapsulated by a cavity-free glass. This glass encapsulation ensures that the rectifier junction is hermetically isolated from humidity and other harmful environmental intrusions.

The resultant sub-assembly could be considered to be a fully functional surface mount rectifier. In fact, many component manufacturers offer MELF devices which have this appearance; namely, an oblong glass bead with two protruding metal end terminations. However, in order that the device have a uniform shape, the General Instrument sub-assembly is over molded with epoxy. The result is a smooth, perfectly cylindrical package.

Two Sizes

Two different size SUPERECTIFIER MELF packages are available. General Instrument designation GL34 and GL41 are for 0.5 ampere and 1.0 ampere rectifier types, respectively. JEDEC mechanical specifications DO-213AA and DO213AB detail the dimensions of the GL34 and GL41, respectively. Figure 2 gives these package dimensions.



DIM.	GL34 DO-213AA MIN	MAX	GL41 DO-213AB MIN	MAX
A	.130	.146	.189	.205
B	.063	.067	.094	.105
C	.016	.022	.016	.022

NOTE: ALL DIMENSIONS IN INCHES

Figure 2

Dimensional outline

MANUFACTURING CONSIDERATIONS

Pick and Place--Surface mount SUPERECTIFIERS are supplied on tape and reel in accordance with JEDEC standard RS-481A. Removal of the devices from the embossed carrier tape is easily accomplished by all vacuum pick-up mechanisms which utilize a compliant tip. The compliant tip will form a tight seal around the cylindrical MELF design once contact with the device has been made. This is not always the case, however, when MELF devices with a non-uniform package outline are used. Figure 3 shows two such MELF outlines. Figure 3A is a device with a concave package outline. This type of package is difficult to consistently remove from the carrier tape as the exact position of pick-up on the component body is critical. Figure 3B is that of the most common form of MELF packaging. This type of construction utilizes a non-transparent glass body which is

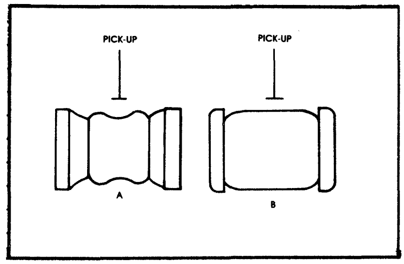


Figure 3.

Non-uniform MELF outlines

often characterized by pitting and surface irregularities. The irregularities make it difficult for a vacuum pick-up to form a tight seal around the device body. The result is that components are often dropped onto the production room floor instead of being placed on the targeted circuit board. General Instrument solves these problems with a smooth surface and perfectly cylindrical package outline.

Bonding Pads -The geometries and dimensions of bonding pads are critical to the proper mounting, soldering and overall performance of all surface mount components. Figure 4 gives the recommended pad layouts for GL34 and GL41 MELF outlines. Use of these pad layouts will be primary assistance in the following three areas:

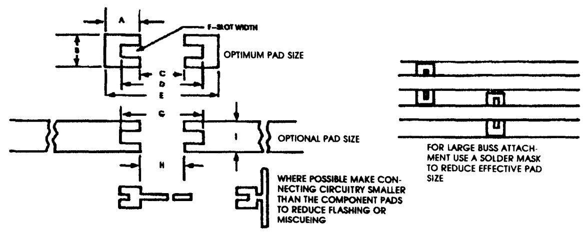
◆ Surface mount technology by nature dictates that smaller component packages dissipate the same power as their larger through-hole counterparts. Hence, adequate bonding pad land area is required in order to aid the component package in the dissipation of this power. The recommended pad layouts provide the needed land area for GL34 and GL41 devices to operate safely at their maximum ratings.

◆ Component adhesive attachment allows the package to shift slightly from its original placement position prior to adhesive curing. In addition, most adhesives tend to spread during the curing process which also may allow package misalignment. The geometry of the recommended pad layouts will tend to minimize such movements. This assumes, of course, that the package was originally positioned correctly.

◆ During reflow soldering, solder surface tension can have a significant effect on the movement and final position of components in relation to their bonding pads. The recommended pad layouts will actually make use of the solder surface tensions to bring MELF devices into alignment with the two bonding pad land areas. This means that MELF devices which are initially placed in slight misalignment on their bonding pads will reposition themselves during solder reflow until a position of alignment is reached.

Soldering--Surface mount SUPERECTIFIERS are capable of withstanding all present forms of wave and reflow soldering. The following guidelines should be followed, however, in order to ensure overall package integrity:

- ◆ GL34--Maximum temperature at device and terminations not to exceed 400°C for 5 seconds. Complete device submersible temperature not to exceed 260°C for 10 seconds in solder bath.
- ◆ GL41--Maximum temperature at device end terminations not to exceed 450°C for 5 seconds. Complete device submersible temperature not to exceed 265° C for 10 seconds in solder bath.



DIMENSION	GL34	GL41
A	.069	.100
B	.063	.100
C	.069	.100
D	.138	.200
E	.207	.300
F	.016	.025
G	.138	.200
H	.035 to .080	.050 to .125
I	.048 min	.075 min

NOTE: ALL DIMENSIONS IN INCHES

Figure 4

Recommended pad layout

PART NUMBER	CURRENT(A)	VOLTAGE(V)	TRR(NS)	PACKAGE
GENERAL PURPOSE				
GL34A-J	0.5	50-600	–	GL34
1N6478-84	1.0	50-1000	–	GL41
GL41A-Y	1.0	50-1600	-	GL41
FAST RECOVERY				
RGL34A-J	0.5	50-600	150-250	GL34
RGL41A-M	1.0	50-1000	150-500	GL41
ULTRA FAST RECOVERY				
EGL41A-G	1.0	50-400	50.0	GL41
EGL34A-G	0.5	50-400	50.0	GL34

General Instrument's surface mount SUPERECTIFIERS combine superb electrical performance with unmatched levels of reliability. The construction of the SUPERECTIFIER virtually eliminates all problems associated with high-speed pick and place of MELF components. In addition, SUPERECTIFIER construction ensures that performance and reliability are never compromised when the device is subjected to the demands of surface mount assembly techniques or when other seemingly harmful environments are encountered. Quite simply, no other surface mount rectifier comes close to offering all the advantages of the SUPERECTIFIER MELF.

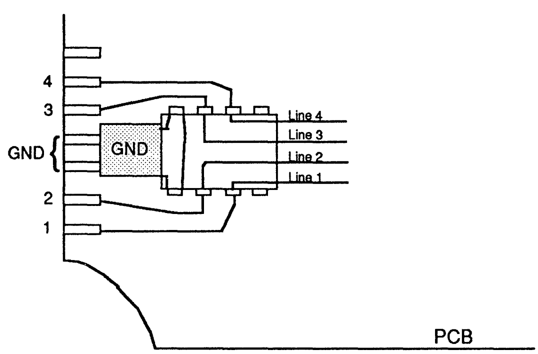
All surface mount components are small and save space. However, performance and reliability should never be considered necessary trade-offs in order to utilize surface mount technology. Use of General Instrument surface mount SUPERECTIFIERs requires no such sacrifices; no trade-offs.

TRANSZORB® TVS DIODE ARRAY
DA SERIES
8 AND 16 PIN DUAL-IN-LINE PACKAGE (DIP)

by
David W. Hutchins

Introduction

The SMDA and DA family of transient voltage suppressors (TVS) are designed for protection of multiple power bus lines or I/O ports at the printed circuit board (PCB) level. Packaged in a standard 8 or 16 pin plastic DIP, devices are available in either 5.0 to 24 volts. They are designed to be used for multiple protection of 5.0 to 24 volt logic circuits, memories, line drivers/receivers and microcomputers. Combining several protectors in a single package minimizes board space and helps in the coordination of input protection within a defined area of the PCB, Figure 1.



Data Line Protection
Suggested Trace Layout for a Single-Layer Board
Using SMDA05C

Figure 1

Induced voltage transients from residual lightning, relays, small motors, inductive load switching and electrostatic discharge (ESD) are clamped protecting sensitive components. Both unidirectional and bidirectional devices are available for positive, negative or plus and minus operating circuit voltages, respectively. The TVS array protects 4 or 6 lines within an 8 pin package and 8 or 12 lines within a 16 pin package.

Electrical Parameters

These devices are designed to be used in applications that have multiple power or data line inputs. Each transient voltage protector is capable of dissipating up to 500 watts of peak pulse power for an 8/20μs impulse waveform. The individual chips, within the package, are capable of dissipating the full peak pulse power. A peak pulse power versus time curve is provided for other pulse widths. In this case, the pulse width (duration) is defined from the point of the initial impulse to the 50% decay point of the peak impulse value.

There are two ground leads for the 8 pin DIP and four ground leads for the 16 pin DIP to allow for the higher current conduction during a transient event. The internal ground leads are capable of diverting transient currents simultaneously from all protector inputs. For best results, the PCB ground path to these terminal pins should be tied together using as large a land area as possible, Figure 1. In this way the return line impedance will be kept to a minimum, reducing the possibility of a voltage overshoot experienced with fast rise time transients.

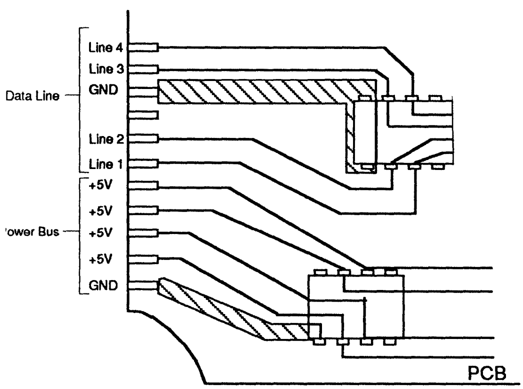
The SMDA and DA series devices are to be used in those applications where the transient events are non-repetitive or are less than a .01% duty cycle. For transient events longer than 10ms or continuous pulses, the standard individual axial lead or surface mount device is recommended. These special applications require some level of average power dissipation rating beyond the design considerations of the SMDA and DA devices.

The unidirectional types are designed to clamp both positive and negative transients. In the forward direction, the devices will clamp the voltage below 2 volts depending upon the transient current. The bidirectional types are symetrical and will clamp the transient voltage to the same value in both directions. The actual clamping voltage will vary with the transient current. For reference, the data sheets provide the maximum clamping voltage for a 10 ampere impulse using an 8/20μs waveform.

In those applications where the SMDA suppressor is protecting I/O ports, the individual chip capacitance is given at 0 volts, 1MH$_Z$. These are maximum values to help in the calculation of the amount of loading that can be expected for signal loss or the added capacitance for long line networking systems. Lower capacitance devices are available in discrete form such as in the LCE or SAC series types for very high speed applications.

Applications

A typical application using the SMDA series devices is at the PCB interface close to the input contacts on the edge connector, Figure 1. At this location, the transient currents are diverted back to the source via the shortest route. Location of the SMDA TVS at one side of the PCB is also recommended. Protection of the power bus lines as suggested at the edge of the PCB followed by I/O port protection,
Figure 2.

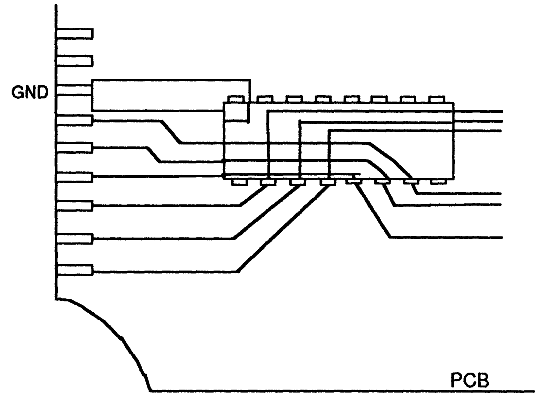


Additional data lines on the back side.

Power Bus and Data Line Protection
Suggested Trace Layout for a Double-Sided Board
Using
SMDA05 for Power Bus
SMDA05C for Data Line

Figure 2

It is important to keep the unprotected lines with the highest transient current away from the protected lines to avoid possible transient voltage crossover. Where this is not possible, the unprotected lines should cross at 90° to the protected lines, Figure 3.



Data Line Protection
Multiple-Layer PCB
Using DA05CP

Figure 3

These devices can also be used within the PCB for protection of individual circuit components. Additional caution is given when designing for protection of individual components. Coordination of the V_{cc} bus lines and the I/O ports are important. A differential voltage between input pin terminals can cause component upset or even damage. These voltage differences can be attributed to improper protector selection or the length of land traces to the protector. These traces can cause a high voltage to exist during a fast transient that will exceed the clamping voltage of the TVS. Traces leading to and from the TVS protector should be kept as short as possible to minimize voltage differences. Ground returns should be as large as possible such as a buried ground plane or surface area to reduce any series lead inductance.

FAILURE MODES AND FUSING OF TVS DEVICES

by

David W. Hutchins

Introduction

Transient voltage suppressors (TVS) will fail if they are subjected to conditions beyond their designed limits. It is, therefore, important to understand the types of failure modes of TVS devices before designing them into a circuit application. There are three basic types of failure modes: shorts, open and degraded (outside of the specification limits). Although the silicon avalanche junction transient voltage suppressor (SAJTVS) will first fail short in most applications, there is always one transient event that will cause it to open initially. In this case, the transient energy is large and of short duration that the silicon chip itself explodes.

When a TVS device does short, follow-on operating current may cause the device to open. Fusing of the line is recommended in all applications. Shorted devices will start to conduct current away from the circuit or system affecting its performance. Open devices are transparent to the circuit/system and will not usually distribute circuit functions. In either case, it is difficult to determine if the TVS device is still functioning while in the circuit. Degraded TVS devices are most difficult to detect in the circuit. These can be devices with high leakage currents which may not adversely affect circuit performance, except under elevated operating temperatures. All three types of failure modes are discussed in this application note along with the design practices for fusing the line when a device does fail.

With the thought that a TVS device can fail, there are some additional terms that designers would like to impose on the protector to ease this problem. One such term is a "Fail Safe" condition. The term "Fail Safe" implies some level of safety which cannot be used in connection with the TVS device. Due to the very nature of the unknown transient threat, there are no 100% guarantees. "Fail Safe" is one of the most misunderstood terms regarding transient protection. It is important to define the term and discuss why it should not be used in reference to a TVS device.

Words have different meanings to different people which is the case with the term "Fail Safe". A TVS device cannot assure a fail safe environment. By nature, a TVS device will fail when subjected to a transient beyond its designed capability. If the circuit or system is not properly fused, a shorted TVS device can become a safety hazard conducting operating currents through the return path. Even with the proper design-in and adherence to good engineering practices, this term should not be used in describing the function of the protection network. Quite often, the unknown transient threat along with some of the guess work regarding the sizing (Peak Pulse Power Rating) of the TVS device will suggest some level of risk in the overall protection system. The risk, in this case, is the trial and error method used to guarantee proper TVS device selection versus its location. This type of selection process may take some time to accomplish when the transient threat cannot be fully defined. "Fail Safe" may be used in conjunction with a complete systems approach, but not with a component such as a TVS device.

Failure Modes

TVS devices will fail in one of three modes. These are shorts, opens and degraded devices. In most applications, the preferred method of failure is a short. A short is defined when the TVS device has a resistance value of less than 1 ohm at a dc voltage of 0.1 volts (ref. IEEE/ANSI

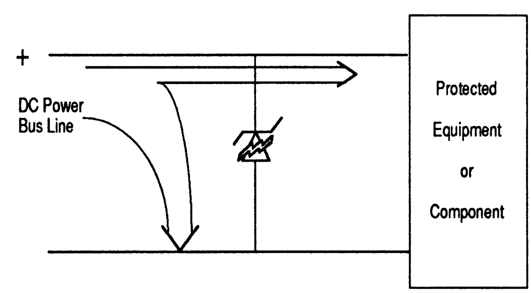


Figure 1. Current Path for Shorted Surge Suppressor

C62.35). In the more practical world, a shorted device will start to conduct a significant amount of operating current to ground, Figure 1.

The actual current shunted to ground will depend upon the resistance in the line ahead of the TVS device. For the power line, this could mean a significant amount of current depending upon the available current from the power supply or source. With data lines, this can be somewhat limited but will depend upon the operating current of the circuit. Data lines operating in the milliampere range are more difficult to fuse. In either case, it is important to provide some type of fusing in the line to open up the circuit when a TVS device does short, Figure 2.

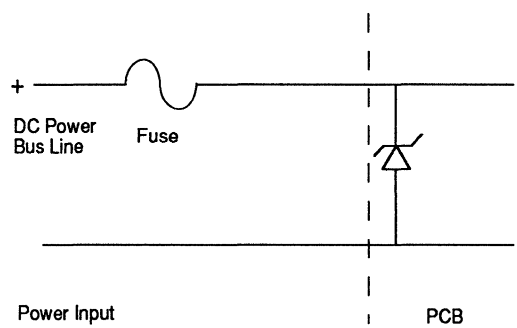


Figure 2. Fuse Location Relative to TVS Device

The fusing element must take into consideration two possibilities. First is the ability to handle the required transient current without interrupting the circuit functions. Second, it has to be able to open the line when the TVS device does short.

An open TVS device is defined as a diode that has a breakdown voltage $V_{(BR)}$ greater than 150% of the pretested value at an applied test current (I_P) (ref. IEEE/ ANSI C62.35). For this test, the unit must be taken out of the circuit for verification. An open device in the circuit will not exhibit any of the standard electrical characteristics such as leakage current or clamping voltage. Once out of the circuit, the TVS device can be tested on a curve tracer for verification of the open condition.

In an improperly fused circuit, a device that has been shorted can become open after an applied operating current is allowed to conduct through the device for a period of time. Figure 3 shows the fusing currents and time durations for each of the major axial lead type package. When this occurs, there is usually some visible evidence in the form of a burn mark on or within the device indicating an open unit.

Devices that degrade are more difficult to detect. These types of failed devices will exhibit an increase in the reverse leakage current under normal operating voltages (equivalent to the stand-off voltage). According to IEEE/

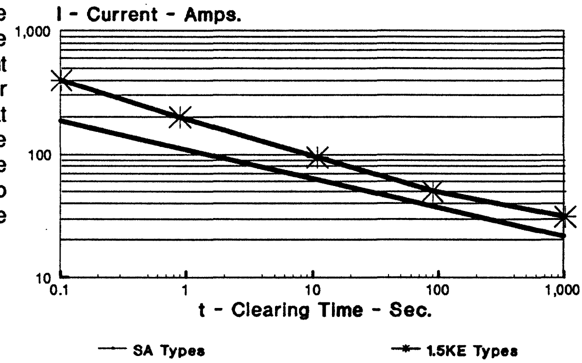


Figure 3. Clearing Time for TransZorb TVS Device - Fail Open Condition

ANSI C62.35, a degraded failure mode has occurred when the avalanche junction surge suppressor has a stand-by current greater than the maximum specified. On the power bus line, this level of current may not be noticed until the leakage current reaches the upper limit of the power supply current or when the unit shorts from the increased current conduction. For data lines, this value may be much less due to the fact that there can be loss of data transmission of information. A device will act as a low impedance shunt path to ground.

As discussed earlier, "Fail Safe" is discouraged in the description of a failure mode for TVS devices. For some, the term can be a desirable characteristic in that the unit will protect up to a specific level. To others it can mean that the device should provide protection because of the fail short or open condition. While both may be true, the TVS device should not be described as a fail safe product due to fact that no one can guarantee a specific type of device failure mode. The transient threat and the location of the transient voltage suppressor in the equipment will also have a major influence on the type of failure mode. In some applications, the transient currents and impulse waveform cannot be completely defined. As a result, the correct TVS device may not be designed in. In this case, the TVS device application is a trial and error method as suggested earlier. A TVS device is designed to withstand a specific level (power) of transient threat as defined by a peak pulse power rating versus pulse width curve, Figure 4.

Most manufacturers will provide a peak pulse power versus time curve on their individual product data sheets. This will provide the designer with the maximum power limit within a product family or series of devices. It is up to the circuit or system designer to translate this product information into the appropriate threat level. Threat levels should always be defined in terms of the peak current amplitude and impulse waveform rather than calculate

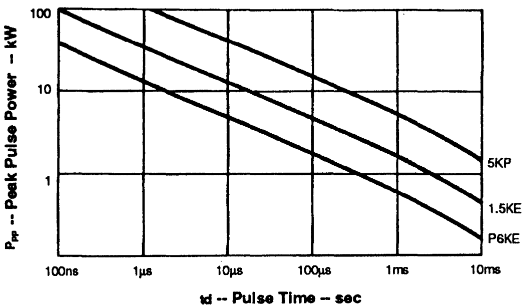


Figure 4. Peak Pulse Power vs. Pulse Time

the energy of the TVS device from the power curve. Energy is not a key parameter here due to the fact that the energy contained within the transient event is not the energy deposited in the TVS device. Equating the transient current threat to the peak pulse current rating of the TVS will ensure proper device selection and the continuous operation of the protector in the application. There will, however, be those applications in which the actual transient current cannot be defined. At best, the identification of the source of the threat is necessary; that is, lightning, switching, ESD or NEMP. From this information, the manufacturer can provide the direction for initial product selection.

Product selection begins by equating the circuit operating voltage to the stand-off voltage of the TVS device, Table 1.

TABLE 1
Avalanche Junction
Selection Process

DEVICE PARAMETERS		CONDITIONS
1) Stand-Off Voltage	>	Operating Voltage
2) Peak Pulse Current	>	Transient Current
3) Clamping Voltage	<	Voltage Protection

Next, as discussed above, it is necessary to equate the transient current to the peak pulse current of the TVS device. The transient current must always be less than the peak pulse current of the TVS for continuous operation. It is the transient current that will cause the TVS device to fail in a shorted mode. Device shorts can occur at the semiconductor chip junction surface interface or within the bulk material. This type of short will appear as a burn spot on the junction surface or as a dark spot on the top/bottom of the silicon chip. The bulk type of device short will be a function of the amount of transient current that was passed through the silicon chip. The burn spot can be as small as a pin hole in the die and as large as a funnel hole of a few millimeters in diameter. In both cases there is evidence of remelted semiconductor material. Its size will usually depend upon the current amplitude of the transient and any additional follow-on current that is present over a short period of time. Longer pulses will usually remelt the solder material which can bridge the silicon chip causing the shorted condition. In this case, removing the solder bridge will allow the TVS device to recover and appear as a good device.

Follow-on current after a TVS device has failed short can become a safety or circuit performance problem. For these reasons, it is suggested that a fuse or fusible link be inserted in the line ahead of the TVS device on both the power and data line applications. Selection as well as location of a fusing element is important. From Figure 3, it is possible to determine the I^2t value necessary to select the fuse for any follow-on current. As this data is defined as the clearing time for a TVS device to open up for a continuous applied current, it is necessary to select a fuse with an I^2t characteristic below the device capability. Location of the fuse is best closest to the TVS device in the series line for board level protection, Figure 2. For equipment and high level systems protection, the fusing element can be a circuit breaker located at the point of power entry. At this location, the power and transient currents are terminated at the point of power entry input to the equipment preventing any additional problems such as safety hazard, data errors, or component damage.

One of the most difficult problems is the identification and, sometimes location of the failure. In-line tests are often used as the checkout procedure for the system/circuit's performance. With a transient voltage suppressor, this may not be the best solution. The first step is the identification of problem area; that is, power bus or data line. The second step is to perform a visual inspection to locate the failed device or see evidence of a burn spot on a component. The third step is to apply power to the circuit for performance testing and test for any loss of data. If there are any major problems, tripping of a circuit breaker (CB) or a blown fuse will indicate some type of line problem. Trace the line to the problem area. When a CB or fuse does function, it's best not to reset the CB or replace the fuse but to locate the source of the problem. With data lines, this can be somewhat difficult if the fusing link does not function due to improper sizing.

EFFECT OF LEAD WIRE LENGTHS ON PROTECTOR CLAMPING VOLTAGES

by
O. Melville Clark and Joseph J. Pizzicaroli

Originally presented at the Federal Aviation Administration-Florida Institute of Technology Workshop on Grounding and Lightning Technology
March, 1979—Melbourne, Florida

Abstract

Under high current pulse conditions, excessive lead lengths on suppressor components can be responsible for destruction of the protected circuit. This is caused by voltage build-up across the small but finite amount of inductance in the interconnecting leads of the protector. Some suppressor devices have been tested and observed to have more than twice the specified clamping voltage which was subsequently shown to be caused by inductive effects. Problems and corrective measures are illustrated and discussed in this paper.

SEMICONDUCTOR FAILURE THRESHOLDS

MOS and small area geometry semiconductors are particularly vulnerable to the effects of transient voltages. Unfortunately there has been very little information published on this subject. The work reported by Van Keuren[1] illustrates how fragile CMOS and TTL devices can be. Minimum failure pulse voltage thresholds are shown in Table I.

Electrostatic Discharge (ESD) failures of MOS microcircuits have been measured by Gallace and Pujol[2]. Comparisons among several suppliers indicate that failure levels can be a function of manufacturing technique. Repeated step stressing of a sample of 25 CD4011AF type devices shows that at a given stress level devices would eventually fail, as shown in Figure 1.

TABLE I
Minimum Failure Thresehold of CMOS and TTL

Device Type	Pulse Width					
	20µsec	2µsec	1µsec	0.2µsec	0.1µsec	.025µsec
55107	22V	16V		22V		
55109	36V	38V		60V		
5404			30V		50V	120V
54L30			20V		50V	90V

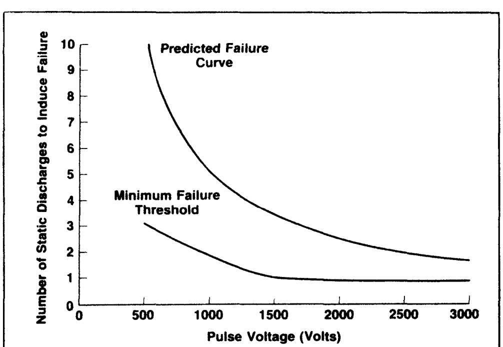


FIGURE 1—Stress Failure of CD4011F

EQUIVALENT CIRCUIT OF PROTECTOR

The equivalent circuit of a silicon transient suppressor, such as the TransZorb® TVS is shown in Figure 2. All parameter values are fixed by manufacturing processes and device construction except L1, the inductance resulting from the lead wires connecting the protector across the circuit for which protection is intended. Normal wiring practice results in lead lengths of the order of centimeters. In some power installations this has been observed to be of the order of feet.

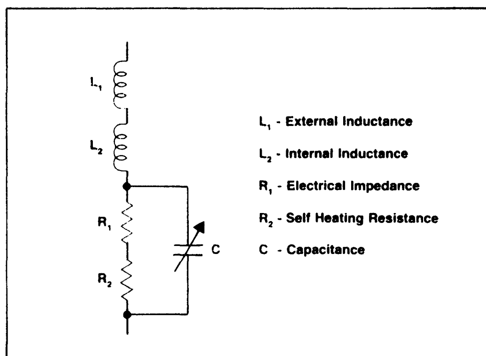


FIGURE 2—Equivalent Circuit of Protector

The inductance within an axial leaded part, as represented by L2, is of the order of 10^{-8} henrys while the inductance within a modular assembly can be one to two orders of magnitude greater, depending on the design and the number of subcomponents. The capacitance of a silicon avalanche suppressor can vary over an order of magnitude, depending on the degree of reverse biasing.

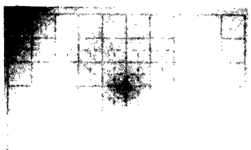
TRANSIENT VOLTAGE RISE-TIMES

a. **EMP:** Voltage rise-times of EMP (Electromagnetic Pulse) transients, as generated by high altitude nuclear detonations, are 5kV/nsec. The presence of even a small amount of inductance in the protector circuit can have very profound results on the effectiveness of a protector device. This is illustrated with the oscillographs in Figures 3 and 4.

Vert: 200V/div.

Horiz: 10nsec/div.

FIGURE 3— 7.5 cm Lead Wires



Vert: 200V/div.

Horiz: 10nsec/div.

FIGURE 4—Zero Length Lead Wires

In Figure 3, a 30V TransZorb TVS in the DO-13 package was pulsed with a 100A 4kV/nsec rise-time transient. With 7.5 cm leads on each end, at which current was injected and voltage measured, the overshoot voltage is slightly greater than 800V. The energy under this curve is calculated to be 70μjoules, sufficient energy to destroy most types of MOS and some TTL devices. By reducing the lead length to zero and repeating the pulsing, the overshoot voltage is reduced to about 200V. The energy under this curve is less than 1μjoule, below the destruct threshold of MOS and TTL devices.

b. **Lightning and Inductive Switching:** From measurements made on 120V ac power systems, Martzloff[3] has proposed a waveform with a frequency of 100kH. The lightning stroke, which is usually reported with current rise-times ranging from 1 to 3μsec has been more recently measured by Llewellyn[4] to be as low as 500nsec. Transients on shipboard ac power systems have been defined by MIL-STD-1339 as having transient rise-times of 1.5μsec.

Normal wiring practices are usually considered adequate for protection of electronic circuitry. "Normal" and "adequate" are relative terms and usually prevail under conditions in which equipment performance is acceptable. What is normal and adequate protection for vacuum tubes is not the same for power semiconductor devices. Protection for microcircuits is also quite different from power semiconductors. With increased usage of microprocessors and other small area geometry semiconductors, equipment is becoming more vulnerable to transient voltages, under both single pulse and repetitive pulse conditions.

INDUCTIVE EFFECTS IN COMPONENT LEADS

a. **Calculation:** The inductance in a straight wire appears, at first glance, to be very small and insignificant. Assuming a value of 1μH/m for a straight wire, most lead wires have inductance values in the nanohenry region. The voltage drop developed across an inductor under pulse conditions is expressed as:

$$V_{(t)} = L\frac{di}{dt}$$

where L is inductance in henrys

$\frac{di}{dt}$ is the rate change of current

For the fast rise-times of EMP as shown above, the associated problems are obvious; however, for the slower rise-time of switching and induced lightning the degree of exposure and protection required can be defined only after carefully studying all boundary conditions.

b. **Case Study:** In the following application, a silicon transient suppressor is being used to both regulate the voltage to power a telecommunications repeater and also provide transient suppression. The schematic is shown in Figure 5. This is one of two repeaters powered and protected by the same component.

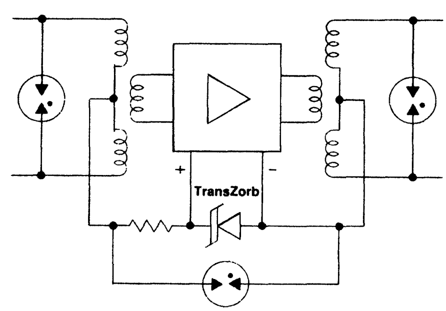


FIGURE 5—Telecom Repeater With Protection

The microcircuitry used in this equipment has some well defined failure levels; 20V in the positive direction and 6.5V in the negative direction. The suppressor has a well defined clamping voltage in the avalanche direction under a specified rise-time. The forward polarity measurements are specified at 100A with an 8.4 msec, ½ sine wave pulse. To determine higher current capability, pulse tests were made with a 1.2 x 50μsec waveform. During the process of taking data, small differences in lead length in the protection circuit were observed to have profound effects on the suppression capability of the device. Measurements extended over the range from 100A to 500A with lead lengths from the body of the device of zero, 1.0 cm and 2.0 cm. Tests were made on a molded 1.5kW TransZorb®. The peak clamping voltage was plotted against pulse current as shown in Figure 6.

After tests were made with zero, 1.0 cm and 2.0 cm lead lengths, the plastic body was carefully cut away leaving only the cell containing the junction and the leads. Voltage measurements were then made across the cell, virtually eliminating inductance within the package. A lead length of 2 cm has a peak clamping voltage of 4V at 100A and 13.5V at 500A. By contrast, the cell only has a peak clamping voltage of 1.3V at 100A and 3V at 500A. Voltage probe placement for taking measurements is shown in Figure 7.

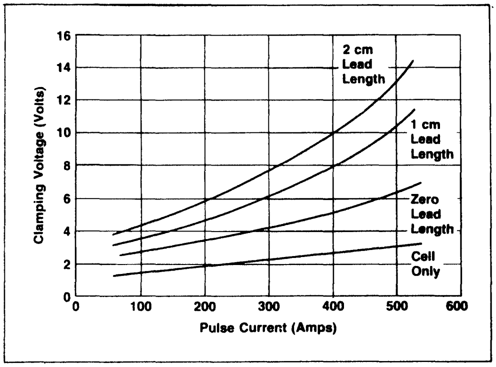


FIGURE 6—Clamping Voltage vs Pulse Current

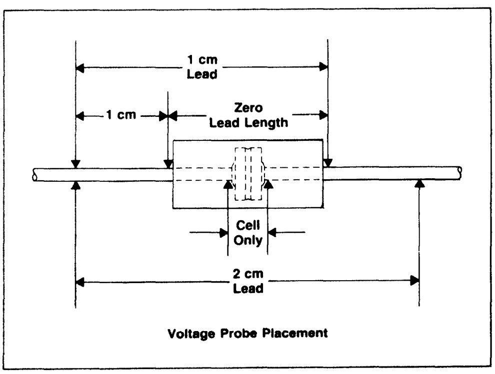


FIGURE 7—Voltage Probe Placement

Voltage drops across the lead wires contributing to peak clamping voltage can be attributed to both resistive and inductive components. Calculations were made for both resistive and inductive voltage drops for a 1.0 cm .040 in. dia. copper wire at pulse current levles from 100A to 500A. Rise-time is 1.2μsec. This data is shown in Table II.

TABLE II
Pulse Current Level and Voltage Drop

Pulse Current (Amps)	Measured Voltage Drop (Volts)	Calculated Resistive Voltage Drop (Volts)	Calculated Inductive Voltage Drop (Volts
100	.75	.019	0.83
200	1.3	.038	1.66
350	2.3	.066	2.91
500	3.3	.095	4.16

Note that the calculated inductive voltage drop compares favorably with the measured voltage drop while the resistive component contributes less than 10% of the total.

CLAMPING VOLTAGE OF AC PROTECTOR

In power systems, it is quite easy to place a modular assembly protector in a convenient mounting location rather than the most effective one, especially in retrofit applications. These components are sometimes bulky and do not always conveniently fit the desired location. To illustrate reduced effectiveness in an ac power transient suppressor, a module was measured for peak clamping voltage having lead lengths of 24 in., 48 in., and 72 in. Pulse currents were 100A, 200A, 300A and 400A with a waveform of 1.2 x 50μsec. Lead length vs additive peak clamping voltage plotted here is that value above the normal clamping voltage with zero lead length.

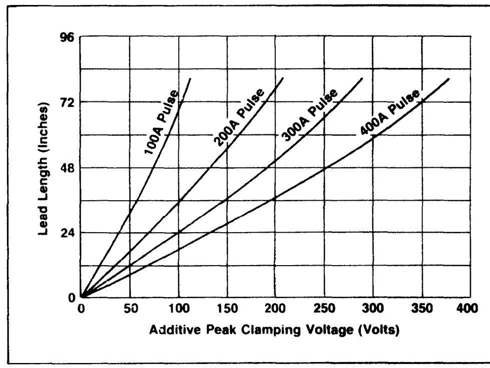
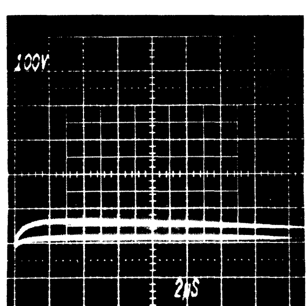


FIGURE 8—Lead Length vs Clamping Voltage

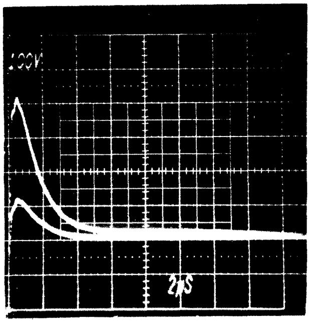
Note that the additive clamping voltage can be down in the range of 35V at 100A for 24 in. leads extending up to 350V at 400A for 72 in. leads. An oscillograph depicting optimum protection at 100A and 400A is shown in Figure 9. The 100A pulse is being clamped at about 215V and 400A pulse at 265V. The peak clamping voltage is substantially increased by the inductive effects of 72 in. leads as shown in Figure 10. In this oscillograph, the 100A pulse produced a peak of about 320V and 400A pulse produced a peak of about 615V. The inductive overshoot illustrated in Figure 10 is quite profound by comparison with Figure 9.



Vert: 100V/div.

Horiz: 2μsec/div.

FIGURE 9—AC Protector, Optimum Protection



Vert: 100V/div.

Horiz: 2μsec/div.

FIGURE 10—AC Protector, 72 in. Leads

CLAMPING VOLTAGE OF MICROCIRCUIT PROTECTOR

An ICT-5 type TransZorb TVS, designed for protecting low voltage logic circuits, was pulsed at levels of 100A, 200A, 300A, 400A and 500A with a 1.2 x 50μsec waveform. Voltage drop was measured across the leads at distances of zero, 1.0 cm and 2.0 cm from the body of the package, adding a total of 4.0 cm .030 dia. straight wire contributing to inductance and subsequently adding to the peak clamping voltage. A graph plotting total lead length vs. peak clamping voltage is shown in Figure 11.

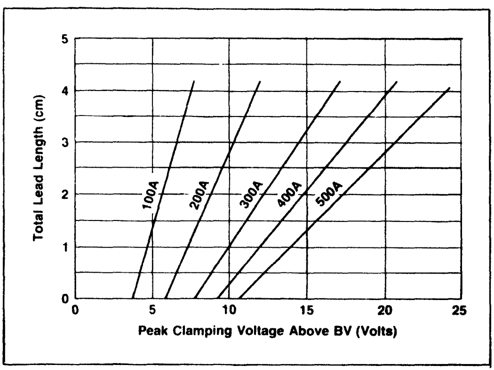


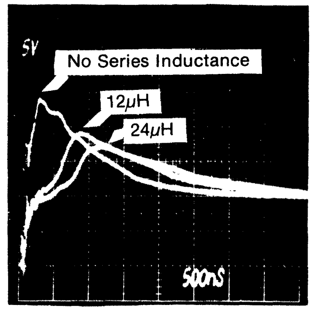
FIGURE 11—Lead Length vs. Peak Clamping Voltage

These curves are plotted as additive above the breakdown voltage (BV) at 1mA, which was 6.3V for the device tested. The clamping voltages increase with pulse current using zero lead length due both to the electrical impedance and thermal self-heating effect on the silicon pn junction. Observe that the clamping voltage covers a very broad range, from 3.6V above BV to 24V above BV depending on peak current and insertion method.

REDUCING INDUCTIVE EFFECTS

The most obvious method of reducing inductive effects and thus optimizing protector capability is to reduce lead wire lengths in the protector circuit. If it is not possible to reduce the conductor length, other options are available. Inductance in a given length of conductor can be reduced by replacing a small diameter wire with a wide strip conductor. On circuit boards, a ground plane on one or both sides of the board has been used by the author as a method for optimizing protector clamping.

Since voltage drop across the lead length is a function of the transient rise-time, it may be feasible to add series inductance between the transient source and the protector to reduce the rise-time and subsequently the peak clamping voltage. A TransZorb® used for 5V logic protection was tested with a 300A pulse having a 1.2 x 50μsec waveform with voltage measurements made at 2.0 cm from each end of the body of the device. This is shown in Figure 12, peaking at 24V. Placing a 12μH choke ahead of the suppressor to reduce the rise-time, reduced the peak to 19V and using 24μH reduced the peak to 17V. These curves are also shown in Figure 12.



Vert: 5V/div.

Horiz: 500nsec/div.

FIGURE 12—Comparitive Clamping Voltages

CONCLUSION

Inductive effects can be, and often are, a source of abnormally high peak clamping voltages compared to the inherent capability of a transient voltage suppressor. These high clamping voltages can cause failure of vulnerable electronic components; thus a suppressor capable of providing adequate protection can be rendered useless due to poor insertion methods. So it behooves the design engineers working on both mechanical layout and circuit design to be acutely aware of inductive effects and the problems which they can cause along with corrective measures in order to optimize transient voltage protector components.

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THE USE OF TRANSZORB® DIODES WITH POWER MOSFETS

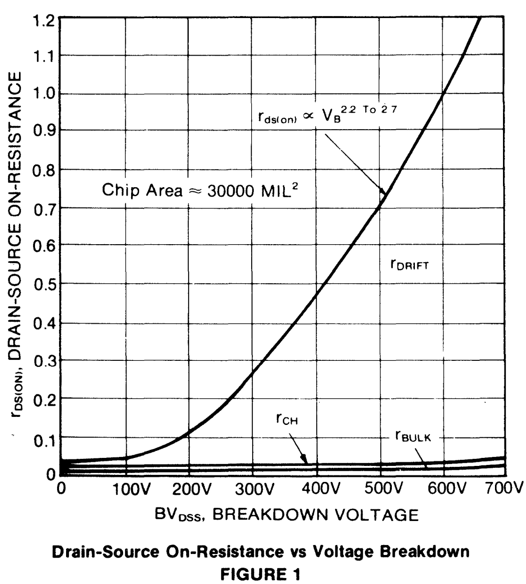
by
Jon D. Paul
and
Bill Roehr

ABSTRACT

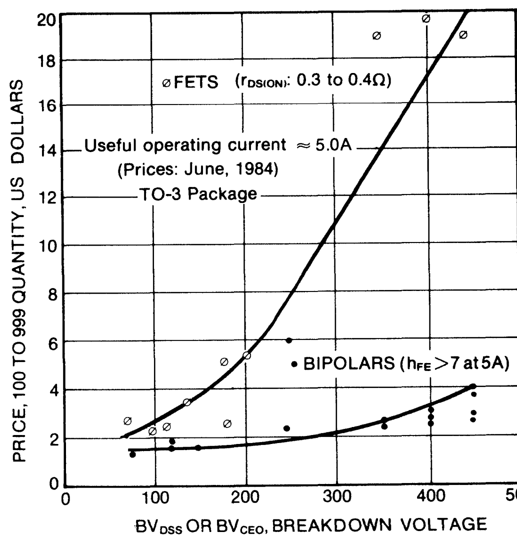
Power MOSFETs have a more rapid cost vs. breakdown voltage tradeoff than do bipolar devices. Transient Voltage Suppressor TransZorb® Diodes may be used to reduce the voltage stress on the MOSFET so that a considerably lower cost device may be used. The TransZorb diode serves a dual application; a transient protector and an ancillary snubber. A design approach is given and successful designs are described.

I. Need For Transient Protection

All off-line power electronic systems are subject to unwanted transient voltages. These originate from two sources: transients on the incoming ac line and transients generated in the system by the rapid switching of the power switch. The usual design procedure with bipolar switches calls for allowing generous voltage margins between the maximum anticipated circuit voltage and the breakdown rating of the transistor. The penalties are not too severe. Increasing a bipolar's breakdown rating causes a reduction in current gain and switching speed. The gain, however, can be restored and speed improved with a modest increase in die area.



Drain-Source On-Resistance vs Voltage Breakdown
FIGURE 1

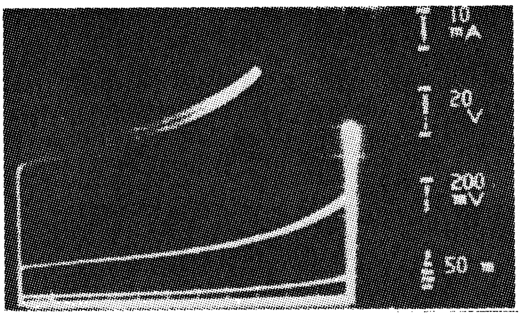


Effect Of Voltage Rating On FET Price
FIGURE 2

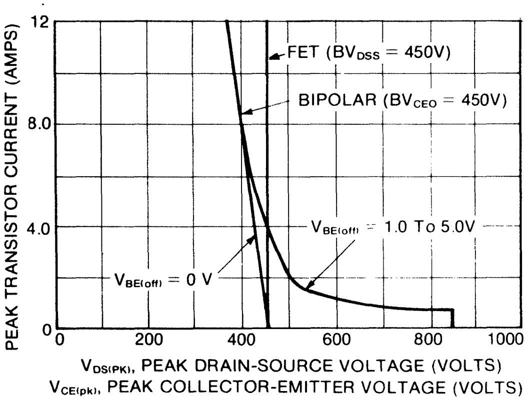
The MOSFET displays several properties which cause protection requirements to differ from those of the bipolar junction transistor (BJT). Figure 1 shows the direct tradeoff in on-resistance with breakdown voltage, for a fixed die size. To maintain a constant on-resistance and current rating as voltage increases requires a rapidly increasing die size.

The price picture for BJT's and FET's is shown in Figure 2. It is evident that when using FET's, reduction of the required voltage specification is a critical and very cost effective task for the design engineer.

It should be noted that the mechanism of breakdown also markedly differs between the MOSFET and BJT. Figure 3 shows the Zener-like property of the FET. The high voltage drop across the device results in high dissipation and usually destruction, should operation occur even for nanosecond intervals in the avalanche breakdown region. Operation in avalanche breakdown is not advisable for a bipolar either, but it can usually sustain some energy in the $BV_{CEO(sus)}$ mode. Circuits are usually designed to limit peak voltage below BV_{CEO}. At low currents, however, most bipolars can handle voltages up to the BV_{CBO} limit which may approach two times the BV_{CEO} limit. The operating limits for a FET and a comparably rated bipolar device are shown in Figure 4. Properly snubbed, the bipolar can operate with a very comfortable margin for transients.



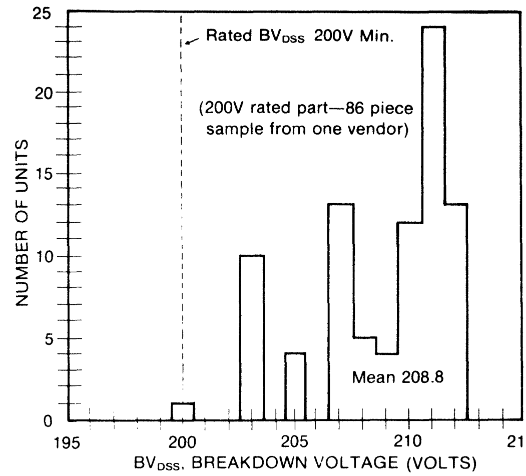
Typical FET Breakdown Characteristics
FIGURE 3



Maximum Reverse Bias (Turn-Off) Safe Operating Area
FIGURE 4

In addition, the FET breakdown voltage has a significant temperature coefficient—approximately 0.5V/° C for a 400V part—which must be considered in the design. The BV_{CEO} breakdown of a BJT is essentially independent of temperature.

The close tolerance of observed MOSFET breakdown voltage is shown in Figure 5. This is a histogram of a sample of 86 parts rated at 200V. Note the nonexistent margin for error due to the tight distribution of units just above the specification minimum. The mean of this sample is 208.8 volts, with a standard deviation of 3 volts. Experience with bipolars has indicated that a margin of 50 volts is not uncommon.



FET Avalanche Voltage Distribution
FIGURE 5

Summarizing the discussion, the need to protect FETs with some voltage limiting device is compelling because:
1. It is expensive to design in voltage margins.
2. FETs display a sharp breakdown characteristic of low energy capability.
3. The breakdown voltage can be expected to be very close to the specified voltage rating for most of the population.

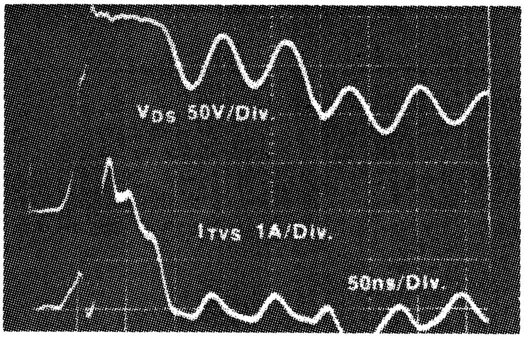
II. Need For Ancillary Snubber

A MOSFET circuit has somewhat more critical snubbing requirements than does a corresponding bipolar circuit. As discussed in the previous section, the FET cannot dependably withstand any transients if they exceed the FET breakdown voltage, whereas the bipolar is somewhat more forgiving.

The transient problem is intensified by the fast switching of the FET. The specified FET current rise time is several times faster than that of the bipolar (for example 30ns vs. 300ns) and in practice FET circuits usually switch faster than bipolar circuits. These fast rise times generate ringing in the stray wiring inductances between the snubber and the FET as well as in the residual inductance and resistance of the snubbing circuit causing the FET to suffer short duration (20-100ns) transients. These transients are observed by probing right at the FET package, rather than at the snubbing point. Figure 6 shows typical waveforms encountered in a MOSFET SMPS. The clamping effect of the protective device is evident on the V_{DS} waveform.

Using the protector in this fashion is termed an "ancillary snubber". It is an additional snubbing device intended to clamp any fast transients which remain after the application of the main snubber. By reducing peak voltage, a lower cost FET can then be used. Dissipation in the ancillary snubber should ordinarily be a small fraction, typically 10%, of the main snubbing power in order to remain within the protector steady state power ratings.

It is important that the protection device be mounted as close as possible to the FET drain and



Waveforms Of 450W SMPS
FIGURE 6

source leads to minimize the lead inductance (L_L). Doing this is critical because any package or lead inductance will cause the FET to suffer an additional transient voltage over that of the device clamp voltage (V_C). That is, the drain source voltage, V_{DS}, is given by:

$$V_{DS} = V_C + L_L \Delta I / \Delta t$$

For example, a 5 Amp pulse rising in 5ns will cause a 10V increase in V_{DS} over V_C for a lead inductance of only 10nH, about 1½" of AWG #18 wire. Thus the rating of the FET will have to be increased to accomodate this overshoot.

III. Choice Of Protective Device And Circuit

The ideal device to insure operation of the FET within its limits would have these properties:

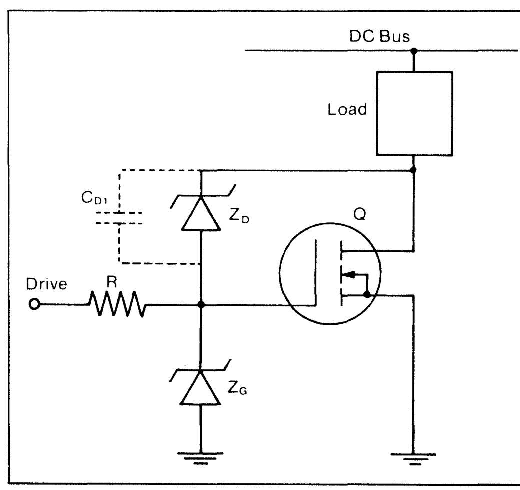
1. Low clamping ratio—to allow optimum utilization of the available FET safe operating area while abruptly limiting just below FET breakdown.
2. Low capacitance—to take best advantage of the inherently fast FET switching.
3. Low cost—to reduce overall systems cost by reducing FET cost without excessive protective device cost.
4. Sustantial steady-state power rating—to permit use of the transient protection device to "mop-up" any remaining repetitive voltage transients after application of snubbing techniques.
5. A variety of close tolerance breakdown voltages—to closely match the FET requirement.
6. Low inductance and fast switching—to clip short (30ns) spikes which can be FET-fatal!
7. Shorted catastrophic failure mode—to save the relatively expensive FET under extreme overload.

Table 1 compares the various protection devices available. The MOV is too soft in its clamp property and is specified in large voltage increments. The standard Zener is not rated for clamp properties and is not fail-safe. Gas tubes are unsuitable due to their arc conduction mode and wide breakdown variation. The Transient Voltage Suppressor (TVS) or TransZorb Diode, if properly specified and selected, is the only device which can fulfill the requirement.

DEVICE	MOV	ZENER	TVS	GAS SURGE ARRESTOR
Range Of Voltages	12-4700	3-200	5-400	90-1,000
Voltage Spec Increments	10-25%	5-10%	10%	20%
Tolerance	10%	5%	5%	15%
***Clamp Ratio @ 10A**	1.85 (13 J)	1.65 No Spec	1.25 (15 J)	2.55
Capacitance (200V Device)	150pF	30pF	30pF	1.2pF
Price	Medium To Low	Low	Medium	Medium
Steady State Power Dissipation Capability	Very Low (½W For 10 J Device)	Good To 50W	Good To 10W	Not Applicable
Failure Mode	Gradual Shift In Breakdown	Open Or Short Circuit	Short Circuit	Gradual Decrease In Protection
Polarity	Bipolar Only	Unipolar & Bipolar	Unipolar & Bipolar	Bipolar Only
Other Properties And Notes	Good For Mains Use. Not Suitable FET Protection	No Spec For Transient Use	Ideal For SMPS Switch	After Ignition Enters Arc Mode With Low Voltage Drop—Requires Zero Current To Extinguish

*Defined as V_C/V_{BR} measured for a particular unit.

Protective Device Comparison
TABLE 1.

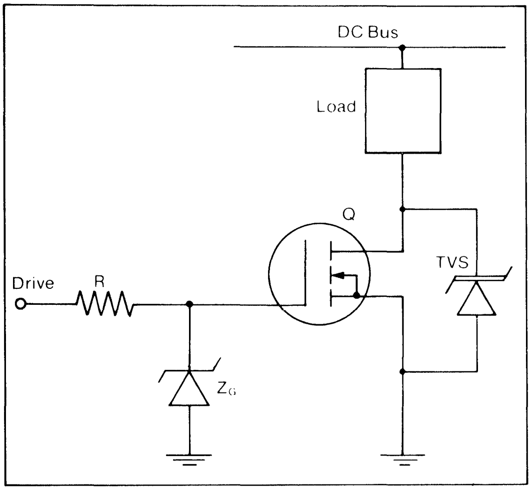


FET Protection Drain To Gate—Not Recommended
FIGURE 7

A suggested technique which has been proposed by FET manufacturers for protection is shown in Figure 7: A Zener rated below the FET breakdown (minus $V_{gs(on)}$) is placed from drain to gate. During a transient the FET is turned on and can handle a much higher current than the Zener diode alone. The configuration has some serious problems:

1. Limited Zener availability at high voltages.
2. Zener capacitance can induce an unwanted dv/dt turn-on of the FET which could be fatal.
3. Increased power dissipation in the FET.

Experience has taught that a protection diode from drain to source is better as shown in Figure 8. Note that a gate to source Zener is always advisable, regardless of the drain voltage breakdown protection scheme.



FET Protection Drain To Source—Preferred Circuit
FIGURE 8

IV. Selecting The Transient Voltage Suppressor

Selecting the rating of the protector is a nontrivial task. This is caused by the lack of correspondence between the manner in which the TVS diodes are specified versus the service conditions experienced in the application. The TVS must be selected on these criteria:

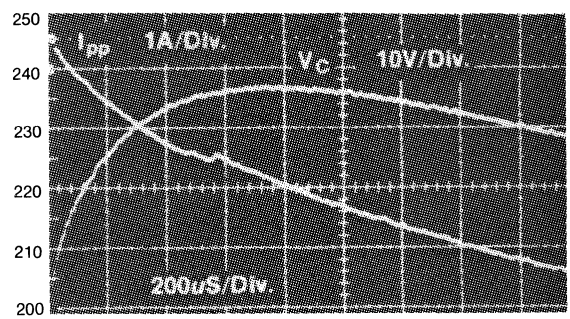
1. Minimum breakdown voltage must exceed maximum bus voltage under worst case conditions. The peak bus for a high line (135/270V) condition is 191/382 volts.

2. Maximum clamping voltage (V_C) at the peak applied TVS currents should be under the MOSFET minimum breakdown voltage. Peak TVS current will approximate peak switch current. For a supply with an 8 Amp switch current, TVS peaks of 3-5 Amp are typical. V_C must be determined for the TVS at its operating current at the extremes of the expected ambient temperature. The MOSFET temperature coefficient must also be considered.

3. The TVS continuous power dissipation must be sufficient to handle the average power experienced by the TVS because of the repetitive current pulse applied.

Specifications for Transient Voltage Suppressor Diodes are generally keyed toward suppressing a large single shot impulse. The format was developed years ago using standards devised by the telephone industry. The key specifications are the range of breakdown voltage (V_{BR}), usually specified at 1mA, and the maximum clamping voltage (V_C) usually specified at the rated power level of the diode. The clamping voltage is specified for a 10 x 1000μs impulse (10μs rise, 1000μs decay to the 50% point) developed by the U.S.A. Rural Electrification Agency (R.E.A.) to simulate lightning surges on telephone lines. The measured voltage is the sum of the breakdown voltage and a non-linear IR drop; both components are temperature sensitive. Since the specifications do not fit a snubber/clipper application, additional data and some data manipulation is necessary in order to determine if a diode will fit a particular requirement.

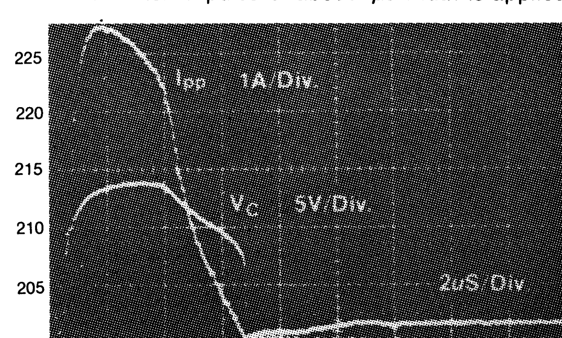
Figure 9 shows the voltage (V_C) and current (I_{PP}) waveforms for the 10 x 1000 impulse used for the standard clamping voltage test on a 200 volt breakdown device. The voltage wave shows the increase in voltage above the breakdown voltage of the diode at 25° C. The initial rise in voltage is the result of diode resistance. The slow rise to the peak value of 46V at about 800μs after pulse application is caused by the temperature rise of the junction. The major temperature dependent voltage change is caused by the temperature coefficient of the avalanche breakdown voltage.



Clamping Voltage Response For A 10 x 1000 Impulse

FIGURE 9

The waveforms of Figure 9 do not permit an accurate observation of the IR drop. A short test pulse is needed. Figure 10 shows the current and voltage waves when a pulse of about 5μs width is applied.



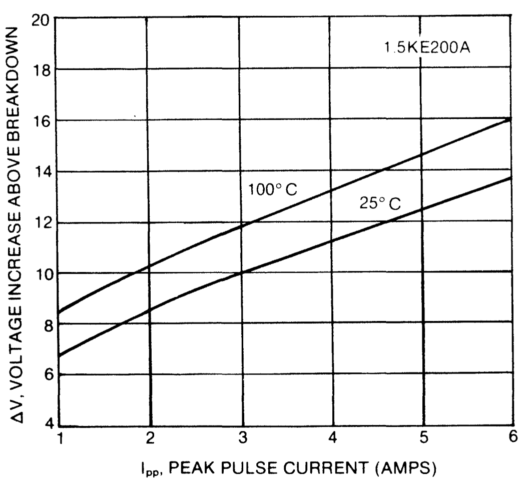
Clamping Voltage Response for a 5us Pulse
FIGURE 10

Some thermal effects are evident because the voltage does not track the fall in current; however, by reading the voltage at the peak of the current wave, the temperature contribution is small. Thus the IR drop is only 13 volts at the specified test condition of 5.5A.

Note that the temperature contributed component of voltage rise is almost three fourths of the total. This proportion has been found to be roughly the same regardless of the TVS diode voltage. Therefore, a more reasonable estimate of the voltage rise (ΔV) above breakdown under short pulse conditions (i.e., negligible instantaneous heating) can be found from:

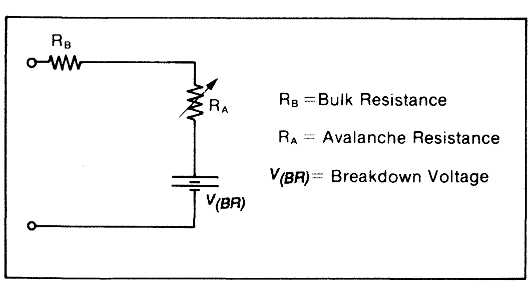
$$\Delta V = (V_{C(10 \times 1000)} - V_{(BR)}^{max})/4 \qquad 1)$$

The voltage from Equation 1 is roughly correct for the test current I_{PP} specified for the clamping level V_C. Typical data supplied by the manufacturer is shown in Figure 11. It indicates a fairly constant resistance at currents above one ampere. At low currents the avalanche resistance increases rapidly with decrease-



Clamping Voltage With A Fast Pulse
FIGURE 11

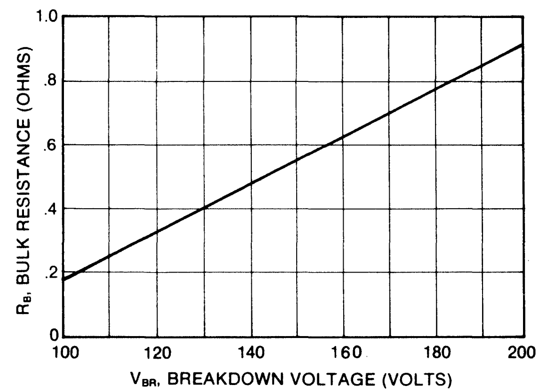
ing current. This behavior suggests a model as shown in Figure 12. At currents above one ampere, the resistor R_A may be replaced with a voltage taken from the y axis intercept of Figure 11. Also from Figure 11, the bulk resistance R_B may be read as approximately



Model For A Transient Voltage Suppressor Diode
FIGURE 12

0.9 ohms. At currents different from the specification, ΔV may be found by adding an IR drop correction term to the voltage from Equation 1.

The resistance R_B varies somewhat proportionately with diode breakdown voltage as shown on Figure 13. This data can be used directly to estimate voltage levels for diodes in the 100 to 200 volt range. Note that R_B of a 200 volt diode is over twice that of a 100 volt part. Consequently, diodes with breakdowns over 200 volts are usually made by stacking die. For example, a 400 volt part is composed of two 200 volt diodes. The data of Figure 13 is therefore useful in estimating clamping levels for all diodes with breakdowns over 100 volts.



Relation Of Bulk Resistance To Breakdown Voltage
FIGURE 13

In a snubber/clipper application, some average power $P_{M(AV)}$ is dissipated and will cause an increase in breakdown voltage. The upper limit $V_{(BR)}$ may be found from:

$$V_{(BR)} = V_{(BR)}^{max}{}_{@\,25°C} + \Theta_V(T_J - 25°C) \qquad 2)$$

Where Θ_V = Temperature coefficient of breakdown voltage in volts per degree centigrade

T_J = Juntion temperature (°C)

The junction temperature (T_J) is calculated either from:

$$T_J = T_A + R_{\theta JA} P_{M(AV)} \qquad 3a)$$

or

$$T_J = T_L + R_{\theta JL} P_{M(AV)} \qquad 3b)$$

Where T_A = Ambient temperature (°C)
$R_{\theta JA}$ = Junction to ambient thermal resistance
$P_{M(AV)}$ = Average power
$R_{\theta JL}$ = Junction to lead thermal resistance
T_L = Lead temperature

The thermal resistance is not often specified but can be found by using the rated power dissipation $P_{M(AV)}$ and temperature rating ($T_{J(max)}$), i.e.:

$$R_{\theta JA} = (T_{J(max)} - T_A)/P_T \text{ @ } T_A \qquad 4a)$$

or

$$R_{\theta JL} = (T_{J(max)} - T_L)/P_T \text{@} T_L \qquad 4b)$$

The total voltage is the sum of V_{BR} from Equation 2 and ΔV from Equation 1, corrected for the actual current through the TVS.

An empirical procedure is a convenient way to select the TVS. We recommend starting with the breadboard circuit, using a passive snubber and the highest available voltage grade of FET. A variety of TVS diodes covering the range of interest should be available. These could be series combinations of lower voltage parts, say 50V, 100V, and 200V devices. Alternately, a TVS whose anode is returned to a variable power supply could be used for circuits where the FET source is grounded. The REA 10 x 1000 current rating should be comparable to the FET on-state current.

The snubbing current in the TVS is observed with a current probe around the TVS lead. The current and duration of the pulse is noted as the TVS (or variable supply) voltage is varied. For each TVS voltage grade, the TVS snubbing power may be found from:

$$P_{M(AV)} = V_C \, I_{PP} \, t_p \, f_r \qquad 5)$$

Where $P_{M(AV)}$ = Average Power
V_C = Clamping Voltage of the TVS
I_{PP} = Peak Pulse Current
t_p = Average Pulse Width
f_r = Repetition Frequency

From this information, the tradeoff between TVS power dissipation and FET breakdown voltage (and hence cost) may be seen. Choosing the lowest voltage FET, consistent with a reasonably low cost appropriate TVS is easily done.

V. Finalizing The Design

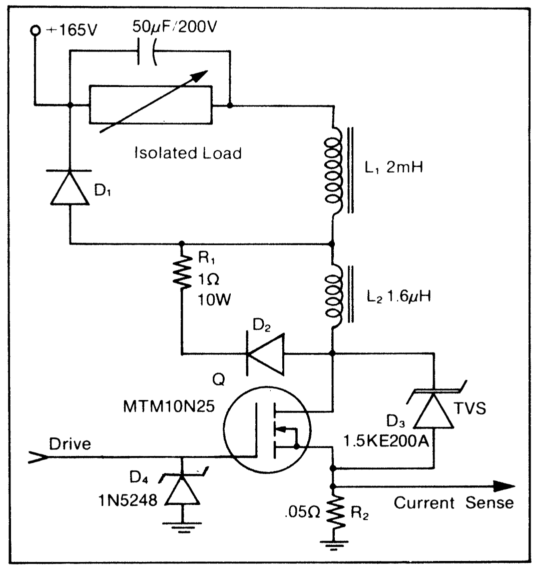
Use of the various procedures and equations discussed are illustrated in this section for three different applications. For convenience, Table 2 is presented. It summarizes the key specs for a popular series of TVS. ΔV for the 5μs pulse was calculated using Equation 1. V_C for the 5μs pulse was calculated by adding ΔV to the maximum breakdown voltage.

ELECTRICAL CHARACTERISTIC	PART NUMBER			
	1.5KE200A	1.5KE220A	1.5KE250A	1.5KE400A
Breakdown Voltage V_{BR} Volts Min/Max	190/210	209/231	237/263	380/420
Maximum Clamping Voltage 10 x 1000 V_C (Volts)	274	328	344	548
Maximum Peak Pulse Current I_{PP} (A)	5.5	4.6	5.0	4.0
Estimated Maximum 5us Volts Above $V_{(BR)}$ ΔV (Volts)	16	24	21	32
Estimated Clamping Voltage 5us Pulse V_C (Volts)	226	255	284	452
Maximum Temp. Coefficient $V_{(BR)}$ θ_V (V/°C)	.216	.214	.266	.432

TVS Specifications For Off-Line SMPS Use
TABLE 2

The first example is a constant current buck regulator operating from 120Vac, the most commonly used main in the U.S.A. The circuit of Figure 14 provides a constant 9 Amp output into a load which varies from 2 to 5 Ohms. The basic regulator is composed of choke L_1, FET switch Q and freewheeling fast recovery diode D_1. The switch current is sensed by R_2; the resulting feedback signal and the gate drive are referenced to ground. The repetition frequency is 33 KHz. The ambient operating temperature range is 0° C to 50° C.

This buck topology generates a current spike when the switch turns on, during the reverse recovery



8 Amp, 0V to 50V Constant Current Buck Regulator
FIGURE 14

interval of D_1. The small choke L_2 limits the magnitude of this current spike, but it stores energy and so is a source of voltage transients. Diode D_2 and resistor R_1 provide a path to dissipate this stored energy. The TVS diode D_3 snubs any remaining energy by clamping the drain-source voltage below the breakdown voltage of Q. Diode D_4 protects the gate.

The power switch has a rated BV_{DSS} of 250 volts. Since FETs are rated on the Absolute Maximum Rating System, this rating is only applicable at 25°C. The temperature coefficient of the FET is about 250mv/° C. Therefore, at 0° C, limit samples of the FET could breakdown at 243.8V, which sets the upper limit of the TVS clamping voltage at 0° C. The maximum junction temperature of the FET under worst case operating conditions will not exceed 100° C. Therefore 268.8 volts is the upper temperature limit of both FET breakdown and maximum TVS clamping voltage. The calculated FET breakdown voltages are listed in Table 3 along with other key data points for this example.

CHARACTERISTICS	WORST CASE LIMITS		
System Ambient Temp.	25°C	0°C	50°C
FET Breakdown Volts	250.0	243.8	268.0 @T_J = 100°C
TVS Breakdown (Vmin)	190.0	184.6	
TVS Breakdown (Vmax)	210.0		224.3 @ T_J = 91.2°C
Maximum Clamping Volts		215.0	240.2 @ T_J = 91.2°C

Key Voltages And Temperatures For Design Example 1
TABLE 3

The lower limit of the TVS should be above 184V to avoid conduction under the high line condition of 130Vac. The cold temperature limit is the worst case.

The waveshapes for this circuit using the best snubber/TVS combination were previously shown in Figure 6. Peak TVS current is approximately 3.2A; the current wave is modeled by a square wave having a 50ns pulse width. From Equation 5, the average power calculates as:

$$P_{M(AV)} = (200)(3.2)(50 \times 10^{-9})(33 \times 10^{3}) = 1.06W$$

Looking at Table 2, it appears that a 1.5KE200A would be satisfactory but the worst case conditions need to be checked. The maximum temperature coefficient is 0.216 Volts/°C. At 0°C, the breakdown could be as low as 190-(.216)(25) = 184.6 volts which is just barely satisfactory.

The upper junction temperature limit of the TVS is more difficult to ascertain. To minimize inductance the TVS should be mounted as close as practical to the transistor drain-source leads which will transfer some heat from the transistor to the TVS. The TVS lead temperature in the buck regulator measures 45°C at room ambient of 25°C. At the 50°C upper operating temperature of the equipment, the lead temperature T_L is 70°C. The TVS has a 5W rating at T_L = 75°C. $T_{J(max)}$ is 175°C. Using Equation 4b:

$$R_{\theta JL} = (175 - 75)/5 = 20°C/W$$

Using Equation 3b, the junction temperature is found to be:

$$T_J = 70 + (20)(1.06) = 91.2°C$$

The maximum breakdown voltage is found from Table 2 and Equation 2 as:

$$\overline{V_{(BR)}} = 210 + .216\,(91.2 - 25) = 224.3$$

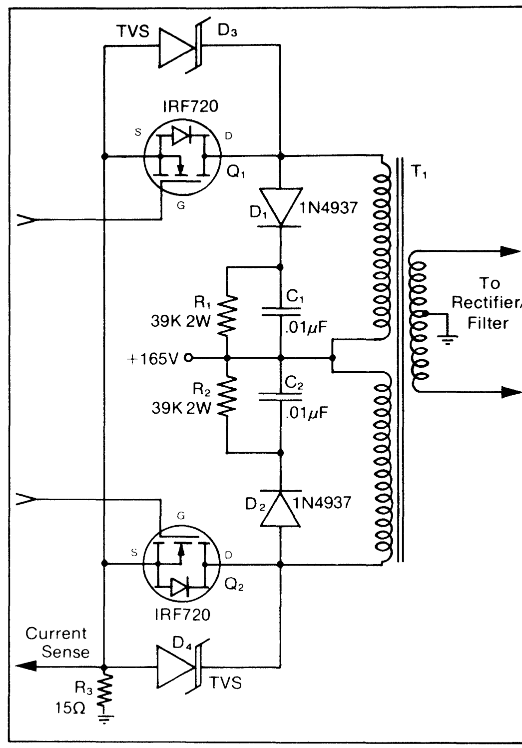
The IR drop (ΔV) in the TVS must now be determined. Data for the 1.5KE200A is shown in Figure 11. It indicates ΔV = 12 volts at 100°C and 10 volts at 25°C, typically. Another approach is to work from the 5.5A estimated ΔV limit of 16 volts. The current correction term is IR_B where R_B is shown in Figure 12 as 0.9 Ohms. Therefore the voltage correction for current is (3.2 - 5.5) (0.9) = -2.1V. Figure 11 indicates a +2 volt correction for T_J = 100°C. Finally:

$$V_{C(max)} = 224.3 + 16 - 2.1 + 2.0 = 240.2V$$

Thus the clamping voltage is well below the actual FET breakdown of 268 volts at T_J = 100°C.

The worst case situation at 0°C needs to be checked. With a high limit TVS and a conservative Θ_V of 0.2V/°C, the breakdown at 0°C is 210 + .2 (0 - 25) = 205V. At T_A = 0°C, the TVS junction will be at 20°C steady-state. Accordingly voltage ΔV at T_A = 0°C is less than the 10 volts shown in Figure 11, so that total V_C will not exceed 215 volts. The FET breakdown at 0°C was shown previously to be 243.8, well above the expected V_C.

The supply shown in Figure 15 is another example. It uses a pair of 400V FETs in a center-tapped push pull configuration. The dc bus is from a rectified 120Vac line (165Vdc). The push-pull topology subjects the FET to twice the bus voltage plus the overshoot due to leakage inductance. At high line the FET steady-state off-voltage is 368 volts.



A 100 Watt Push-Pull Converter

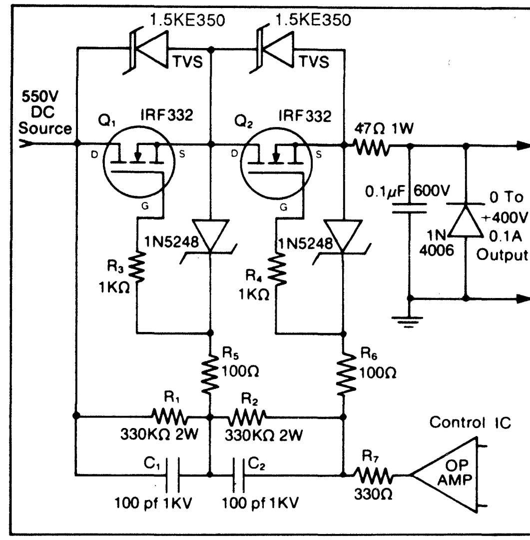
FIGURE 15

The leakage was minimized by careful transformer design. The leakage energy is snubbed primarily by diode-resistor-capacitor networks D_1—R_1—C_1 and D_2—R_2—C_2. The small remaining transient is clamped by the transient suppressing diodes D_3 and D_4. Since the FET breakdown voltage rating is 400 volts, the voltage margins in this situation are quite tight. In order to use the lower cost 400V FET, it was necessary to use a tightly specified TVS, having a minimum breakdown voltage of 370V and a maximum of 390V.

The last circuit to be described is a linear regulator. The circuit provides a 0 to 400 volt output with low noise and precise regulation from a 550V ±50V source. See Figure 16.

Two FETs in series are used with 400 volt ratings. Resistors R_1 and R_2 divide the applied voltage by 2 and drive the gate of Q_1. C_1 and C_2 provide dynamic voltage sharing by swamping FET and stray capacitances. The gate of Q_2 is driven by the control IC op-amp. The control circuitry is referenced to the source of Q_2 (output of circuit). The gate resistors R_3 and R_4 are parasitic suppressors. Resistors R_5, R_6 and R_7 limit fault currents fed to the control circuit in case of drain to gate shorts in either FET.

Protection in this case is used simply for random transients and consists of a 1.5KE350 TVS across each FET plus an 18V gate Zener. The TVS diodes also pass reverse fault currents back to the 550V bus.



Linear Regulator Using Series MOSFETs
FIGURE 16

VI. Summary

A method permitting use of lower voltage and hence lower cost FETs in switched-mode power supplies has been described. The technique involves using a carefully chosen Transient Voltage Suppressor (TVS) diode across the FET drain-source terminal to assure voltage spikes are within the FET rating. A method has been detailed for calculating the TVS performance from the data given on manufacturers data sheets. Its application to successful designs has been discussed.

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ACKNOWLEDGEMENT

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HARDENING POWER SUPPLIES TO LINE VOLTAGE TRANSIENTS

by
Bill Roehr

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Abstract

The power line transient environment is described. Transient voltages on the DC output of off-line rectifier/filter designs are shown. Protection schemes are discussed. An integrated rectifier/transient suppressor circuit is suggested as a cost-effective means of rendering the DC bus virtually immune to line transients.

INTRODUCTION

Unexpected line voltage transients are finally being recognized as a significant factor in the failure of Switching Mode Power Supplies (SMPS). As stated in a recent Navy publication[1]: "The most predominant power supply failure modes are caused by peak instantaneous transients and subtle factors within and external to the power supply. . . The following is a list of key points to consider when designing and evaluating a switching-mode power supply design: (1) Put voltage transient protection on the input power lines."

Until the publication of IEEE Standard 587-1980[2], now ANSI-IEEE C62.41, the designer of off-line SMPS was unsure of the ac line transient environment. Now switching power supplies can be designed to meet this standard and pulse generators are available which produce the waveform specified. The standard specifies that low impedances across the line in commercial and industrial environments should handle an 8/20 current waveshape (double exponential, 8μs rise time, 20μs decay to half of peak) having a peak amplitude of 3000A.

It should be understood that lightning induced transients propagate through a system as a current source looking for a low impedance path to ground. It is unlikely that most designers make provision for the rectifier and filter system to handle pulse currents up to 3000A, but a conservative design philosophy indicates that this should be done. The task is not easy, because component manufacturers do not generally consider this problem either.

A rectifier diode having a single-cycle 60Hz surge current rating exceeding 300A would most probably handle the 3000A, 8/20μs impulse specified in the standard, but the capability of rectifiers with lower ratings is questionable and needs to be verified. Rectifier diode surge capability will not be further addressed in this paper but clearly the rectifier must handle surge currents; the amount depends upon the protection scheme used.

In most off-line SMPS, the element which prevents excessive transient voltages from appearing across the DC bus and also bears the brunt of carrying the line to neutral transient pulse current is the filter capacitor. However, the charge delivered by the input transient and the voltage drop across the capacitor's ESL and ESR combine to develop a large overshoot voltage. This overshoot usually shorts the power switches connected to the DC output from the rectifier system.

Providing a network to limit voltage to a predetermined maximum rather than using higher voltage power switches offers a number of advantages to the power supply designer, independent of the choice of switching transistor (i.e., bipolar or FET). For a bipolar transistor of a given die area, lowering the breakdown voltage raises current gain and reduces all switching times. Reducing the breakdown voltage of a FET chip causes a marked decrease in on-state voltage—the principle determinant of power loss—because of the relationship $r_{DS(on)}$ of $V_B^{2.5}$. Alternately a smaller size power switch chip could be used to achieve the same performance while realizing a significant cost savings[3].

CONDITIONS IN AN UNPROTECTED SYSTEM

Most SMPS have an input network as shown in Figure 1. The impedance is used to limit start-up inrush current without causing excessive power loss. The series impedance may be a thermistor or a resistor which is often shunted by a triac to reduce power loss after start-up.

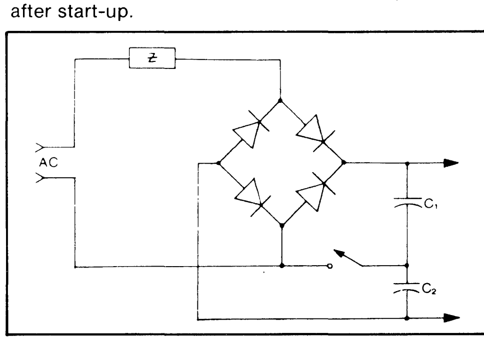

FIGURE 1—Basic line rectifier & filter for SMPS operating from 120/240V lines

It is not unusual to allow for a 20% tolerance on a 120/240V ac power line which puts the voltage crest at about 400 volts. Added to the dc level is the overshoot caused by the 3000A impulse. The usual switching power supply which operates from 120/240V inputs has two capacitors as part of the voltage doubler arrangement. The capacitors are connected in series when used on 240V. Thus, the total dc bus voltage spikes up to twice the individual capacitor transients when used on 240V.

The voltage waveform of Figure 2 reveals the presence of three components of overshoot: 1) a fast rising step caused by the di/dt of the wave flowing through the capacitors ESL, 2) an in-phase component caused by the current flow through capacitor ESL, and 3) a charge placed on the capacitor. Obviously, the transient voltage can be reduced by using a large valued capacitor having low ESL and ESR. The relationship is given in Equation 1.

$$v_C = \frac{1}{C}\int i\,dt + iR_s + L_s\frac{di}{dt} \qquad (1)$$

where

C = input filter capacitance
i = pulse current
R_s = capacitor equivalent series resistance (ESR)
L_s = capacitor equivalent series inductance (ESL)
di/dt = rate of rise of transient current

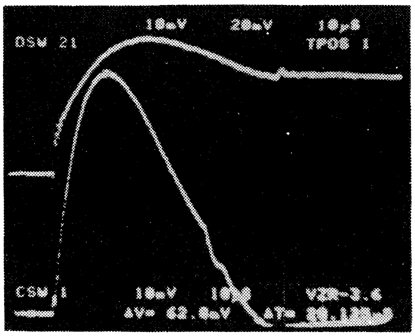

FIGURE 2—Capacitor waveform showing spike caused by current, and charge placed on capacitor
($C_1 = C_2 = 650\mu F$; Upper: 10V/div; Lower: 100A/div; Time: 10μs/div)

Measured voltage transients for some different capacitors when pulsed with 500A in the circuit of Figure 1 are shown in Table 1. With a 3000A pulse, overshoots of 6 times the values shown would occur. In all cases of 240V input, the transient voltage exceeds the typical 250V surge rating of a 200 volt capacitor. Even worse, the DC bus—possibly at about 400 volts because of high line, low load condition—is now up to at least 560 volts! No wonder power switch failures occur in seemingly well designed systems.

C_1, C_2	Type	Input	Peak Transient Voltage	Charge Voltage
540μF	Mepco/Electra 319DA541T250AMA1	120V	39V	30V
		240V	75V	58V
650μF	Mepco/Electra 3120EA651T200BHA1	120V	33V	23V
		240V	65V	46V
2100μF	General Electric 44A417052M21	120V	12V	7V
		240V	27V	16V

TABLE 1—Transient performance of the circuit of Figure 1
(Peak Pulse Current = 500A)

The spike could be clipped by a suitable TVS device but the charge voltage persists for too long and is not easily eliminated. The best solution is to minimize the amount of transient current being fed to the capacitor.

TRANSIENT PROTECTION TECHNIQUES

General principles of powerline transient protection have been described in a paper by Jacobus[4]. Almost concurrently, a specific module designed using these same principles which meets the 3000A specification of ANSI-IEEE C62.41 was described by Roehr and Clark[5]. Both papers deal with providing transient protection downstream from susceptible equipment. However, in a power supply, components which must be present for rectification and filtering may be used as part of the transient suppression network.

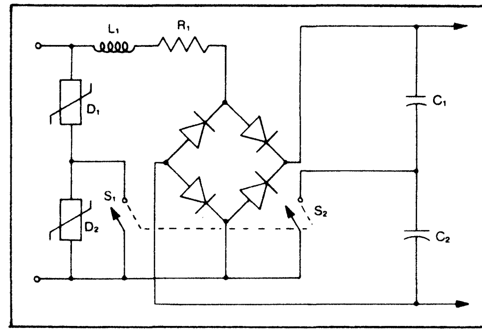

FIGURE 3—Basic circuit with MOV protection

When transient protection is used in a SMPS, it most often is nothing more than a single MOV across the line as shown in Figure 3. Table 2 shows test results taken in the circuit of Figure 3. Note that the worst transients occur in the 240V position when both switches are open. However, unless the MOV voltage is adjusted to fit the lower line voltage when used on 120V ac, (i.e., S_1 is closed), a very large capacitor current flows. For example, with only .5 ohm impedance the 77 volt spike appears across only one capacitor; with 3000A of input current the spike would increase to 115V which could exceed the surge voltage rating of the capacitor. The 106 volt transient increases to about 150 volts when 3000A is applied, bringing the bus voltage to 550 volts.

R_1 - L_1	Input	S_1	Peak Transient Voltage	Charge Voltage	Peak Capacitor Current
0.5Ω - 0μH	120V	Open	77V	54V	1080A
		Closed	24V	21V	440A
	240V	Open	106V	78V	780A
0.5Ω - 100μH	120V	Closed	18V	10V	190A
	240V	Open	74V	47V	440A
1.0Ω - 100μH	120V	Closed	12V	7V	130A
	240V	Open	53V	34V	300A

TABLE 2—Transient performance of the circuit of Figure 3
($R_1 = 0.5\Omega$, $C_1 = C_2 = 540\mu F$, Peak Pulse Current = 2000A)

To improve the transient suppression, the capacitor and/or the series impedance must be larger. The data in Table 2 taken with higher series impedances shows some improvement in lowering the transient levels but the transients are still higher than desired. For very low power supplies, the circuit of Figure 3 would be satisfactory if an appropriate series impedance and capacitor were chosen. For example, the data of Table 1 shows that the 2100μF capacitor allowed only 27V of overshoot with a 500A pulse. This capacitor would be satisfactory if used in Figure 3 with the 0.5 ohm-100μH input network.

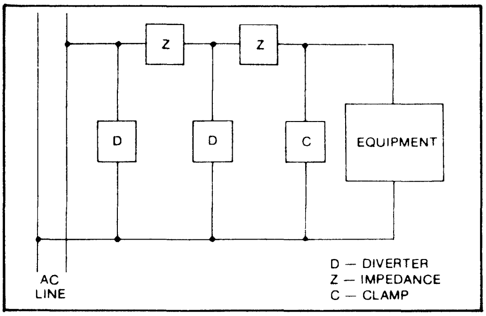

FIGURE 4—General topology for a protection network

A general topology for transient protectors is shown in Figure 4 using the notations of Jacobus. The diverter devices handle high currents but do not offer a precise control of voltage; gas tubes and metal oxide varistors (MOVs) are typical diverting elements. The **clamp** devices have lower impedance than the diverters but have lower energy handling capabilities. A TransZorb® Voltage Suppressor (TVS) Diode is a typical clamping device. The series impedances shown semi-isolate the various diverter and clamp stages by causing a voltage drop between them. To meet the requirements of ANSI-IEEE C62.41, Category B, and provide low output voltage clamping, the topology of Figure 4 has proven to be quite effective.

AN INTEGRATED RECTIFIER/SUPPRESSOR CIRCUIT

After some experimentation, the network of Figure 4 has been found to work quite well when the first diverter is a MOV, the first impedance is composed of the inrush current limiting resistance and an inductor, the second diverter is a silicon transient voltage suppressor and capacitor network, the second **impedance is a series R-L circuit, the clampings devices is the filter capacitor.**

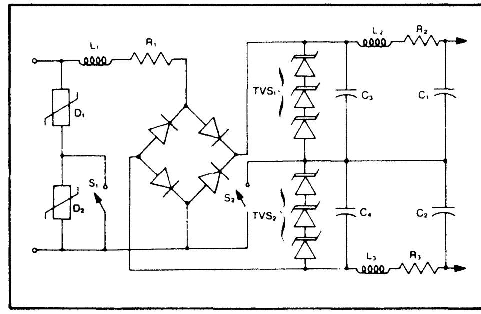

FIGURE 5—Circuit providing a high level of protection

Figure 5 (patent pending) shows a practical implementation of the circuit of Figure 4 which is virtually immune to transients. The resulting T filter network also attenuates high frequency noise in both directions, thus easing EMI filter requirements. Performance is shown in Table 3 when pulsed with 2500A. The resulting 25V peak transient appearing at the output is low enough to allow the use of 450V rated transistors in the power switching section.

Input	Peak Transient Voltage	Charge Voltage	Peak Capacitor Current
120V	9V	5V	103A
240V	25V	16V	163A

TABLE 3—Transient performance of the circuit of Figure 5
(Pulse Current ≈ 2500A, $L_1 = L_2 = L_3 = 100\mu H$, $R_1 = R_2 = R_3 = 0.5\Omega$ TVS Stack; 5KP60)

CONCLUSION

Only by ensuring a clean dc bus can a switching power supply be a reliable piece of equipment. Attention must be given to the lowly line rectifier and filter system to dramatically reduce line voltage transients. The circuit of Figure 5 provides a satisfactory clean dc level.

Reference

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2. "IEEE Guide for Surge Voltages in Low-Voltage AC Power Circuits," IEEE Standard 587-1980, Institute of Electrical and Electronic Engineers, 345 E. 47th St., New York, NY 10017
3. Jon D. Paul and Bill Roehr, "The Use of Transient Voltage Suppressor Diodes With Power Mosfets," Official proceedings of the 9th International PCI '84 Conference, Intertec Communications, Inc. 2472 Eastman Ave., Unit 34, Ventura, CA 93003.
4. N.M. Jacobus, "Designing Power Line Transient Protection Circuits," Proceedings of Powercon 11, D-4 pp. 1-11., Power Concepts, Inc., P.O. Box 5226, Ventura, CA 93003.
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AN EFFECTIVE TRANSIENT AND NOISE BARRIER FOR SWITCHING POWER SUPPLIES

by
Bill Roehr

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Abstract

The power the transient environment and conduction emission requirements are described. Transient voltages of the DC output of off-line rectifier designs are shown. Various protection and filter schemes are discussed. An integrated rectifier/transient suppressor/EMI filter circuit is suggested as a cost effective means of rendering the DC bus virtually immune to power line (ac mains) transients as well as keeping EMI from the switching power supply out of the ac mains.

INTRODUCTION

Switching power supply designers are aware that the interface between the ac mains and the rectified DC bus must be designed to solve two problems.

1. Component failure caused by line voltage transients.
2. Excessive conducted noise into the mains.

Unexpected mains voltage transients are now being recognized as a significant factor in the failure of Switching Mode Power Supplies (SMPS). As stated in a recent United States Navy Publication[1]:

"The most predominant power supply failure modes are caused by peak instantaneous transients and subtle factors within and external to the power supply. . . The following is a list of key points to consider when designing and evaluating a switching-mode power supply design:

(1) Put voltage transient protection on the input power lines."

With the publication of IEEE Standard 587-1980[2], now ANSI-IEEE C62.42, power supplies can be designed with assurance that failure caused by power line transients are rare. The standard specifies that low impedances across the line in commercial and industrial environments should handle an 8/20 current waveshape (double exponential impulse 8us rise time, 20us decay to half of peak) having a peak amplitude of 3000A. The reason for dealing with current is that lightning induced transients propogate through a system as a current source seeking a low impedance path to ground. Most designers presently do not make provision for the rectifier and filter system to handle pulse currents up to 3000A without producing excessive dc bus voltage, but a conservative design philosophy indicates that this should be done.

Since the emissions from switching power supplies can cause serious interference with broadcast and telecommunications services, governments have imposed conducted noise limits on equipment connected to the ac mains. Despite efforts to control the noise sources within the SMPS, filtering is needed at the power input terminals.

In an off-line switcher without transient voltage suppressor (TVS) devices, the ripple filter capacitor must handle the line to neutral transient pulse current. However, the charge delivered by the input transient and the voltage drop across the capacitor's ESL and ESR combine to develop an overshoot voltage. Given enough transient current, the overshoot is high enough to cause breakdown failures in the power switches connected to the DC output from the rectifier system.

The ripple filter capacitor also filters differential mode (line-to-line) noise to a degree. However, it is not adequate as a high frequency filter because of its ESL and ESR failing to allow equipment to meet the modern emission standards. In addition, the capacitor does nothing to reduce common mode noise which is usually the major EMI problem.

A common solution to the line transient problem is to add a transient voltage suppressor, usually a MOV, across the line and another MOV or two from neutral to ground and line to ground. However, to be effective, either an excessively large impedance must be placed between the MOV and the filter capacitor or an excessively large filter capacitor must be used.

The usual solution to the EMI problem is to add an ac mains filter to the power supply input. Often, on off-the-shelf item will permit compliance to the required agency regulations, but in some cases a custom design is required. Unfortunately, many filters cannot handle line transients without generating severe ringing or becoming damaged. The transient suppression and filtering requirements must be carefully coordinated if satisfactory results are to be obtained.

The material in the following sections will initially review the priciples of powerline transient suppression and filter circuits. Secondly, a way of integrating the two functions into a circuit which uses inductors to function both as current limiting impedances for transients and as filter reactors for EMI will be described.

REVIEW OF PROTECTION TECHNIQUES

The work in this paper is an extension of that reported in an earlier paper[3]. For completeness, the key findings and basic principles will be reviewed here and integrated into the newer material.

The voltage placed on the ripple filter capacitor by a transient consists of three components and is given approximately by Equation 1.

$$v_C = \frac{1}{C}\int i\,dt + iR_s + L_s\frac{di}{dt} \qquad (1)$$

where

C = input filter capacitance

i = pulse current

R_s = capacitor equivalent series resistance (ESR)

L_s = capacitor equivalent series inductance (ESL)

di/dt = rate of rise of transient current

Measured output voltage transients in the typical rectifier circuit of Figure 1 are shown in Table 1. The voltage components developed across R_s and L_s are essentially in phase with the current wave but the voltage caused by the charge persists for a relatively long time after the input transient has subsided. Both the

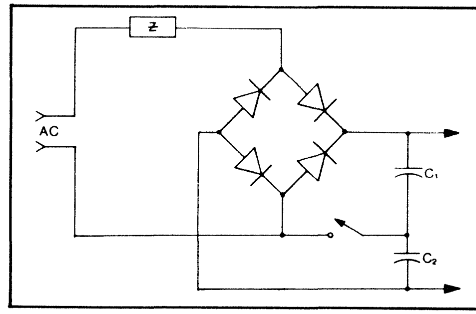

FIGURE 1—Basic line rectifier & filter for SMPS operating from 120/240 lines

peak voltage and the charge component are noted in the table.

Two values of impedance were used for Z. Z_1 consists of 10μH (from a circuit breaker) in series with a ½ ohm resistor while Z_2 consists only of a resistor. The small inductor caused a slight distortion of the 8/20 wave from the pulse generator as compared to the case when the ½ ohm resistor was used alone.

By studying the data in the table, several conclusions are evident:

1. The 240V input connection produces about twice the transient voltage than does the 120V connection. This is to be expected since the capacitors are connected in series.
2. What might appear to be minor differences in waveshape can produce significant differences in transient voltage. This also is not surprising; Equation 1 indicates that the rate of current rise and the area under the current waveform effect the peak transient voltage for a fixed level of peak current.
3. Even with a transient current of 500A, a commonly encountered value, the transients developed across the smaller filter capacitors could cause power switch failure, particularly if a high line condition were simultaneously encountered. At the 3000A level of the standard, the transient voltages would be 6 times the values in the table, spelling disaster for the power supply.
4. The larger the filter capacitor, the better the situation. This point is also obvious from Equation 1 and serves to explain why low-power personal computers and their peripherals have such a poor field service record.

C_1, C_2	Type	Input	Peak Transient Voltage		Charge Voltage	
			Z_1	Z_2	Z_1	Z_2
540μF	Mepco/Electra 319DA541T250AMA1	120V	39V	30V	30V	22V
		240V	75V	60V	58V	44V
650μF	Mepco/Electra 3120EA651T200BHA1	120V	33V	30V	23V	18V
		240V	65V	58V	46V	34V
2100μF	General Electric 44A417052M21	120V	12V	13V	7V	6V
		240V	27V	26V	16V	12V

TABLE 1—Transient performance of the circuit of Figure 1

($Z_1 = 10\mu H + 0.5\Omega, Z_2 = 0.5\Omega$)

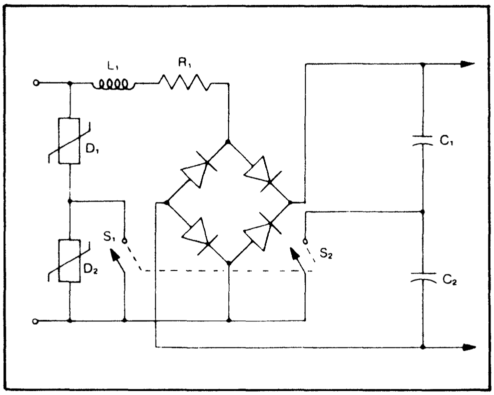

FIGURE 2—Basic circuit with MOV protection

Faced with this kind of evidence, many designers have concluded that transient voltage suppression devices are necessary. Quite often protection takes the form of little more than a single MOV across the line. Figure 2 shows another variation of the usual MOV protection circuit. In this circuit S_1 provides a means to adjust the MOV voltage to fit the line voltage. If this is not done, a very large capacitor current flows when the input filter is configured for 120VAC operation. This is illustrated in Table 2 in the top row with S_1 open and .5 ohm impedance. The large capacitor current produces a 77 volt spike across only one capacitor since the circuit operates as a voltage doubler; with 3000A of input current the spike would increase to 115V which could exceed the surge voltage rating of the capacitor. The 106 volt transient produced in the 240V circuit configuration increases to about 150 volts when 3000A is applied, bringing the bus voltage to 550 volts under a high line condition. A 550V bus is usually not acceptable.

To improve the transient suppression capability, the capacitor and/or the series impedance must be larger. Other data in Table 2 taken with higher series impedances shows some improvement in lowering the transient levels but the transients are still higher than desired. To obtain satisfactory transient performance with the circuit of Figure 2, it is necessary to further increase the series impedance and/or the filter capacitance. For example, the data of Table 1 shows that the 2100μF capacitor allowed only 27V of overshoot with a 500A pulse. This capacitor would be satisfactory if used in Figure 3 with a 0.5 ohm-100μH input network.

To improve transient suppression without using either excessively large series impedances or capacitors, a two-stage design proves to be cost effective. Further economies can be realized by placing the second stage TVS following the rectifier, because the output level is relatively constant regardless of whether 120V ac or 240V ac is applied to the input.

Figure 3 shows a practical circuit which is virtually immune to transients. The MOV TVS diverts most of the transient current back to the line. The series impedances limit the current available to the downstream devices. The TransZorb® avalanche diode TVS clamps at a low level which—together with the second inductor—prevents excessive transient current from entering the capacitor. When pulsed with 2500A, filter capacitor current measured 163A resulting in a 25V peak transient voltage appearing at the output. This level is low enough to safely allow the use of 450V rated transistors in the power switching section.

R_1 - L_1	Input	S_1	Peak Transient Voltage	Charge Voltage	Peak Capacitor Current
0.5Ω - 0μH	120V	Open	77V	54V	1080A
		Closed	24V	21V	440A
	240V	Open	106V	78V	780A
0.5Ω - 100μH	120V	Closed	18V	10V	190A
	240V	Open	74V	47V	440A
1.0Ω - 100μH	120V	Closed	12V	7V	130A
	240V	Open	53V	34V	300A

TABLE 2—Transient performance of the circuit of Figure 3
(R_1 = 0.5Ω, C_1 = C_2 = 540μF, Peak Pulse Current = 2000A)

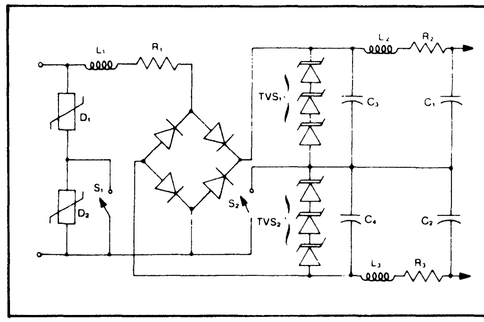

FIGURE 3—Circuit providing a high level of protection

LINE FILTER TOPOLOGIES

It is obvious that the network of Figure 3 also can serve as a high pass filter if capacitors are placed across the diverter and clamping devices. Under ideal matched conditions, rolloff is 24dB/octave, but should be at least 18dB/octave when working into powerline impedances. This type of filter charactersitic has been shown to be usually adequate if common mode filtering is also provided.

A recent paper[4] has shown the frequency rejection characteristics of various filter connections when driven with a switching power supply. The circuit of Figure 4 with the common mode coil facing the power supply, proves to be the most useful topology for switchers, although it is not a commonly used configuration. In order for it to serve also as the topology for transient suppression, the common mode inductor must be designed to have a specific value or leakage inductance, or discrete inductors must be added in series with each coil as shown.

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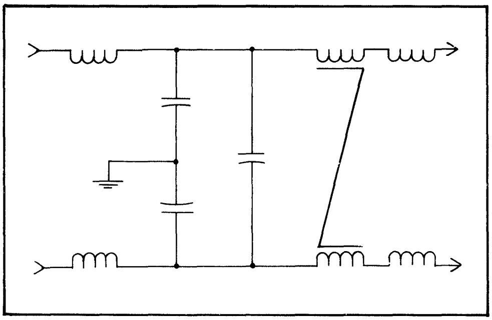


FIGURE 4—Useful filter topology for switchers

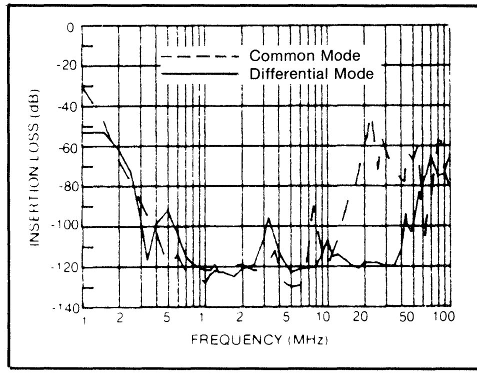


FIGURE 6—Insertion loss for circuit of Figure 5

TRANSIENT & NOISE BARRIER

Using the suppressor topology of Figure 3, and the filter topology of Figure 4, the circuit of Figure 5 results. It is a bi-directional noise and transient barrier for switchers. Although the values used are somewhat different from that described in the earlier paper, the transient performance is similar. With a 3000A, 8/20 pulse on the ac input, the transient output voltage on the filter capacitors was a mere 10 volts. Common mode voltage (i.e., 3000A input on both ac lines with respect to ground, output from dc plus voltage to ground) only exhibited a 3 volt transient.

Frequency response of the filter constructed on a lab breadboard is shown in Figure 6. For differential mode tests, the ac mains were terminated with 50 ohms. The input RF signal was applied to the dc (+) and the (-) terminals with the ripple filter capacitors removed. For common mode tests, the ac lines were connected together. Output voltage was read across 50 ohms connected between the ac inputs and ground. Attenuation exceeds 120dB over a wide frequency range. The design challenge in a filter is to have well designed broad-band coils. They must maintain their inductance into the low frequency range and be wound to minimize shunt capacitance. The cut-off frequencies can of course be easily altered by changing the values of the common mode capacitors C1 and C2, or the differential mode capacitors C3 and C4.

Parts	Values/Manufacturer's Part Number
C_1 - C_2	.005μF, 600V
C_3 - C_4	.1μF, 600V
L_1 - L_4	50μH - Dale
L_{cm}	1.2mH - Coilcraft E3495
M_1 - M_4	V130LA20 - G.E.
R_1 - R_4	0.5 Ohm, 2W
TZ_1 - TZ_2	3 - 1.5KE75A - General Semiconductor Ind.

TABLE 3—Parts list for circuit of Figure 5

CONCLUSION

Only by ensuring a clean dc bus can a switching power supply be a reliable piece of equipment. Attention must be given to the lowly line rectifier and filter system to dramatically reduce line voltage transients. To meet government imposed conducted noise requirements, powerline filtering is needed. Most cost effective transient and noise reduction can be achieved by a circuit which integrates the rectifier/filter, voltage limiting and high frequency filtering into a single circuit module.

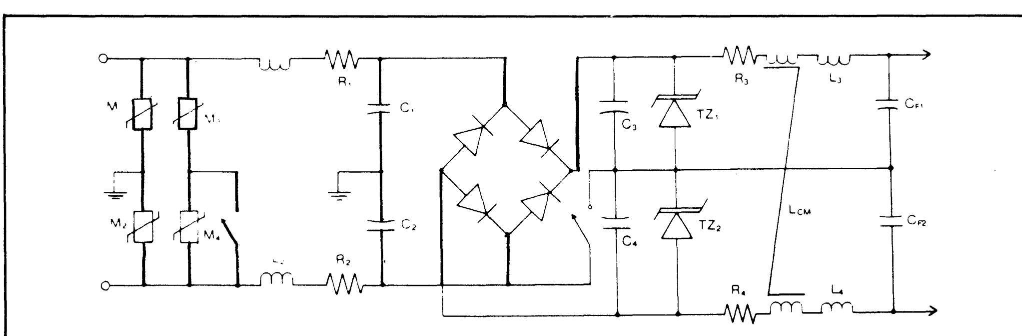


FIGURE 5—Complete circuit for a bidirectional transient and noise barrier integrated with the rectifier/filter system

A COMPARISON OF ZENER DIODES VS TRANSZORB® TRANSIENT VOLTAGE SUPPRESSORS

TransZorb Transient Voltage Suppressors (TVS) are silicon P-N junction devices which have been *"designed, manufactured, specified, and tested"* as transient voltage suppressors. TransZorb TVSs are characterized by their surge handling capability, fast response time, and low clamping voltage vs their small physical size.

Zener diodes are *"designed, manufactured, specified and tested"* as voltage regulators.Zener diodes inherently have a certain amount of surge capability, however, in most instances, the surge handling capability is not a specified parameter, and in situations where it is, its capability is normally characterized as typical.

Different Zener diode manufacturers use different manufacturing techniques in the formation of the junction. Both the process and the junction size are directly related to the surge performance, therefore, a standard JEDEC device purchased from one manufacturer may not have the same surge performance as the original prototype.

If zener diodes are going to be used in surge applications, the surge should be a specified parameter and part of the vendor qualification procedure.

A true test of comparison comes from actual evaluation of both zener diodes and TransZorb TVSs in the surge environment. As stated earlier, zener diodes do have surge handling capabilities, but are their response characteristics sufficiently adequate to protect the voltage sensitive circuitry???

TEST PROCEDURE

To perform this comparison, we selected a series of zener diodes from various manufacturers and subjected them to a family of pulses. The response curves for each device were recorded on a memory oscilloscope. Figure 1 is a block diagram of our test setup. The following page contains the actual photographs.

Our test program consists of 5 types of 10 V zener diodes ranging from 400 mV to 10 W and a 10 V TransZorb in a 1 W axial lead package. Each 10 V zener was energized with a 1 milliamp current and the oscilloscope used this 10 V reference as the base line. The vertical sensitivity of the oscilloscope was 1 V per division. We then superimposed a 100μs pulse on the "diode under test." The test pulse was sequentially increased from 1 amp, 2 amp, 5 amp, 10 amp, 20 amp, 40 amp to 80 amps or until the device failed. The pulses were at one minute intervals.

FIGURE 1—TEST DIAGRAM

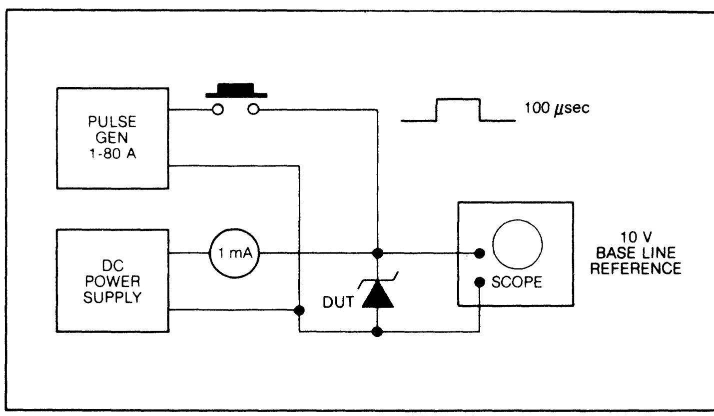
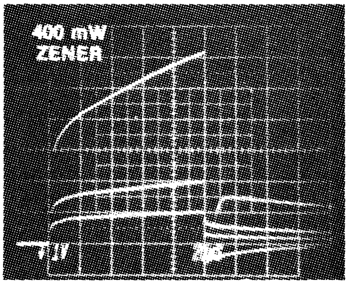


TABLE 1—SUMMARY OF TEST RESULTS

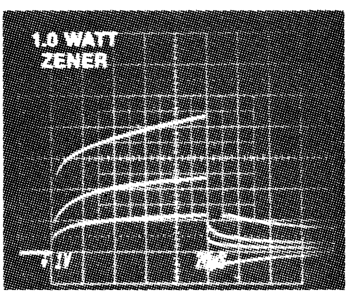
Type	Breakdown Voltage	Clamping Voltage @ Ipp in Amps							Mfg.
		1	2	5	10	20	40	80	
.4 W	10	11.0	12.0	16.2	*F	—	—	—	F
1.0 W	10	11.2	12.4	14.3	*F	—	—	—	I
2.0 W	10	11.6	12.2	13.3	15.3	F	—	—	T
5.0 W	10	10.4	10.5	11.0	11.9	13.9	F	—	U
10.0 W	10	10.3	10.4	10.6	10.9	11.6	12.9	F	I/
1.5 K 10 A 1.0 W	10	10.2	10.2	10.3	10.4	10.5	10.7	11.0	GSI

*F—Failed

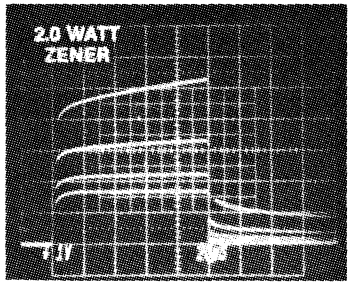
The change in clamping voltage is caused by both the resistance of the device and the thermal characteristics. The higher the slope, the higher the thermal performance.



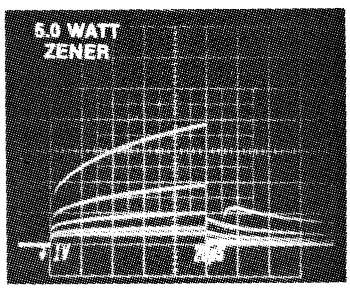
The 400mW, 10 V zener was subjected to a 1 amp, 2 amp and 5 amp pulse. The clamping voltage at the end of 100μs, 5 amp pulse was in excess of 16 V. Note the increase of the breakdown voltage caused by the thermal rise of the junction that occurs at the end of the 100μs pulse. This device failed when subjected to a 10 amp pulse.



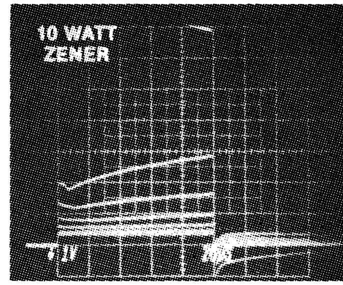
Depicts the 1 W, 10 V zener diode. There is a significant difference in the thermal slope of the clamping voltage due to the improved heat seeking capabilty of the 1 W package, however it is interesting to note that the dynamic resistance of this device is considerably higher than that of the 400mW zener indicating a smaller junction area. This device failed under the 10 amp pulse.



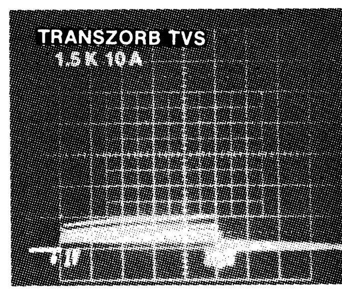
Depicts a 2 W, 10 V zener diode being subjected to 1 amp, 5 amp and 10 amp pulses. The unit failed at 20 amps. Again, it is interesting to note the difference of dynamic resistance and the thermal response curve which is appreciably different than the other two manufacturers. Packaging techniques do make a difference.



Depicts a 5 W "surge" rated zener diode. The clamping voltage at 20 amps was approximately 14 V. The device failed when subjected to a 40 amp pulse.



Depicts a 10 W zener diode. The discontinuity at the leading edge of the waveform is caused by package inductance where V is equal to $L_{di/dt}$. It is interesting again to compare the change caused by the thermal rise after the 100μs pulse. This device failed when subjected to 80 amps.



Depicts the 1.5K 10A TransZorb TVS over the entire family of pulse through 80 amps. The unit under test exhibited a clamping voltage of 11 V. The trailing curves also indicate the superb thermal characteristics of the package.

SUMMARY

Without a doubt, this series of tests graphically depict the differences between a zener diode and a TransZorb TVS. Transient surges caused by both the induced effects of lightning or by direct static discharge lie within the 40 to 80 amp spectrum, and therefore, the tests are applicable to actual environments.

Paper presented at EMC-ESD International Conference, Denver, Colorado, April 22, 1990

OPTIMIZING PLACEMENT OF BOARD LEVEL TRANSIENT VOLTAGE SUPPRESSORS

O. Melville Clark and Timothy M. Dalsing

ABSTRACT

With the increasing sensitivity of communication ports on silicon based equipment, many manufacturers have incorporated transient voltage suppression at the board level to provide transient immunity. The effectiveness of transient suppressor devices is installation dependent and requires that certain rules be followed to provide optimum protection. Utilizing a SPICE circuit simulation program to model parasitic impedances, the relationship between board layout, transient suppressor device structure, and effectiveness of the transient suppression is investigated. The data indicates that circuit board and device design constraints for fast rise-time transients, such as ESD, are significantly greater than those for other waveforms. Recommendations for optimum protection are made based on the data presented.

INTRODUCTION

Generally the most vulnerable components subject to electrical overstress (EOS) conditions are interface devices used by electronic equipment to communicate with the outside world. This is due to the fabrication techniques employed in constructing integrated circuits, which results in structures sensitive to high currents and high voltages. ICs fabricated with CMOS topography are especially sensitive to voltage transients, due to the presence of extremely thin layers of silicon dioxide separating the gates from the sources and drains in the NMOS and PMOS devices within the IC. Not only are these devices susceptible to EOS transients, but the ready exposure of interfacing cables to transient sources increases the risk of occurrence. It has often been reported [1] [2] [3] that interface ICs are the most likely component to fail in the event of an overstressing transient voltage.

EOS originates from a number of sources. The two most common are electrostatic discharge (ESD), which results from the release of charge present in the capacitance of the human body, and induced lightning, usually resulting in induced voltages on cables exposed to nearby lightning strikes. Transient voltages are also associated with nuclear detonations and induction from nearby power mains. However, this paper concentrates on ESD and lightning caused EOS. The traditional criteria for proper PC board layout stresses minimum parasitic impedance in series with the Avalanche Junction Transient Voltage Suppressor (AJTVS) when placed across the protected IC. Black [4] has reported that silicon AJTVS devices clamp at excessively high voltages when subjected to the fast rise-times of ESD. He attributed this effect to unknown factors. Dalsing and Neill [5] found, through SPICE modeling, that for ESD transients the effectiveness of the suppressor critically depends on the parasitic impedances of the PC board traces, the parasitic impedance of the AJTVS, and the impedance of the load. They found that for low impedance loads characteristic of line drivers, the parasitic impedance of the circuit board traces was less critical than for the much higher impedance loads of line receivers. This was attributed to a resonant condition set up by the PCB traces, the parasitic impedance of the AJTVS, and the load impedance.

The object of this paper is to contrast the different methods for optimal PCB layout and transient suppressor design for protecting I/O ports from ESD and lightning threats. Techniques for maximizing the performance of the suppressor are analyzed using SPICE modeling.

SPICE MODELS AND PARAMETERS

A 386 based personal computer running PSPICE [6] was used for all simulations. The standard models that came with the software were used for all simulations.

Overview of SPICE Models for ESD Simulation

To model the characteristics of an TVS protected I/O port, an equivalent circuit was derived. A schematic of the circuit is shown in Figure 1. The major components of the circuit are:

1. *ESD Generator:* the model for the ESD generator is designed to meet the short circuit current waveform requirements of the highest severity level of the IEC 801-2 standard, defined by the International Electrotechnical Commission [7]. Figure 2 shows the short circuit current waveform produced by this circuit, where the peak current is 30A, the current at 30ns is 16A, and the current at 60ns is 8A.

2. *Unprotected PCB Trace:* line 1 represents the unprotected circuit board trace which is connected to peripherals or other devices in the external world. This line is described as a transmission line model using 25 discrete segments, where the inductance is the inductance of the PCB trace and the capacitance is the line to ground plane capacitance. The value of the components within the line are calculated using the line length and the per unit length inductance and capacitance.

3. *Transient Voltage Suppressor:* the TVS device is modeled using the standard diode models in PSPICE, as shown in Figure 3, with a series inductor included external to the model representing the inductance of the devices leads and other parasitics. A "bi-directional" device is modeled, which simply means the characteristics of the device are the same for both positive and negative polarities. This configuration and the values for the model parameter are common for TVS devices used to protect I/O ports, such as those used for RS-232 signal transmission.

4. *Protected PCB Trace:* line 2 represents the protected circuit board trace which is connected to the IC requiring protection. The same segmented model is used.

5. *Load:* the protected IC is modeled as a simple impedance, consisting of either a resistor or a resistor and capacitor in parallel. A typical RS-232 receiver is modeled by a 4k ohm resistor, and an RS-232 driver is modeled by a 300 ohm resistor in parallel with a 470 pF capacitor, which is externally connected to the line to limit the dv/dt of the driver.

The values for the parameters are given in Table I. For this study, a standard two-sided circuit board 0.063 inches thick was utilized. The PCB traces on the component side of the board are 0.010 inches wide, and the backside of the board is entirely covered with a ground plane. The parameter values for the PCB traces was directly measured utilizing an HP 4275A LCR meter.

Description of Model Parameters for ESD Simulation

For the evaluation of board layout techniques and TVS device structure the length of lines 1 and 2, and the value for the TVS inductance, were varied, as shown in Table II. The values for the line inductances and capacitances were calculated from the length and the per unit length values shown in Table I. The values for the TVS device inductances are representative of axial leaded, surface mount, and Kelvin type constructions. Two additional runs were made without the suppressor to evaluate its contribution.

The diode model parameters represent typical values for a transient voltage suppressor device commonly selected for use in this application.

Overview of Model for Lightning Simulation

A typical model for an induced lightning surge is an exponential current waveform which rises to its peak in 1.2 μseconds, then decays to half the peak value in 50 μseconds. For this paper the open circuit voltage waveform described in the IEC 801-5 standard for data lines is used. Due to the low values of di/dt for this waveform parasitic inductances and capacitances on printed circuit boards become less significant and the parasitic resistances become dominant. For example, the maximum di/dt possible with the IEC 801-5 standard is 24A/1.2μsecond, or 20A/μsecond. The worst case voltage drop across a 10cm line (with L=105nH) is 5V. The simulations reveal that the worst case di/dt is actually about 18.2A/μsecond, for a voltage drop across a 10cm line of 4.6V, which is relatively small compared to the ~1100V capacitor voltage of the generator. Therefore, for the lightning surge case, the circuit board traces are modeled as simple resistors. A schematic of the circuit is shown in Figure 4. The short circuit current waveform is shown in Figure 5.

Description of Model Parameters for Lightning Simulations

In the same manner as the ESD models, the line lengths were varied to examine their effect on suppressor performance. The diode model resistance is also varied to show the effect of suppressor construction (i.e., size) on its effectiveness. Table III shows the values for the model parameters and Table IV gives the variable quantities.

RESULTS OF SPICE SIMULATIONS

Results for ESD Simulations

As observed in Table V, the peak voltages at the load with a 30V AJTVS protector diode ranged very broadly, from approximately 50V up to slightly less than 2,000V for the high impedance line receiver. The most critical parameter was LT, the parasitic impedance in the protector leads, with peak load voltages in excess of 1300V observed for 10nH, typical of an axial leaded device. Lower parasitic inductance in the surface mount suppressor provided greater reduction, with best results achieved with a Kelvin contact structure having a parasitic lead inductance well below 1 nH. This will be discussed in detail later.

Figure 6 summarizes the data in Table V for RL values of 4000 Ohms, characteristic of RS-232 line receivers. Each curve illustrates a specific layout of the component network. The effect of suppressor lead inductance, LT, is graphically illustrated in this group of curves. Note that there is some advantage to having a longer trace before the suppressor and followed by a short trace between the suppressor and the load as shown in the 10/1 plot.

Reductions in load voltages as a function of suppressor parasitic impedance is further illustrated in Figures 7, 8 and 9. Note in Figures 7 and 8, that the resultant pulse becomes a rapidly damped oscillation at about 1 GHz. The near zero value of LT, which produces the greatest protection effectiveness, reduces clamping voltages to levels well below failure thresholds as described in publications produced by The Reliability Analysis Center [9] in Rome, NY.

Without an AJTVS, the simulated ESD voltage component across the 4000 Ohm load approaches the source voltage as depicted in Figure 10.

For the lower impedance line driver supplemented with a 470pf capacitor (normally required to reduce the devices slew rate and EMI/RFI emission), there was, by comparison with the high impedance receiver, significantly lower voltages at the load for all test conditions as shown in Figure 11. There are a few anomalies in the load voltages attributed to variations in resonance in the total circuit; however the resultant effect of these differences are not significant as voltages are well below failure thresholds for ESD spikes.

Figure 12 depicts the load voltage for a 10 / 1 cm line configuration with the worst case LT value of 10 nH. Although peak voltage is 69V, protection provided would be well within an acceptable level.

Even without a protective device, there is significant attenuation of the incident ESD voltage when applied to the line driver configuration as shown in Figure 13. The test voltage of the ESD generator is reduced by 85% of its original value by the RLC network of this particular load.

Results for Lightning Simulations

The same circuit and component configurations for lightning surge produced entirely different results than those for ESD, as expected, due to the much slower rise times of lightning. The low voltages appearing across the loads, shown in Table VI, were almost identical for both line drivers and receivers under all conditions of varying trace lengths and LT.

The L(di/dt) effects of the PC board traces were small and insignificant, so the trace resistances were used in the SPICE model as explained earlier. The result is that the voltage across the load was limited only by the clamping voltage of the AJTVS, with all other components of the circuit having negligible effects.

The result of using lower power rated AJTVS devices is illustrated by simulations having higher values of RS (Diode). Peak voltages at the load are correspondingly increased as illustrated in the last three lines of Table VI with RS (Diode) values of 0.39, 0.96, and 1.12 Ω.

Recommendations

From the data shown above, one can expect significant differences in voltages developed across line drivers and line receivers depending on the transient source, the board layout, the parasitic inductance in the transient current path of the AJTVS and the load impedance. The slow rise times of lightning can be adequately suppressed even with relatively high values of parasitic inductance in the suppressor lead lengths, hence board layout is not as critical for lightning surge as it is for the much faster rise-times of ESD. Thus it can be concluded that a circuit which passes lightning surge tests may not necessarily be immune to ESD.

The importance of optimum performance of transient voltage suppressors is increasing with technological changes. For example, industry is rapidly converting bipolar signal communication ports with lower power consuming CMOS equivalent types. This contributes to higher vulnerability accompanied by lower threshold failure levels; however, even very sensitive devices can be protected to the threats defined in industry standards using the proper AJTVS devices and following good practice in PC board layout.

These guidelines include the following:

1. Include as much inductance in the PC board input to the suppressor device as the design will allow while maintaining minimum trace length between the suppressor and the protected IC.

2. Reduce parasitic inductance in the suppressor path to an absolute minimum. This includes conductor length on the suppressor, along with any transient current path included in a PC board trace.

3. Use surface mount devices where possible as these devices have inherently lower parasitic inductance than axial leaded devices.

4. Due to the high (about 1 Ghz) waveform produced with high impedance loads, traces connected to sensitive circuitry should be routed away from suppressed input lines.

5. ESD and other transients can damage precision resistors to out of tolerance levels and should not be overlooked when planning suppression.

Emerging transient protection technology can be expected to respond to industry needs by optimizing protector performance through the use of Kelvin contact structures as illustrated in Figure 14. A suppressor of this structure has been calculated to have parasitic inductance values of the order of .01 nH. As illustrated by the data in this report, such a device will provide adequate protection for the fast rise-times of ESD and relax some of the constraints in circuit board layout.

CONCLUSION

Performance of transient voltage protective devices can be enhanced by PC board layout. Trace inductance ahead of the AJTVS improves performance while the suppressor parasitic lead inductance plays the major role in overall performance.

The fast rise-times of ESD are significant in layout while the slower rise times of lightning appear to be a minor factor in inhibiting protector performance. Other threats, such as EFT with its 5ns rise time, would also be expected to influence board design.

Within the overall scope of transient voltage protection, the data presented in this report indicates that adequate protection can be implemented to meet the conditions as set forth by the international standards IEC 801-2 and IEC 801-5 for both ESD and lightning related surge threats.

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[1] M. Tetreault and F. Martzloff, " Characterization of Disturbing Transient Waveforms on Computer Data Communication Lines", EMC Proceedings, Zurich, March 1985, pp. 423-428.

[2] A. Urbeita, "Sensitivity Study to EOS/ESD of Bipolar Integrated Circuits", Proceedings of EOS/ESD Symposium, EOS-8, 1986, p.214.

[3] F. Martzloff, "Coupling, Propagation and Side Effects in an Industrial Building System", IEEE/IAS Conference Proceedings, Oct. 1988, p. 1467.

[4] E. Black, "Real Circuit Performance of ESD Protection Devices", Proceedings of EOS/ESD Symposium, EOS-8, Sept. 1991, pp. 15-17.

[5] T. Dalsing, and D. Neill, "Suppression of Defined IEC Waveform by PC Board and Silicon Avalanche Components," PCIM Power-Conversion Conference Proceedings, Oct. 1991, pp.305-320.

[6] MicroSim Corporation, Version 4.05a

[7] IEC 801-2, Electromagnetic Compatibility for Industrial Measurement and Control Equipment, Second Edition, Part 2: 1991-04.

[8] IEC 801-5, Electromagnetic Compatibility for Industrial Measurement and Control Equipment, draft, Jan, 1991.

[9] VZAP-91, Electrostatic Discharge Susceptibility Data, Reliability Analysis Center, Rome, New York, 1991.

Circuit Module	Parameter	Value	Units
ESD Generator	LK	50	nH
	RK	225	Ω
	CK	7.5	pF
	V_{CK}(Initial)	8	kV
	LS	5.8	uH
	RS	340	Ω
	CS	110	pF
	V_{CS}(Initial)	8	kV
Lines 1 and 2	L	10	nH/cm
	C	0.1	pF/cm
	(See Table II for line lengths)		
Transient Voltage Suppressor	BV	30	V
	IBV	1	mA
	IS	1	μA
	RS	0.2	Ω
	CJO	1000	pF
	LT	See Table II	
Load	RL	See Table II	
	CL	See Table II	

Table I - SPICE Parameters for ESD Simulation

Run Name	Line 1 (cm)	Line 2 (cm)	LT (nH)	CL (Pf)	RL (Ω)
ESD1	10	10	10	None	4000
ESD2	10	1.0	10	None	4000
ESD3	1.0	10	10	None	4000
ESD4	1.0	1.0	10	None	4000
ESD5	10	10	3.0	None	4000
ESD6	10	1.0	3.0	None	4000
ESD7	1.0	10	3.0	None	4000
ESD8	1.0	1.0	3.0	None	4000
ESD9	10	10	0.01	None	4000
ESD10	10	1.0	0.01	None	4000
ESD11	1.0	10	0.01	None	4000
ESD12	1.0	1.0	0.01	None	4000
ESD13	10	10	10	470	300
ESD14	10	1.0	10	470	300
ESD15	1.0	10	10	470	300
ESD16	1.0	1.0	10	470	300
ESD17	10	10	3.0	470	300
ESD18	10	1.0	3.0	470	300
ESD19	1.0	10	3.0	470	300
ESD20	1.0	1.0	3.0	470	300
ESD21	10	10	0.01	470	300
ESD22	10	1.0	0.01	470	300
ESD23	1.0	10	0.01	470	300
ESD24	1.0	1.0	0.01	470	300
ESD1A	10	10	No TVS Device	None	4000
ESD13A	10	10	No TVS Device	470	300

Table II - Values for Variable Parameters for ESD Simulation

Circuit Module	Parameter	Value	Units
Surge Generator	CS	10.0	μF
	RS	1.14	Ω
	LS	4.5	μH
	V_{CS}(Initial)	1.1	kV
	RW1	13.0	uH
	RW2	21.0	Ω
	RD	40.0	Ω
Lines 1 and 2	R	26	mΩ/cm
Transient Voltage Suppressor	BV	30	V
	IBV	1	mA
	IS	1	μA
	RS (Diode)	0.2	Ω
	CJO	1000	pF
Load	RL	See Table IV	
	CL	See Table IV	

Table III - SPICE Parameters for Surge Simulation

Run Name	Line 1 (cm)	Line 2 (cm)	RS (Diode)	CL (pF)	RL (Ω)
SURGE1	10	10	0.2	None	4000
SURGE2	10	1.0	0.2	None	4000
SURGE3	1.0	10	0.2	None	4000
SURGE4	1.0	1.0	0.2	None	4000
SURGE5	10	10	0.2	470	300
SURGE6	10	1.0	0.2	470	300
SURGE7	1.0	10	0.2	470	300
SURGE8	1.0	1.0	0.2	470	300
SURGE1A	10	10	0.39	None	4000
SURGE1B	10	10	0.96	None	4000
SURGE1C	10	10	1.12	None	4000

Table IV - Values for Variable Parameters for Surge Simulation

Line 1 (cm)	Line 2 (cm)	LT (nH)	CL (pF)	RL (Ω)	Peak Voltage at Load (V)
10	10	10	None	4000	1981.9
10	1.0	10	None	4000	1326.5
1.0	10	10	None	4000	1815.8
1.0	1.0	10	None	4000	1665.8
10	10	3.0	None	4000	674.7
10	1.0	3.0	None	4000	441.7
1.0	10	3.0	None	4000	660.2
1.0	1.0	3.0	None	4000	582.0
10	10	0.01	None	4000	78.8
10	1.0	0.01	None	4000	45.6
1.0	10	0.01	None	4000	79.3
1.0	1.0	0.01	None	4000	48.9
10	10	10	470	300	69.0
10	1.0	10	470	300	69.8
1.0	10	10	470	300	69.2
1.0	1.0	10	470	300	66.8
10	10	3.0	470	300	66.7
10	1.0	3.0	470	300	56.3
1.0	10	3.0	470	300	66.8
1.0	1.0	3.0	470	300	56.3
10	10	0.01	470	300	66.2
10	1.0	0.01	470	300	65.0
1.0	10	0.01	470	300	66.1
1.0	1.0	0.01	470	300	64.7
10	10	No TVS Device	None	4000	9271.6
10	10	No TVS Device	470	300	1251.5

Table V - SPICE Results for ESD Simulations

Line 1 (cm)	Line 2 (cm)	RS (Diode)	CL (pF)	RL (Ω)	Peak Voltage at Load (V)
10	10	0.2	None	4000	40.2
10	1.0	0.2	None	4000	40.2
1.0	10	0.2	None	4000	40.3
1.0	1.0	0.2	None	4000	40.2
10	10	0.2	470	300	40.2
10	1.0	0.2	470	300	40.2
1.0	10	0.2	470	300	40.2
1.0	1.0	0.2	470	300	40.2
10	10	0.39	None	4000	49.1
10	10	0.96	None	4000	74.8
10	10	1.12	None	4000	81.8

Table VI - SPICE Results for Surge Simulations

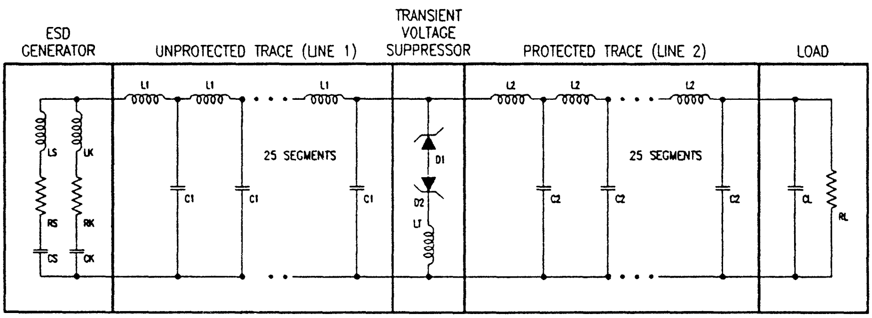


Figure 1 - Circuit for SPICE ESD Analysis

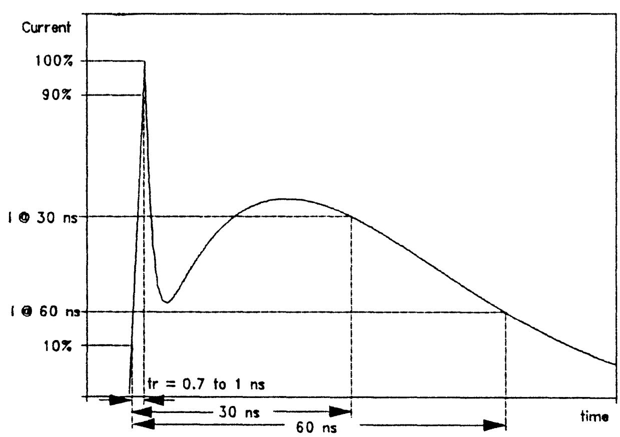


Figure 2 - IEC 801-2 Short Circuit Current Waveform

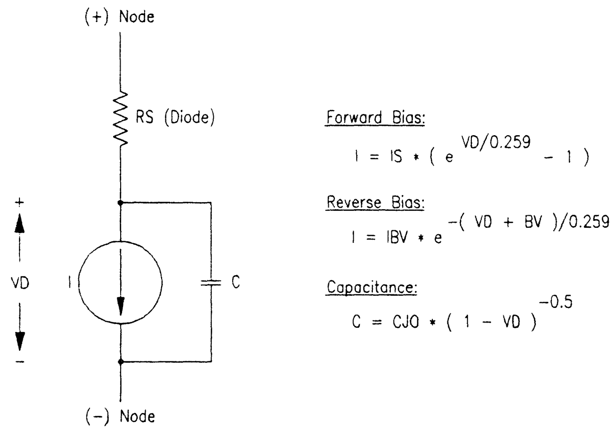


Figure 3 - SPICE Diode Model

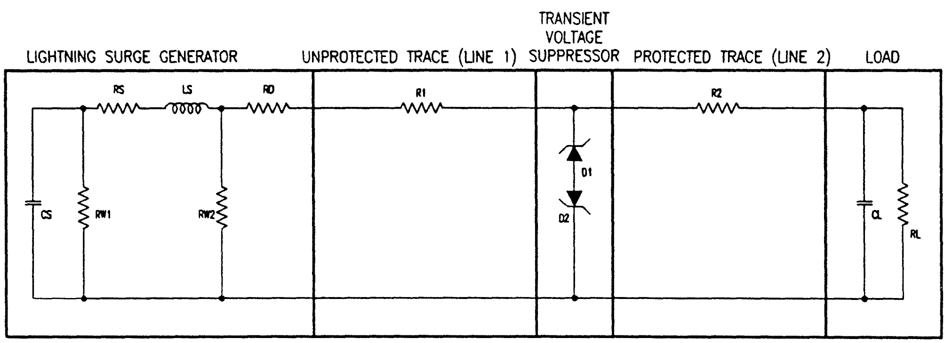


Figure 4 - Circuit for SPICE Surge Analysis

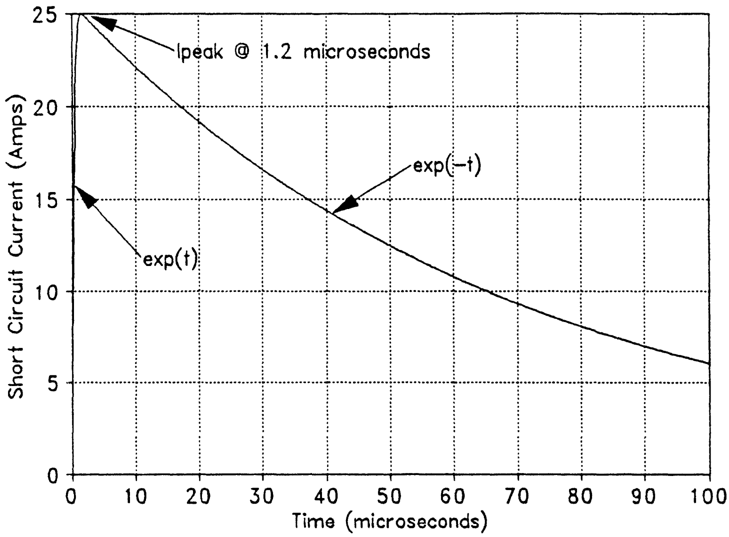


Figure 5 - Short Circuit Waveform for IEC 801-5 Standard

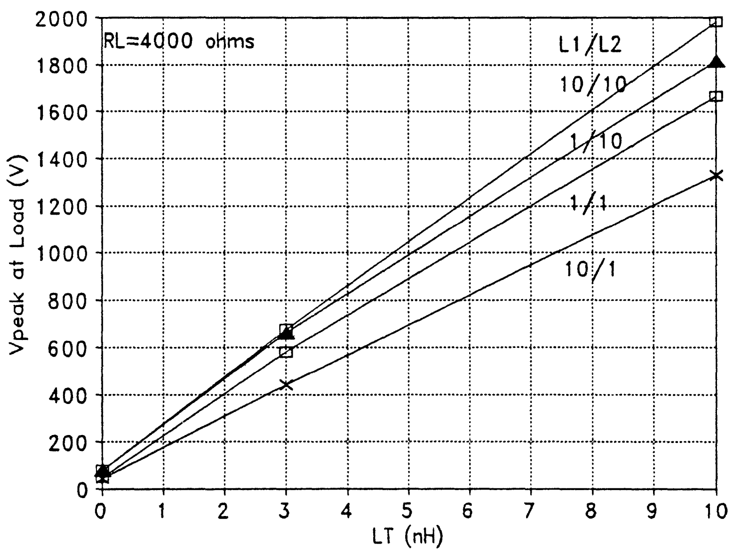


Figure 6 - Peak Voltage at Load vs. TVS Series Inductance
ESD Simulations: Receiver Case

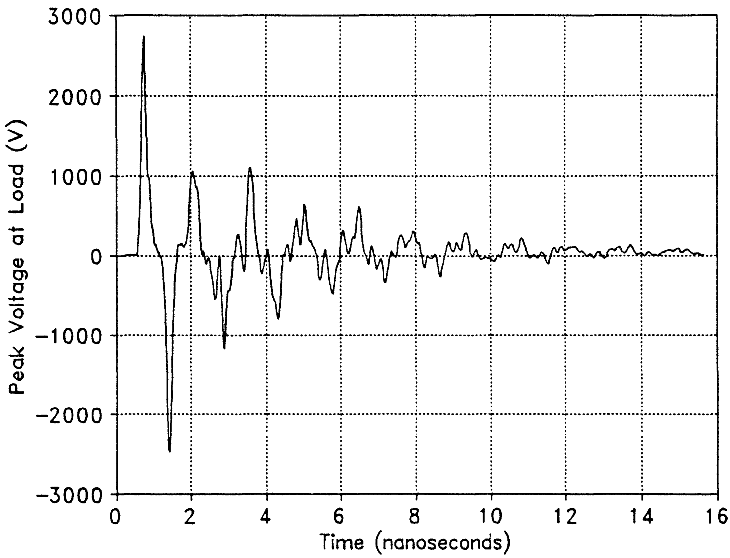


Figure 7 - Transient Plot for Run ESD1

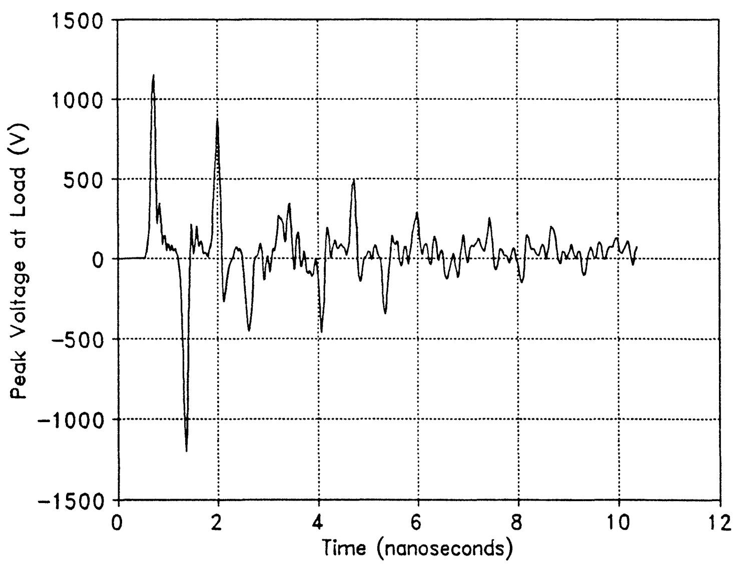


Figure 8 - Transient Plot for Run ESD5

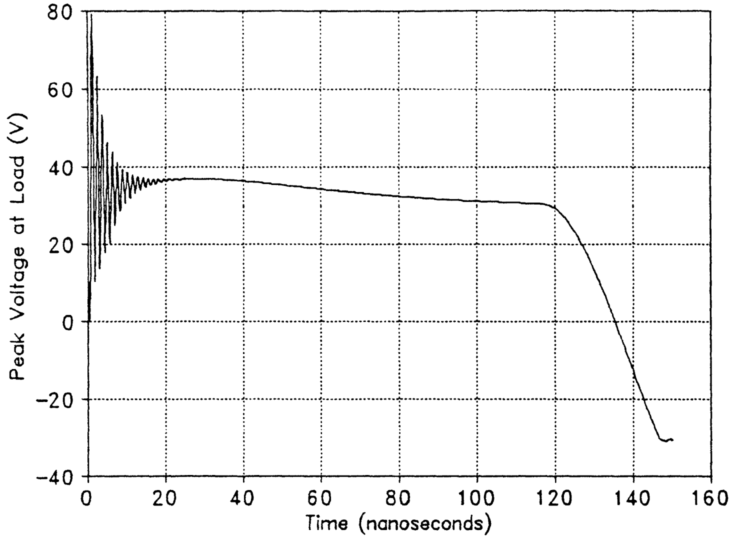


Figure 9 - Transient Plot for Run ESD9

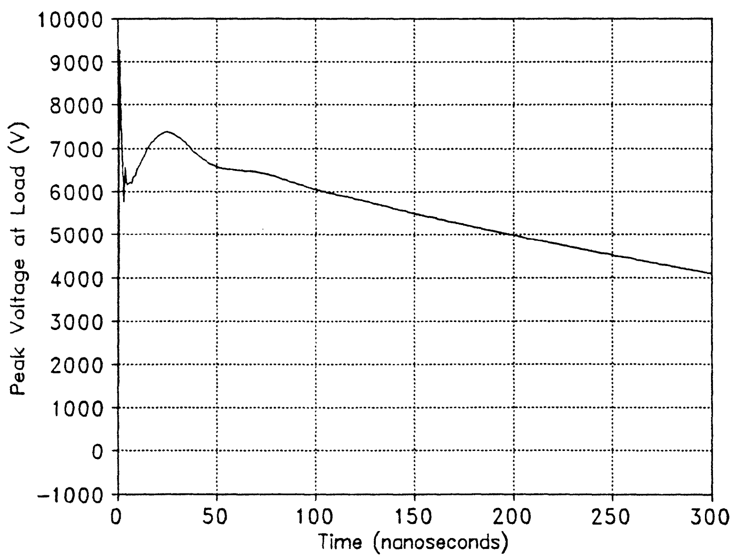


Figure 10 - Transient Plot for Run ESD1A

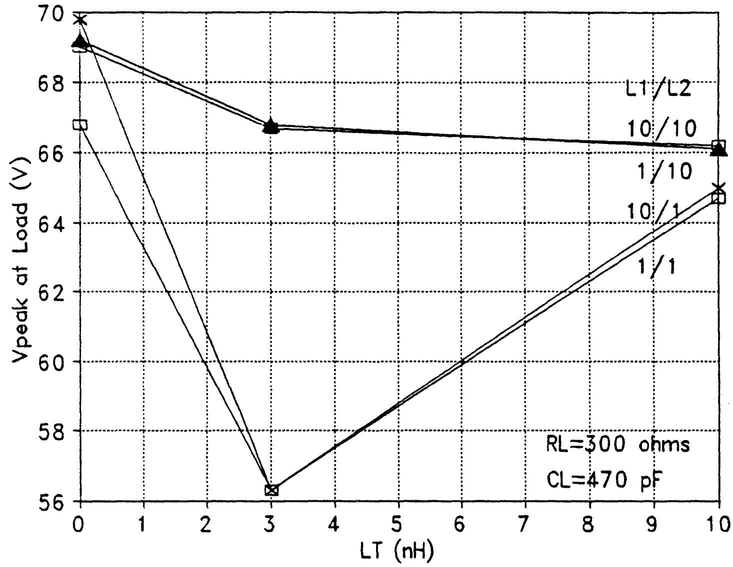


Figure 11 - Peak Voltage at Load vs. TVS Series Inductance ESD Simulations: Driver Case

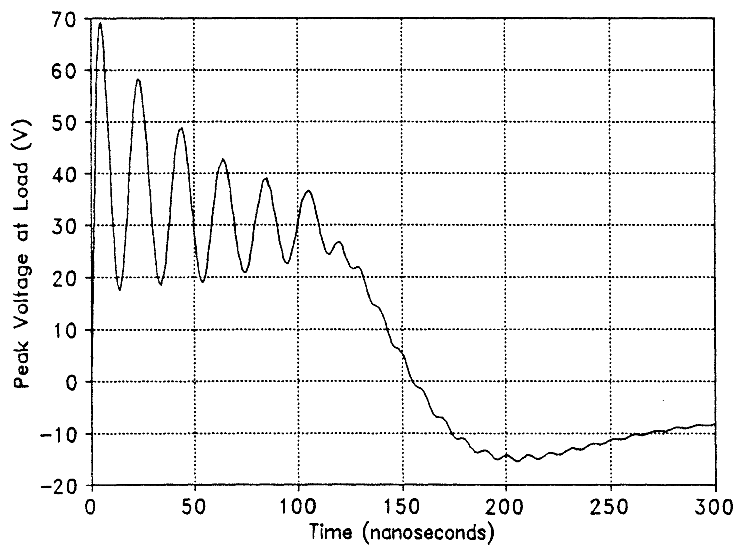


Figure 12 - Transient Plot for Run ESD14

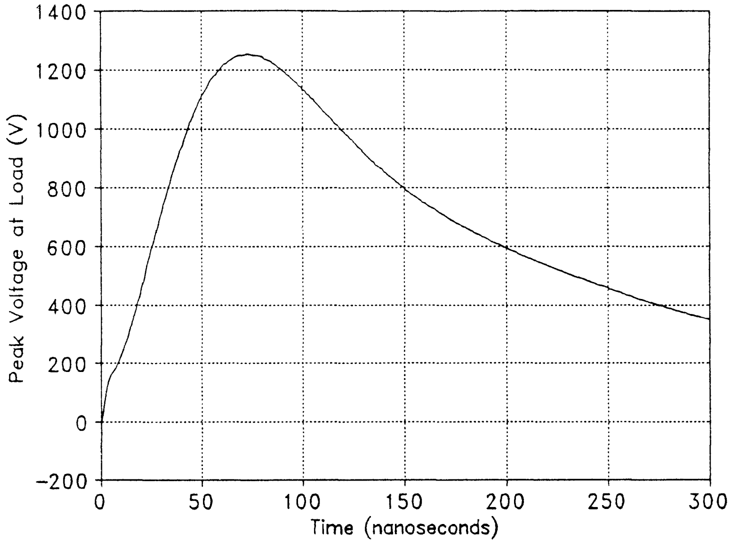


Figure 13 - Transient Plot for Run ESD13A

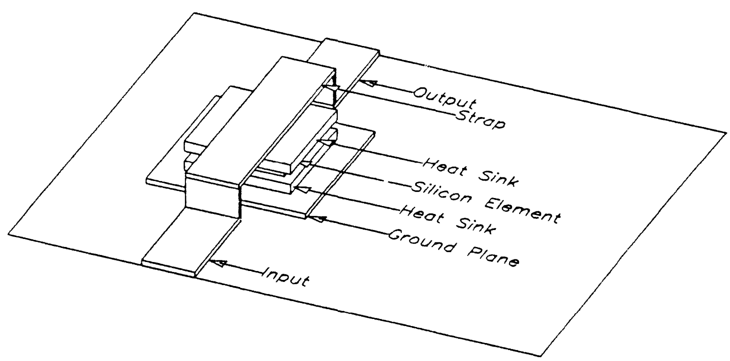


Figure 14 - Diagram of Ultra-low Inductance Transient Voltage Suppressor

Protection of Power Supply and Data Lines Via Thyristor Surge Suppressor and TVS Devices

by Jon Schleisner

The Power Semiconductor Division of General Instrument (PSD), a mainstay in the arena of axial rectifiers, Schottky diodes, TVS, and surface mount technology, has extended its product line. PSD has entered the exciting and growing market of solid state "crowbar" type protection products.

Protection of power supply and data lines against transients is an art still in evolution. The advent of microprocessor- driven telephone systems based on sensitive electronics (instead of charcoal compressive microphones) has changed the criteria for protection. MOVs, gas tubes, and carbon blocks have been the staple components for protection schemes for decades.

These older protection devices have several advantages and disadvantages versus their solid state counterparts. The common advantages are low cost and the ability to absorb tremendous amounts of energy. The disadvantages include slow turn-on times, lack of totally controllable breakover (gas tube) and avalanche (MOV, carbon block) voltages, and an inherent wear-out mechanism (use them and you lose them).

The advantages of the General Instrument's TVS and Thyristor Surge Suppressor devices are speed of response (pico- and nanoseconds), control of avalanche (Zener) voltage, and breakover voltage. Solid state protectors do not shift in parametric value unless stressed beyond their rated limits and driven to destruction The disadvantage of solid state protection are generally lower power handling capacity and higher costs.

The cost factor is rendered moot if the slow protection device (MOV or gas tube) acts too slowly to protect the system to which it is dedicated.

The power limitations can be overcome. to a great degree, with some imaginative engineering. Thyristor Surge Suppressors and TVS devices are specified differently. Table 1 lists all the pertinent TVS and Thyristor Surge Suppressor device parameters for comparison. While both devices are used for transient protection, their electrical behavior is quite different.

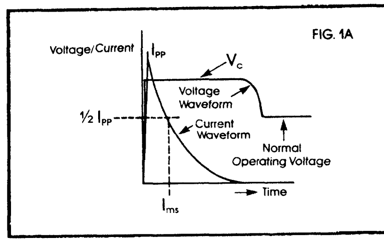


FIG. 1A

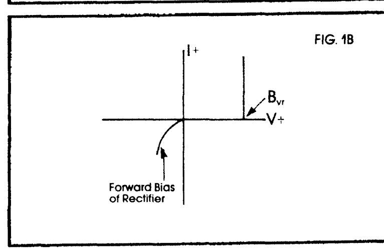


FIG. 1B

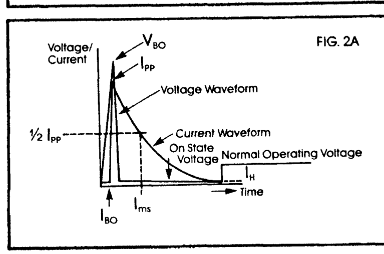


FIG. 2A

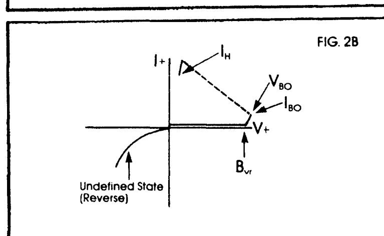


FIG. 2B

<u>TVS</u> $V_{(BR)}$ - The voltage at which the part goes into reverse breakdown at a specified test current, usually 1 or 10 milliamps.

Thyristor Surge Suppressor BV_R - The voltage at which the Thyristor Surge Suppressor device begins to conduct current, equivalent to the TVS BVR.
Thyristor Surge Suppressor V_{BO}- The voltage at which, when reaching the specified IBO, causes the device to "fire" or "fold back" in the low-voltage forward mode.
Thyristor Surge Suppressor I_{BO} - The required current at VBO that causes the devices to "break over or fold back".
TVS V_C - The maximum specified voltage at Ipp, the TVS max clamping voltage.
TVS I_{PPM} - The max rated current to test the VC parameter.
Thyristor Surge Suppressor Vt - The voltage drop across the device at the specified It, after the device folds back.
It- The specified current at which Vt is tested.
I_D - This is a leakage spec with V_{WM} set to less than BVR or $V_{(BR)}$ on TVS or Thyristor Surge Suppressor devices.
Thyristor Surge Suppressor IH - This is a spec. that is unique to "Thyristor Surge Suppressor" technology. After the device has been "fired," when the current starts to decay and passes below a critical value (usually several hundred milliamps), the device turns off and resumes its normal high impedance state

There is no TVS equivalent to IH (holding current). This function is important; it places certain critical limitations on application of the Thyristor Surge Suppressor device. Consider a power supply output with a 1-amp current limit. If this line is protected with a Thyristor Surge Suppressor device with an IH=500mA, problems will arise. If the is fired, it will never shut off. The available current from the power supply is greater than IH, hence the part will stay turned on until power is momentarily removed. This classic condition requires attention whenever designing in a Thyristor Surge Suppressor device in a protection system.

This aspect of Thyristor Surge Suppressor device performance makes it ideal for protection of data lines from lightning and other true transient voltage conditions. Typical data lines have current limiting set rather low. The telephone system in North America has a current limit of 250mA, so maintaining IH250mA will ensure device turn-off after the passage of the transient.

Fig. 1 & 2 highlight differences in TVS and Thyristor Surge Suppressor device performance.

The following figures provide an explanation of circuit applications:

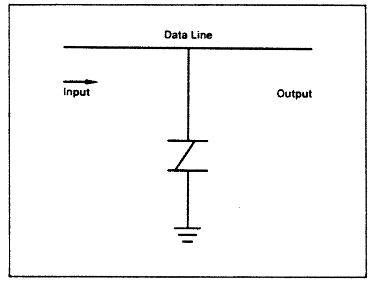


FIGURE 1.

The simplest and most direct application of a Thyristor Surge Suppressor device across a medium to slow data line. If a positive transient strike exceeds VBO with sufficient IBO, the Thyristor Surge Suppressor device will fire, absorbing the transient.

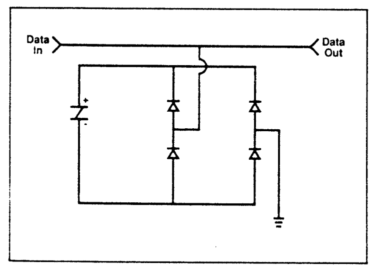


Figure 2

The same approach as Figure 1 with the addition of steering diodes to absorb bidirectional transients. Most transients are bidirectional in nature.

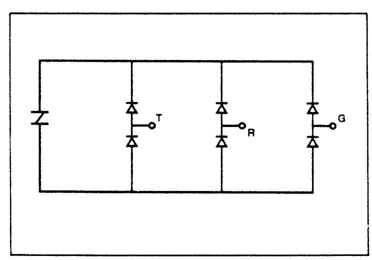


Figure 3

This is a further extension of Figure 2. With the terminals marked T (Tip), R (Ring), and G (Ground), this becomes the classic telephone line protection scheme.

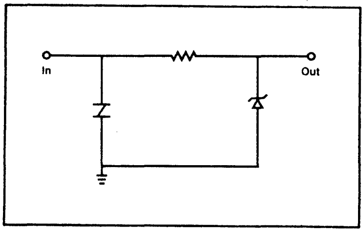


Figure 4

This is data line protection where the turn on transient approaching VBO (225 -260V) cannot be tolerated. The resistor limits the current through the TVS to VBO - VC/R, the duration of this pulse is typically less than 1 usec, so a small TVS can be used.

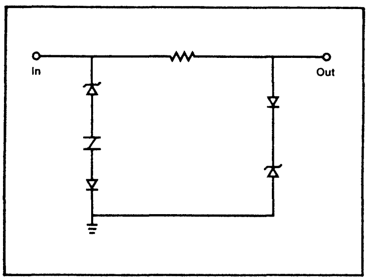


Figure 5

Similar to Figure 4, but designed to have reduced parasitic capacitance across the data line.

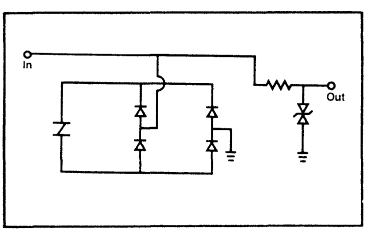


Figure 6

This circuit is a bidirectional version of Figure 4 with the low capacitance benefits of Figure 5.

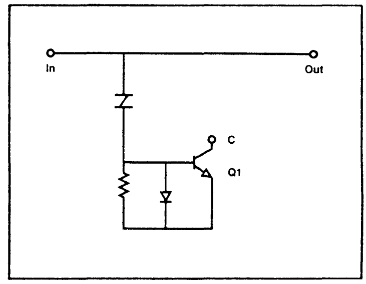


Figure 7

This is a power supply protection circuit. The open collector of Q1 is connected to the power source at the input and should be used to shut off the power supply output for a few milliseconds. This permits the current through the Thyristor Surge Suppressor device to fall below IH before restart begins.

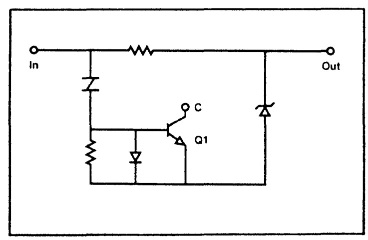


Figure 8

This circuit is equivalent to Figure 7 with the addition of TVS clamp at the output. This prevents VBO from appearing at the protection circuit's output.

General Instrument's Power Semiconductor Division will support your design efforts and assist in applying these new solid state protection devices. More protection performance for your dollar– that is our goal.

Using Rectifiers In Voltage MultiplierCircuits

By Joseph M. Beck
Sr. Applications Engineer

Systems designs frequently call for a high voltage, low current power source that needs only minimal regulation. A few familiar examples are CRT circuits, electrostatic copiers, and photoflash applications. Required voltages typically range from 10 to 30KV and the current demand rarely exceeds 5 milliamperes.

When your design requires this type of power source, you may want to consider a voltage multiplier circuit. They are inexpensive, easy to design, versatile, and can provide virtually any output voltage that is an odd or even multiple of the input voltage.

This article explores the basic operation of multiplier circuits and discusses guidelines for electronic component selection. Since General Instrument Corporation is the industry's leading manufacturer of rectifier products, we will place special emphasis on selecting rectifier diodes for multiplier circuits.

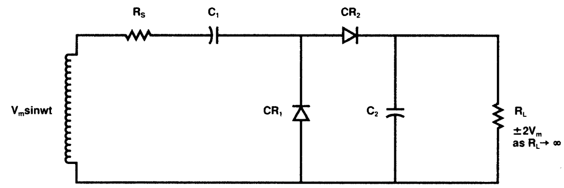


Figure 1A

Basic multiplier circuits.Half-wave Voltage Doubler

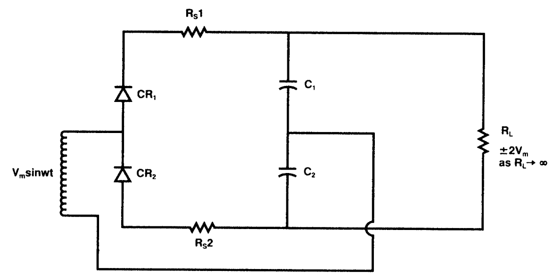


Figure 1B

Basic multiplier circuits.Full-wave Voltage Doubler

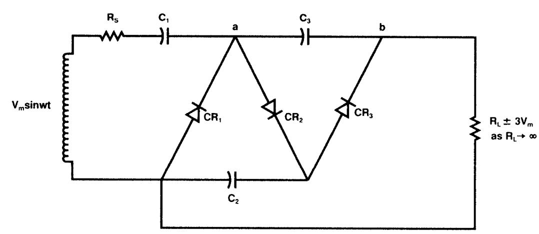


Figure 1C

Basic multiplier circuits.Half-wave Voltage Tripler

BASIC OPERATING PRINCIPLES

Most voltage multiplier circuits, regardless of their topology, consist chiefly of rectifiers and capacitors. Figure 1 shows three basic multiplier circuits.

The operating principle of all three circuits is essentially the same. Capacitors connected in series are charged and discharged on alternate half-cycles of the supply voltage. Rectifiers and additional capacitors are used to force equal voltage increments across each of these series capacitors. The multiplier circuit's output voltage is simply the sum of these series capacitor voltages.

A wide variety of alternating signal inputs are used with multiplier circuits. The most popular are sine and square wave inputs. For simplicity, this discussion will be limited to sine wave inputs; the calculations become somewhat more involved with asymmetrical signals.

Voltage Doublers **-** Figure 1A shows a half-wave voltage doubler circuit. It functions as follows. On the negative half-cycle of the input voltage, capacitor C1 charges, through rectifier CR1, to a voltage of Vm. On the positive half-cycle, the input voltage, in series with the voltage of C1 (Vc1=Vm), charges capacitor C2

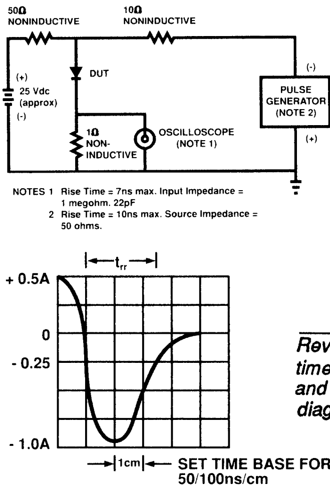


Figure 2

Reverse recovery time characteristic and test circuit diagram

through rectifier CR2 to the desired output voltage of 2Vm. Capacitor C1, which aides in the charging of capacitor C2, sees alternating current ("AC Cap") while C2 sees only direct current ("DC cap"). In this circuit, the output voltage and the input signal have the same ripple frequency.

The same operating principle extends to the full-wave voltage doubler circuit of figure 1B. On the negative half-cycle of the input voltage, capacitor C2 is charged through rectifier CR2 to a voltage of Vm. On the positive half-cycle, capacitor C1 is also charged to a voltage of Vm, through rectifier CR1. The series voltages of capacitors C1 and C2 (Vc1=Vc2=Vm) yield the desired output voltage: 2Vm. In this case, capacitors C1 and C2 are "DC capacitors"; they see no alternating current. The output ripple frequency of the full-wave doubler is twice that of the input signal.

Voltage Tripler **-** Higher output voltages are possible through the use of a half-wave voltage tripler circuit, shown in figure 1C. This circuit operates as follows. On the negative half- cycle of the input voltage, capacitor C1 charges through rectifier CR1 to a voltage of Vm. On the positive half-cycle, the input voltage, in series with the stored voltage on C1 (Vc1=Vm), charges capacitor C2 through rectifier CR2 to a voltage of 2Vm. On the next negative half-cycle, the charge on C1 is replenished. At the same time, the input voltage, in series with the stored voltage on C2 (Vc2=2Vm), charges capacitor C3 through CR3 to a voltage of 2Vm (Vc3=Vb-Va=(Vm +Vc2)-Vc1=2Vm). Vc1 and Vc3, in series, provide the output voltage of 3Vm. In this case, the output ripple frequency is equal to that of the input signal.

Although half-wave and full-wave multiplier circuits can provide equivalent output voltages, there are some fundamental differences that should be considered. First, the full-wave circuit has the advantage of higher output ripple frequency (twice that of the half-wave circuit). In addition, the full-wave circuit provides better voltage regulation than the half-wave circuit, since the latter relies upon one capacitor (C1 in figure 1A) to provide the charging energy to a single DC load capacitor (C2 in figure 1A). The full-wave circuit, however, requires that the secondary side of the transformer be capable of withstanding high voltages (approximately 1/2 of the output voltage). For this reason, the half-wave multiplier is usually the preferred circuit when high voltage outputs (Vo=kilovolts) are required.

DESIGN GUIDELINES

Capacitor selection **-** The size of capacitors used in multiplier circuits is directly proportional to the frequency of the input signal. Capacitors used in off-line, 60Hz applications are usually in the range of 1.0 to 20uF while those used in higher frequency applications, say 10KHz, are typically in the range of .02 to .06uF. In practice, it is usually easier, and less costly, to use the same large capacitance value for all capacitors, both "AC" and "DC" type. The overall capacitive reactance of the circuit must be considered, however, to determine the largest permissible value.

The voltage rating of capacitors is determined solely by the type of multiplier circuit. In the half-wave doubler circuit of figure 1A, C1 must be capable of withstanding a maximum voltage of Vm, while C2 must withstand a voltage of 2Vm. In the full-wave doubler circuit of figure 1B, both C1 and C2 must withstand voltages of Vm. The half-wave voltage tripler of figure 1C requires C1 to withstand a voltage of Vm, and both C2 and C3 to withstand voltages of 2Vm. A good rule of thumb is to select capacitors whose voltage rating is approximately twice that of the actual peak applied voltage. For example, a capacitor which will see a peak voltage of 2Vm should have a voltage rating of approximately 4Vm.

Rectifier Diode Selection

Several basic device parameters should be considered:

Repetitive Peak Reverse Voltage (Vrrm) **-** Repetitive peak reverse voltage is the maximum allowable instantaneous value of reverse voltage across the rectifier diode. Applied reverse voltages below this maximum value will produce only negligible leakage currents through the device. Voltages in excess of this maximum value, however, can cause circuit malfunction --- and even permanent component damage --- because significant reverse currents will flow through the device. For example, General Instrument's GP02-40 rectifier diode has a peak reverse voltage rating (Vrrm) of 4,000 volts, maximum. Applied reverse voltages of 4KV or less will produce a maximum reverse leakage current, I_R, of 5 microamperes through the device when operated at room temperature (25 ° C). In most cases, this leakage current is considered negligible, and the device is said to be completely blocking (I_R=0).

In the case of the three circuits of figure 1, the maximum reverse voltage seen by each rectifier diode is 2Vm. So devices must be selected with reverse voltage (Vrrm) ratings of at least 2Vm.

Reverse Recovery Time (trr) **-** In general terms, reverse recovery time is a measure of the time needed for a rectifier diode to reach a state of complete blocking (I_R=0) upon the application of a reverse bias. Ideally, this time should be zero. In reality, however, there's a finite period of time in which a stored charge at the diode junction must be "swept away" before the device can enter its blocking mode. This stored charge is directly related to the amount of forward current flowing through the device just prior to the application of the reverse bias. Fortunately, since operating currents are very low in multiplier circuits, reverse recovery times are kept to a minimum. Nevertheless, trr plays an important role in multiplier design.

When selecting rectifier diodes, the frequency of the input signal to the multiplier network must be considered. For symmetrical signal inputs, the device chosen must be capable of switching at speeds faster than the rise and fall times of the input. If the reverse recovery time of the rectifier is too long, the efficiency and regulation of the circuit will suffer. In the worst case, insufficient recovery speeds will result in excessive device heating, as reverse power loses in the rectifier become significant. Continued operation in this mode usually results in permanent damage to the device.

The reverse recovery time (trr) specification is very dependent upon the circuit and the conditions being used to make the measurement. Several industry standard trr test circuits exist (figure 2 is the test circuit used for the GP02-40). Therefore, it's very important to note which test circuit is being referenced, as the same device may measure differently on different test circuits. Furthermore, the trr specification should be used for qualitative, not quantitative purposes, since conditions specified for trr measurement rarely reflect those found in actual "real life" circuit operation. The trr specification is most valuable when comparing two or more devices that are measured on the same circuit, under the same conditions.

Figure 3 shows the relationship between forward current and trr in the GP02-40. As you can see, decreasing current flow in the multiplier circuit makes it possible to use higher input frequencies. An increase in current flow has the opposite effect. Ideally, the multiplier network load should draw no current.

Peak Forward Surge Current (Ifsm) **-** A peak forward surge current rating is given for most rectifier diodes. Most often, this rating corresponds to the maximum peak value of a single half- sine wave (50 or 60Hz) which, when superimposed upon the devices rated load current (JEDEC method), can be conducted, without damage by the rectifier. This rating becomes important when considering the large capacitance associated with multiplier circuitry.

Surge currents can develop in multiplier circuits, due to capacitive loading effects. The large step-up turns ratio between primary and secondary of most high voltage transformers causes the first multiplier capacitor (C1, secondary side) to be reflected as a much larger capacitance into the primary. For example, a transformer with a turns ratio of 25 will cause a 1.0 uF capacitance to be reflected into the primary circuitry as a capacitance of (1.0)(25) uF, or 625uF. At circuit turn-on, large currents will be developed in the primary side as this effective capacitance begins charging.

On the secondary side, significant surge currents can flow through the rectifiers during initial capacitor charging at turn-on. The addition of a series resistance (Rs in figure 1) can greatly reduce these current surges, as well

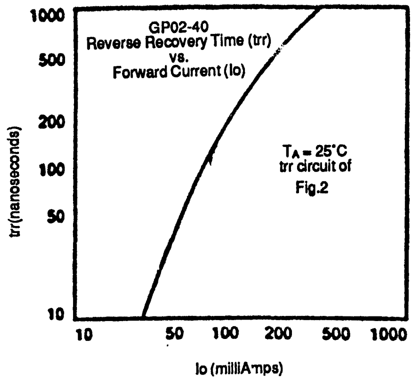


Figure 3

Trr as a function of forward current

as those in the primary circuitry. For example, the GP02-40 has a forward surge rating, Ifsm, of 15 amperes. Considering a maximum secondary voltage of 260 Vrms, 60Hz, the calculation of Rs is as follows:

$$RS \geq Vpeak/Ifsm \quad eq.1$$
$$RS \geq (1.41)(260)/15$$
$$RS \geq 24.4\ ohm$$

Other Parameters - Of lesser significance are the forward current rating, Io, and maximum forward voltage, Vf.

Forward current, Io - As stated earlier, in the ideal multiplier configuration the load will draw no current. Ideally, the only significant current flow through the rectifiers occurs during capacitor charging. Therefore, devices with very low current ratings (hundreds of milliamperes) can be used. It must be noted, however, that the forward current and forward surge current ratings are related, since both are a function of silicon die area. Generally speaking, devices with a high surge current rating, Ifsm, will also have a high forward current, Io, rating, and vice versa.

Forward Voltage, Vf - In practice, the forward voltage drop, Vf, of the rectifiers does not have a significant effect on the multiplier network's overall efficiency. For instance, the GP02-40 has a typical forward drop of 2.0 volts when measured at a current of 100 milliamperes. A half wave doubler with an 8KV output will have less than .05 percent (2x2V/8KV) loss in efficiency due to the forward voltage drops.

HIGHER ORDER CASCADE MULTIPLIER

Still higher voltages are possible by using the cascade multiplier circuit shown in figure 4. The output voltage is calculated as:

Vo = (n)(Vm), as IL -- 0 *eq.2*

where n = number of capacitors or diodes, assuming equal value capacitors, ideal diodes and symmetrical signal input.

In theory, one can obtain any incremental output voltage increasing the value of n. In practice, however, voltage regulation and efficiency become increasingly poor as n increases. The potential for voltage arcing must also be considered as the value of n increases, and when higher output voltages are required. Careful mechanical design can minimize arcing, to a large extent.

From a pure circuits standpoint, voltage multipliers are relatively easy to design. The selection of circuit components, however, is one facet of the "overall design" that should not be taken for granted or trivialized. Careful consideration of all component parameters is the only way to ensure both reliable and predictable circuit performance. Put another way, ideal circuits require ideal circuit components.

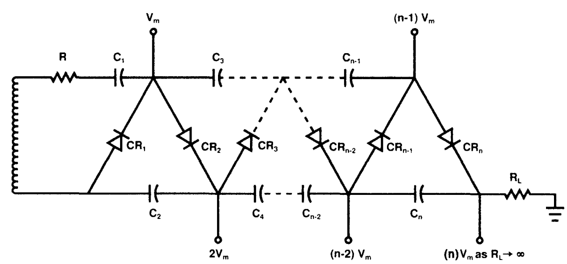


Figure 4

Cascade multiplier

To find the ideal rectifier for your voltage multiplier, consult the ***General Instrument Power Semiconductor Division Data Book. You can obtain a copy by phoning 516-847-3000 or by writing to General Instrument Corp., Power Semiconductor Division, 10 Melville Park Road, Melville, NY 11747***

Transient Voltage Suppressors Ideally Suited for Automotive Applications or Harsh Environments

Gloria M.Luna
Automotive Applications Engineer

The combination of durability and high temperature performance has come together in the form of General Instrument's new, patented PAR (Passivated Anisotropic Rectifier)* process. Transient voltage suppressors produced by this process exhibit high temperature reverse bias stability, excellent transient energy capability, and low dynamic impedance, and are ideally suited for the harsh environments of automotive applications.In a standard diffused junction process, there are several conditions present that could affect the integrity of a device. These conditions become critical to the performance of the device as the junction temperature is increased and the device is stressed to the limits of its operation. They include the presence of a high field at the surface of the junction when a voltage is applied. The electric field (V/cm) that occurs over the depletion layer of a device determines the voltage capability of the device:

$$E(x) = \frac{dV(x)}{dx}$$

This field is not only present in the bulk of the device but also at the surface. When this electric field sees ionic contaminants on top of the surface and along the edge of the die, the contaminants will ionize and the resulting charge will distort the original field. This distortion can increase local leakage current and cause localized breakdown as well as thermal runaway. By growing an oxide directly on the surface of the junction layer, these contaminants can be eliminated. In addition, by employing a positive bevel angle construction, the field at the surface would be diminished to a point where it could not contribute to device degradation.General Instrument engineers have combined these features in a process that provides reliable devices under the high temperature conditions of the automotive environment as well as one that lends itself to state-of-the-art semiconductor manufacturing processes. Thus came the development of the PAR process.

*patented by General Instrument

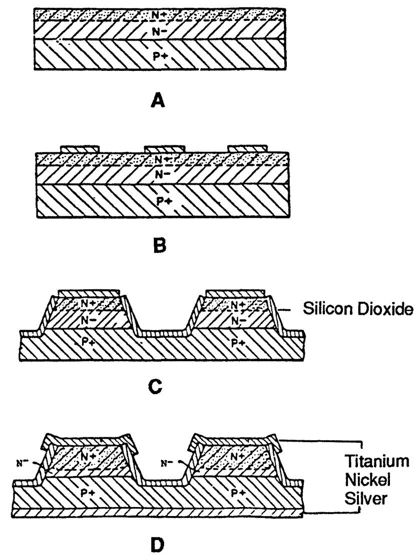


Figure 1

PROCESS TECHNOLOGY

As illustrated in Figure 1(A), we begin with a P+ device and an N- surface layer. We then diffuse in a shallow N+ layer, deposit and subsequently etch a silicon nitride layer that functions as a mask as shown in Figure 1(B). The resulting pattern is then anisotropically etched to form a mesa structure on the top side of the wafer. By utilizing this anisotropic process we are able to achieve a uniform 45 degree angle all around each die.We oxidize the silicon surface where there is no nitride, which results in a grown silicon dioxide layer that is ten times as thick as the silicon nitride. This oxide layer forms around the mesas but not on the original nitride as shown in Figure 1(C). As the N+ layer is driven deeper into the junction, a phenomenon occurs which results in a curvature between the N+ and the N- surface layers as illustrated by Figure 1(D). This curvature is essential in achieving higher breakdown voltages. The final step includes the removal of the top silicon nitride layer and the sintering of a metalization layer composed of titanium, nickel, and silver deposited on the top and bottom surfaces. This is also illustrated in Figure 1(D).

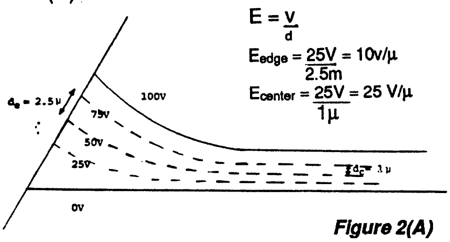


Figure 2(A)

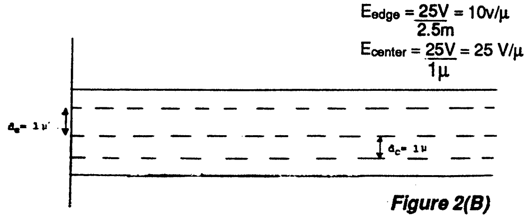


Figure 2(B)

This process is notable for the following reasons:

1. Reverse current measurements remain stable and uniform.

2. Complete stability during high temperature reverse bias and thermal cycling

3. Low electrical contact resistance.

This process results in several important features unique to the PAR construction. First, particle contamination is virtually eliminated by the use of a grown oxide to passivate the junction. Second, by utilizing a positive bevel angle construction, we are able to lower the field at the surface. Due to the fact that the reverse breakdown voltage of a device is determined by the width of the high ohmic region, the curvature of the N+/N- junction becomes an important design criteria in obtaining higher breakdown voltages at the surface of the silicon. This promotes a breakdown along the bulk of the junction rather than at the edge. As illustrated in Figure 2(A), the curviture of the junction results in an increase in the distances of the equipotential lines at the surface. By calculation, all of the breakdown occurs at the bulk of the device rather than at the edge because the field at the edge does not excede the critical value of the layers of material outside of the silicon near the junction (greater than 10V/u). In contrast, the equipotential lines for a standard diffused junction device are illustrated in Figure 2(B). With the breakdown occurring at the edge of the junction, the incidence of high leakage and localized breakdown associated with field distortion is increased, particularly when the device is exposed to extreme environmental and operating conditions. In addition, this tailored junction affords the following advantages:

1. By having the breakdown occur over the large bulk area of the device, large energy surges can be safely handled without damage or deterioration to the device.
2. By modifying the edge of the device, the results under high temperature reverse bias are excellent.

AUTOMOTIVE TRANSIENTS

Electronic devices that operate in the automotive environment are subjected to very extreme conditions. Temperature, humidity, exposure to various liquids, vibration, voltage changes, and surge voltages are just some of the factors to be considered in the automotive environment. Temperatures can rise to as high as 200 degrees C in the engine compartment and as low as -20 degrees C. As a result, it is necessary that any electronic device be able to withstand these conditions and operate within reasonable limits so as not to degrade the performance of any system it may be operating in. Transients in the automotive environment cover a wide range of energy levels and time durations, as illustrated in Figure 3. These transients are distributed throughout the electrical system of an automobile and can occur at any time.

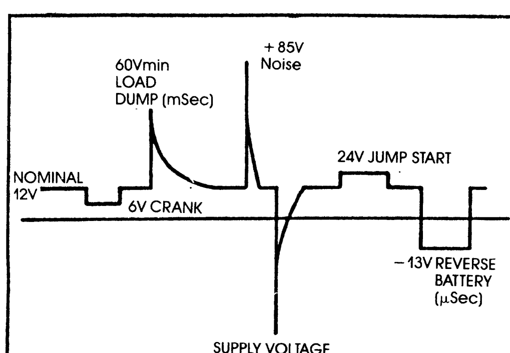


Figure 3

Possible automotive supply voltage variations

Some of the most serious types of transients are:

1. A load dump transient occurs when the alternator load is suddenly dropped due to battery disconnection. Voltages can range from 30 to 125V for up to 400 ms. This is considered the worst of all types of transients and was made a test requirement for all electrical systems and modules designed for the automotive industry back in the 1970's. See Figure 4

2. Transient voltages generated when the inductive loads (relays, solenoids, and switches) are turned off. See Figure 5.

3. Transient voltages generated when the ignition switch is turned off.4. Transient voltages generated by inductive or capacitive coupling when electrical equipment (such as the ignition system) is turned on.

By connecting a transient voltage suppressor across the output of a circuit or connecting them within the circuit, you can protect delicate components and systems by clamping these transient voltages. Because the failure threshold level of a system is determined by its weakest component, it is wise to insure that a TVS would be able to withstand all of these conditions.

LOAD **LOAD DUMP TRANSIENT**

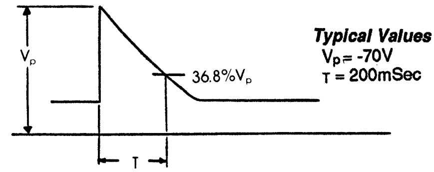


Figure 4

INDUCTIVE LOAD TRANSIENT

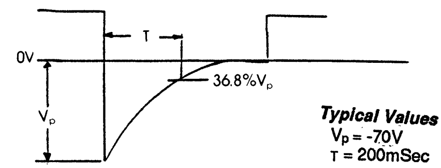


Figure 5

RELIABILITY

Due to this increased focus on reliability under harsh environmental conditions, the ability to quantify reliability has become an important criteria in selecting components.Failure modes fall into two broad categories--those related to defects in the silicon die, and those related to packaging of the die.Die defects relate to field distortion, oxide defects, surface charge or microcracking. By using devices manufactured with the PAR process, the incidence of these types of failures is greatly reduced. These failures can be provoked by high temperature reverse bias testing. In this test, the devices are reverse biased by applying 80% of the rated reverse voltage to the device and heating the device to at least 150 degrees C. This test can run anywhere from 250 to 1000 hours to insure device durability.Shown in Figure 6 are the results of HTRB testing on PAR produced transient voltage suppressors

RESULTS OF HTRB TESTING
AT 80% RATED VOLTAGE

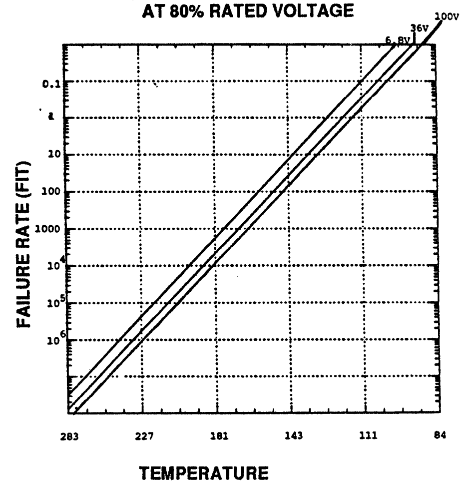


Figure 6

Definition: Failures > 5µA I_R at 25°C
Failure Rate = - fails / 10^9hi

rated at 6.8V, 36V, and 100V. In addition, reverse leakage remains within a very tight distribution and very little drift is observed in values before and after test.Packaging defects can occur from fatiguing of the bond or the presence of atmospheric vapor onto the die surface. Particularly in the automotive environment, semiconductor devices can be subject to thermal and electrical stress causing cracking, separation or voiding of the bond between the die and the lead. These conditions can lead to degrading operation and eventually, thermal runaway.By thermally cycling the device from low (typically -65 degrees C) to elevated temperatures (typically 150 degrees to 170 degrees C) with a dwell time of 5 minutes at each temperature, the bond can be stressed to the point of failure to insure the integrity of the device. The results of temperature cycling for PAR devices is shown in Figure 7.

RESULTS OF TEMPERATURE CYCLING TESTING

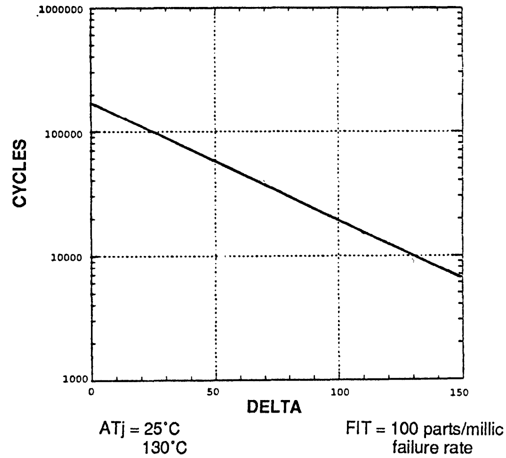


Figure 7

PART NUMBERS

The devices are available in three different power ranges utilizing the following part numbers:

P4KA (400 Watts) 6.8V to 43V
P6KA (600 Watts) 6.8V to 43V
1.5KA (1500 Watts) 6.8V to 43V
6KA24 (6500 Watts) 24V
TPSMA (400 Watts Surface Mount) 6.8V to 43V
TPSMB (600 Watts Surface Mount) 6.8V to 43V
TPSMC (1500 Watts Surface Mount) 6.8V to 43V

QUIKNOTES ™

What is a Silicon Transient Voltage Suppressor?
and How Does It Work?

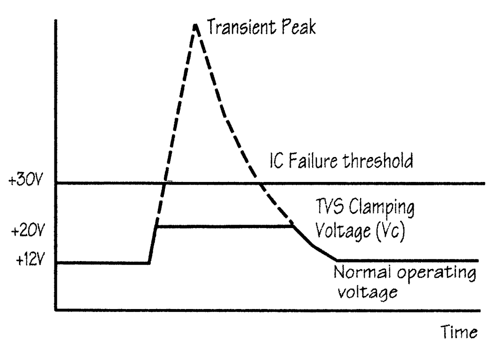
O.M. Clark and F.B. Hartwig

Transient voltage suppressors (TVSs) are devices used to protect vulnerable circuits from electrical overstress such as that caused by electrostatic discharge, inductive load switching and induced lightning. Within the TVS, damaging voltage spikes are limited by clamping or avalanche action of a rugged silicon pn junction which reduces the amplitude of the transient to a nondestructive level.

In a circuit, the TVS should be "invisible" until a transient appears. Electrical parameters such as breakdown voltage ($V_{(BR)}$), standby (leakage) current (I_D), and capacitance should have no effect on normal circuit performance.

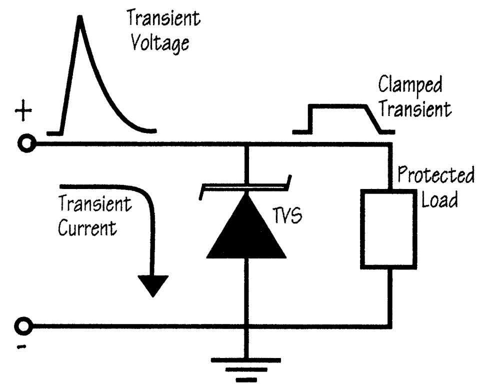
The TVS breakdown voltage is usually 10% above the reverse standoff voltage (V_R), which approximates the circuit operating voltage to limit standby current and to allow for variations in $V_{(BR)}$ caused by the temperature coefficient of the TVS. When a transient occurs, the TVS clamps instantly to limit the spike voltage to a safe level, called the clamping voltage (V_C), while conducting potentially damaging current away from the protected component.

Fig 1.
Transients of several thousand volts can be'clamped' to a safe level by the TVS.



TransZorb® is a registered trademark of General Instrument

Fig 2.
Transient current is diverted to ground through TVS; the voltage seen by the protected load is limited to the clamping voltage level of the TVS.



TVSs are designed, specified and tested for transient voltage protection, while a zener diode is designed and specified for voltage regulation. For transient protection, the designer's choice is a TVS.

The surge power and surge current capability of the TVS are proportional to its junction area. Surge ratings for silicon TVS families are normally specified in kilowatts of peak pulse power (P_P) during a given waveform. Early devices were specified with a 10/1000µs waveform (10µs rise to peak and 1000µs exponential decay to one half peak), while more recent product introductions are rated for an 8/20µs test waveform. Power ratings range from 5kW for 10/1000µs, down to 400W for 8/20µs. This power is derived from the product of the peak voltage across the TVS and the peak current conducted through the device.

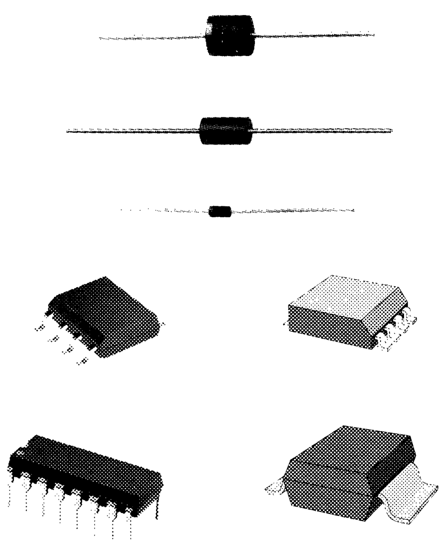
(continued)

What is a Silicon Transient Voltage Suppressor?
and How Does It Work? (cont.)

Packaging covers a broad spectrum according the need. Discrete axial leaded components are available in peak pulse power ratings of 400W, 500W, 600W, 1.5kW and 5kW. The higher power devices are most frequently used across power buses.

Fig. 3

TransZorb® transient voltage suppressors are offered in axial, surface mount and array packages.



For lower power, high density applications, suppressor arrays are available in both DIP and small outline surface mount configurations. Arrays are normally used across data lines for protecting I/O ports from static discharge. Specialized low capacitance TVSs are available for use in high data rate circuits to prevent signal attenuation.

TVSs have circuit operating voltages available in increments from 5V up through 376V for some types. Because of the broad range of voltages and power ratings available, (as well as the universal presence of transient voltages) TVSs are used in a remarkably wide variety of circuits and applications.

Integrated circuits normally feature on-chip protection which is usually provided by internal resistor- diode networks or SCRs. There is insufficient space on a microchip to provide more than minimal protection, so the higher power, external protection of a TVS should be added in those applications where damaging transient voltage threats exist.

The loss to US industry due to transient voltages exceeds $10 billion per year. TVS devices are an important part of the solution.

General Instrument and General Semiconductor Industries Inc. have combined to become the world's leading supplier of silicon TVS protection.

Determining Clamping Voltage Levels for a Broad Range of Pulse Currents

O.M. Clark and F.B. Hartwig

In TransZorb® transient voltage suppressor (TVS) data sheets, all clamping voltage (V_C) levels are specified at maximum rated peak pulse current (I_{PP}). How do you interpolate the V_C levels for transient currents (I_P) other than the rated maximum?

This figure is easily calculated using the parameters on the data sheet with the formula:

$$V_C = (I_P/I_{PP})(V_C \text{ max} - V_{(BR)} \text{ max}) + V_{(BR)} \text{ max}$$

Where: I_P = test pulse current
I_{PP} = max rated pulse current
V_C max = maximum specified clamping voltage
$V_{(BR)}$ max = upper limit of breakdown voltage

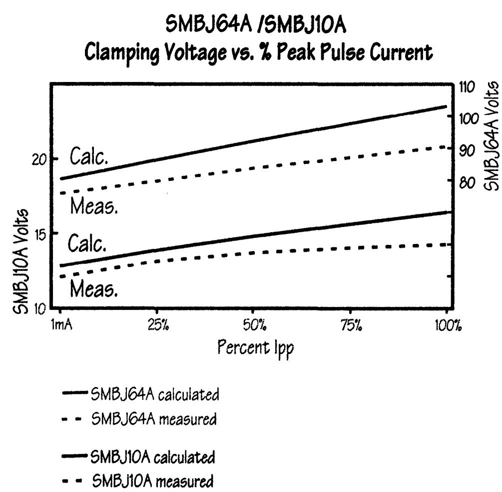
This calculation assumes a linear increase in V_C between $V_{(BR)}$ and V_C max, which is realistic. Figure 1 illustrates the ΔV_C vs ΔI_P relationship for two voltage levels, 10V and 64V, in the SMB 600W series between $V_{(BR)}$ and V_C as determined by this formula. Results are linear as expected. $V_{(BR)}$ max is used in this calculation as it is the upper limit of specified breakdown voltage.

In those instances where $V_{(BR)}$ max is not given on the data sheet, it can be closely approximated. For "A" suffix parts, multiply the minimum $V_{(BR)}$ by 1.11 and for nonsuffix parts, multiply by 1.22 to obtain the maximum $V_{(BR)}$.

The curves derived from measured data are compared with calculated values in figure 1. Surge tests were performed for a 30 piece sample at 25°C ambient with a 10/1000μs waveform.

Note that the curves based on actual surge data have a more shallow slope than those from the calculation, indicating that the devices are conservatively rated and that the formula shown provides a sufficient level of confidence for worst- case design.

Fig 1.
V_C vs I_P for SMBJ10A and SMBJ64A
Calculated and Measured



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Using the Power vs Time Curve

O.M. Clark and F.B. Hartwig

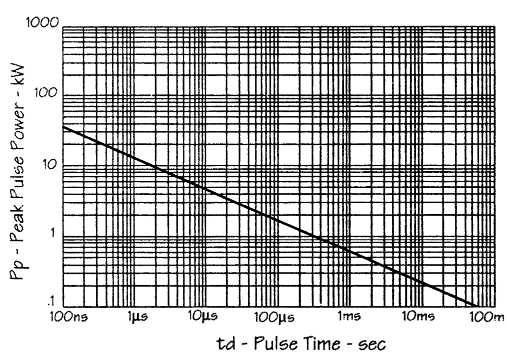
How can the maximum transient power and current capability for silicon transient voltage suppressors (TVS) be derived for conditions other than the 10/1000µs pulse specified on data sheets?

Most TransZorb® TVSs are rated for 10/1000µs non-repetitve pulse waveforms (10µs being the front time and 1000µs being the time from start to decay to one- half of the peak value), which is an early telecom transient waveform. Real world transients will have varying pulse widths depending on the source. Various standards describe other waveforms to reflect these origins. For example, IEC 801- 5 describes a lightning threat to data lines approximating 1.2/50µs.

The graph in figure 1 relates peak pulse power with time for 600W suppressors; similar curves exist for TVSs rated at other power levels. At 1000µs

Fig 1.

Peak Pulse Power vs Pulse Time



the maximum pulse power (P_P) is 600W, the rating condition of the device. The graph illustrates that at 50µs, the rating is 2100W and at 10,000µs (10ms), P_P rating is down to approximately 200W. This applies to all devices in the 600W series regardless of their operating voltage.

Under shorter pulse widths a TVS will sustain higher pulse currents (I_P). For a width of 50µs, for example, a TVS will sustain 3.5 times its rated I_P at 1000µs, 600W. Thus the peak I_P of an SMBJ12A would increase from 30.2A at 10/1000µs to 105.7A at 1.2/50µs. The current rating of an SMBJ64A would increase from 5.8A to 20.3A.

Increasing the pulse width to 10,000µs will reduce the I_P rating by a factor of .33 since the P_P is reduced to 200W. An SMBJ12A with an I_P of 30.2A at 1000µs would be reduced to an I_P of 9.9A for a 10,000µs duration.

This method can be applied to derive the P_P and the I_P of a TVS from any other series (such as 400W, 500W, 1.5kW, 5kW,) using its published power vs pulse time curve.

Most TVSs, including the examples shown here, are rated for 10/1000µs double exponential waveforms. For one-half sine wave pulses, derate to 75% of the exponential waveform value and for square wave pulses, derate to 66%.

Protecting Low Current Loads in Harsh Electrical Environments

O. M. Clark and F. B. Hartwig

Today's sophisticated electronic systems feature sensors, transducers and microcontrollers which are often placed in harsh environments having exposure to lightning, heavy load switching and other damaging transients.

To protect these vulnerable circuit elements from electrical overstress, high power silicon transient voltage suppressors (TVSs) are usually the first choice as illustrated in figure 1.

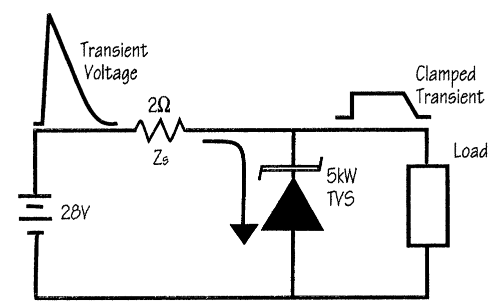


Figure 1.
A 5kW TVS is required to handle the high surge current.

Consider as an example, a pressure transducer which operates at 28V, placed in an environment in which it encounters a transient voltage of 140V peak, having a source impedance of 2 ohms and a duration of 10/1000μs. The failure threshold of the transducer is 40V, therefore the TVS must clamp at 40V or less. The current delivered by this transient is:

$$I = (140V - 40V)/2\Omega = 50A$$

Note that the voltage clamping action of the TVS results in a voltage divider whereby the open circuit level of the transient appears across the combination of the source impedance and the TVS device. Thus the TVS clamping voltage is subtracted from the transient voltage leaving a net source voltage of 100V. When the clamping voltage is high compared to the transient peak voltage, the surge current is significantly reduced.

This circuit can be protected with a 5kW-rated suppression device such as the 5KP28A TransZorb® TVS which will easily sustain the surge current.

An alternate and more economical approach is to add a series resistor to effectively increase the source impedance thus limiting surge current as illustrated in figure 2. Since the current drawn by the transducer under normal operation is small (<20mA typical), performance is not adversely affected by reduction in supply current.

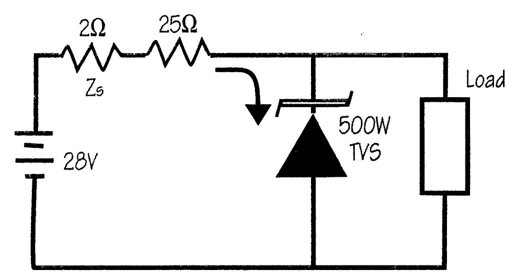


Figure 2.
Series resistor reduces transient current allowing a much smaller TVS to be used.

Protecting Low Current Loads in Harsh Electrical Environments

For a small load current, 10mA, the voltage drop across the added resistance is minimal, about .25V for a 25 ohm resistor. Adding this resistor reduces the surge current to:

$$I = (140V - 40V)/(2\Omega + 25\Omega) = 3.7A$$

This is less than one-tenth the surge current without the resistor. A TVS with lower power rating is able to handle the resulting current. In this case a 500W suppressor, such as the SA28A TransZorb® TVS, replaces the 5kW device, saving board space and cost.

An SA28A was chosen in this example since its current rating for a 10/1000μs pulse is 11A, easily withstanding the 3.7A surge calculated above. Although the maximum clamping voltage for the SA28A is given on the data sheet as 45.4V, the reduced surge current is 33% of the suppressor's peak capability, hence the clamping voltage would be approximately 38V, within our stated limit. (Reference QuikNote™ No.101)

Carbon composition resistors are recommended for this application, as they have sufficient energy capability for the pulse condition. Steady state power dissipated by the resistor (E x I) is 0.25W requiring a 0.5W rated resistor for adequate margin.

The examples given are for 25°C ambients. For elevated temperatures, derate accordingly. Protected circuits derived within these guidelines should be fully evaluated under operating and threat conditions before use.

Protecting for Repetitive Transient Voltages

O.M. Clark and F. B. Hartwig

While lightning may not strike twice in the same place, in circuits which involve power switching, relays, or motor control, components may be continually subjected to very short transient voltages occurring at regular intervals. A TransZorb® transient voltage suppressor (TVS) will effectively limit the transient voltage to a safe level, but some guidelines are needed for selecting the TVS which must handle this repetitive stress.

The average steady state power which the TVS will dissipate can be calculated for recurring short pulse widths. This average power must be within the steady state power rating of the TVS selected for the application. For example, in a motor drive circuit, the switching of current through the inductance of the motor winding continuously generates a pulse which has a 4μs duration and a 25A peak current at a frequency of 120 Hz.

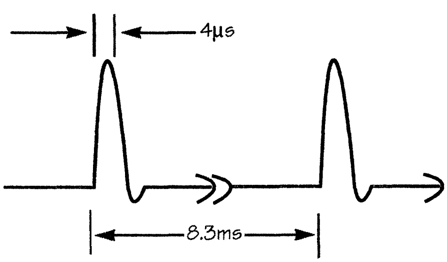


Figure 1
Repetitive transient generated by motor winding inductance

In this application a surface mount TVS, part number SMBJ6.5A, is initially selected to protect the control inputs of the motor drive circuitry because it will clamp the single-pulse voltage to a maximum level of 11.2 volts. But will this suppressor survive the continuous (120 times per second) application of this transient?

Pulse interval, the inverse of the frequency, is:

$$1/120 \text{ pulse/sec} = .0083 \text{ sec}$$

Peak pulse power is the clamping voltage multiplied by the pulse current:

$$P_p = 11.2V \times 25A = 280W$$

Average power can be closely estimated by multiplying the peak power times the ratio of the pulse width to its interval:

$$P_{avg} = 280W \times (.000004s / .0083s) = 0.134W$$

The SMBJ6.5A will dissipate at least one watt steady state on a typical printed circuit board. Thus the calculation shows that the suppressor safely dissipates the average power generated in the motor drive, and clamps the transient voltage to a safe level. The SMAJ6.8A device is another option for this application.

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Protecting for Repetitive Transient Voltages (cont.)

Circuit board layout and engineering practices which provide adequate heat sinking for the suppressor should be observed. Higher power dissipation can be achieved by sizing mounting pads proportionately. Where this is not practical, or if calculation results in average dissipation greater than can be safely handled, a transient suppressor with a higher steady state power rating should be selected.

Derating must be observed for operation at elevated temperatures since all electrical ratings are normally specified at 25°C. For the described electrical conditions an ambient temperature of 75°C will provide 60% of the rated steady state capability.

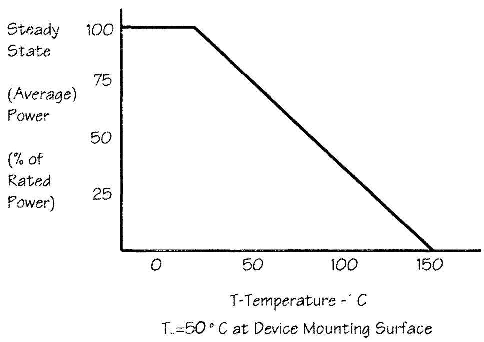


Figure 2
Temperature derating for steady-state power dissipation

The average power calculation shown here is generally valid for pulses up to 10μs in duration, occurring at intervals in the range of 100 to 1000μs. Longer pulse durations approaching 1ms or more may be sustained only if the interval increases correspondingly.

It may not be possible to determine the exact conditions (current amplitude, pulse width, etc.) in repetitive pulse environments, so some experimentation may be required to optimize the suppressor selection.

PACKAGING
BULK AND REEL

ALSO

RECOMMENDED SOLDERING PROCEDURES AND SURFACE MOUNT PAD SIZES

PACKAGE CODE	PACKAGING DESCRIPTION
1	Bulk
2	SMB, 12mm Tape, 7" Diameter Plastic Reel
3	26mm Horizontal Taping and Ammo Packing
4	52.4mm Horizontal Tape, 13" Diameter Paper Reel Class I
5	SMB, 12mm Tape, 13" Diameter Paper Reel
6	Avisert, Cathode Up, Cathode First Off Reel
7	SMC, 16mm Tape, 7" Diameter Plastic Reel
8	Avisert, Cathode Up, Cathode First Off Ammo Pack
9	SMC, 16mm Tape, 13" Diameter Paper Reel
10	Avisert, Cathode Down, Anode First Off Reel
11	SMA, 12mm Tape, 7" Diameter Plastic Reel
12	Avisert, Cathode Down, Anode First Off Ammo Pack
13	SMA, 12mm Tape, 13" Diameter Paper Reel
14	Panasert, Cathode Up, Cathode First Off Reel
15	Panasert, Cathode Up, Anode Off First, Ammo Pack
16	Panasert, Cathode Up, Cathode First Off Ammo Pack
17	GF1, 12mm Tape, 7" Diameter Plastic Reel
18	Panasert, Cathode Down, Anode First Off Reel
19	GF1, 12mm Tape, 13" Diameter Paper Reel
20	Panasert, Cathode Down, Anode First Off Ammo Pack
21	Panasert, Cathode Up, Cathode First of Reel, Lead Coat (Plastic DO-204AL only)
22	Bulk Pack for Special Axial-Leaded Formed Devices
23	52.4mm Horizontal Tape Ammo Pack, Class I
24	Panasert, Cathode Up, Cathode First out of Ammo Box, Lead Coat (Plastic DO-204AL only)
26	GL41 SMD 12mm Tape, 13" Diameter Paper Reel
27	DFS Bridge,16mm Tape, 13" Diameter Paper Reel
28	Special Carton Packing method for Tube Packaging Products
30	0.5A Bridge SMD, 8mm Tape, 13" Diameter Paper Reel
32	GL34 SMD, 8mm Tape, 7" Diameter Paper Reel
35	Bulk, Axial-Leaded Conductive Packaging
36	Standard Horizontal Reel, Class I (Metric 52.4mm) Conductive Packaging
37	Bulk, TO220, TO3P Conductive Tubes
38	Bulk, Conductive Packaging for Bridge Rectifier
39	Miscellaneous Non-Standard T&R Packaging
40	Euroform, Reel, Cathode First Off Reel, Lead Coated
41	Euroform, Ammo Pack, Cathode First Out of Box, Lead Coated
42	Euroform, Reel, Cathode Last Off Reel, Lead Coated
43	Euroform, Ammo Pack, Cathode Last Out of Box , Lead Coated
44	52.4mm Horizontal Tape, 13" Diameter Paper Reel, 5mm Component Spacing for DO201 Packages
45	Anti-Static Tube Packaging for TO220, TO3P, DFM, SMDA and Arrays
46	GL41 SMD 12mm Tape, 7" Diameter Plastic Reels
48	GL34 SMD 8mm Tape, 7 " Diameter Plastic Reels
50	MPG06 Pseudo Radial Tape, Cathode First Out of Ammo Pack

Also available for all packaging Electro-Static-Protection by adding the number "50" to the existing codes. For example, "51" would be Bulk, Electro-Static Packaging. "54" would be T/R, Electro-Static Packaging.

TABLE 3

GI TAIWAN BULK PACKAGING

DEVICE TYPE	PACKAGING	BOX SIZE		QUANTITY PER PACKAGING	GROSS WEIGHT	
		INCHES	CM	EA.	LBS.	KG
GL34 SURFACE MOUNT	PAPER BOX	8.0 x 3.5 x 1.0	20.3 x 8.8 x 2.54	8000	0.55	0.25
GL41 SURFACE MOUNT	PAPER BOX	8.0 x 3.5 x 1.0	20.3 x 8.8 x 2.54	4000	1.03	0.47
GF1 SURFACE MOUNT	PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	2000	0.76	1.67
SMA SURFACE MOUNT	PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	2000	0.77	1.69
SMB SURFACE MOUNT	PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	2000	0.77	1.69
SMC SURFACE MOUNT	PAPER BOX	8.0 x 3.3 x .87	20.3 x 8.4 x 2.2	1000	0.87	1.92
DO15	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	4000	3.85	1.75
DO201AD	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	1500	4.41	2.0
DO204AP	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	4000	3.75	1.7
DO204MB	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	5000	3.15	1.43
DO41/MPG06	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	5000	2.38/2.20	1.08/1.0
G4/G3	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	3000/2000	5.07 / 5.29	2.3/2.4
GP20	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	1500	3.75	1.7
P600	PAPER BOX	11.75 x 5.125 x 2.5	29.8 x 13.0 x 6.3	750	3.7 2	1.69
P6KE	PAPER BOX	11.75 x 3.5 x 1.0	29.8 x 8.8 x 2.54	2000	1.93	0.87
DF-M/DF-S	ANTI-STATIC PLASTIC TUBES	19.0 LENGTH	48.2 LENGTH	50	0.12	0.05
TO-220, CT	ANTI-STATIC PLASTIC TUBES	20.5 LENGTH	52.0 LENGTH	50	0.306	0.14
TO3P	ANTI-STATIC PLASTIC TUBES	20.5 LENGTH	52.0 LENGTH	30	0.572	0.26
WG	PLASTIC BAGS	-	-	100	0.37	0.17
KBPM/2KBPM	ANTI-STATIC PVC TRAY	12.5 x 6.5 x 1.25	31.7 x 16.5 x 3.17	120	0.53	0.24
GBU4,6,8	ANTI-STATIC PVC TRAY	12.5 x 6.1 x 1.0	30.9 x 15.5 x 2.5	250	2.42	1.1
GBL	ANTI-STATIC PVC TRAY	12.5 x 6.1 x 1.0	30.9 x 15.5 x 2.5	400	2.20	1.0
GBPC12-35W	PAPER BOX	12.5 x 12.5x 1.7	31.7 x 31.7 x 4.3	100	4.63	2.1
GBPC1,GBPC6	PAPER BOX	7.5 x 7.5 x 1.43	19.0 x 19.0 x 3.6	100	1.26/1.48	.57/.67
KBL	ANTI-STATIC PVC TRAY	12.2 x 6.1 x 1.5	30.9 x 15.5 x 3.8	300	4.19	1.9
GBPC12-35	PAPER BOX	12.5 x 12.5 x 1.7	31.7 x 31.7 x 4.3	100	4.85	2.2
KBU4,6,8	ANTI-STATIC PVC TRAY	12.2 x 6.1 x 1.5	30.9 x 15.5 x 3.8	250	4.63	2.1

GI IRELAND BULK PACKAGING

DEVICE TYPE	PACKAGING	BOX SIZE		QUANTITY PER PACKAGING	GROSS WEIGHT	
		INCHES	CM	EA.	LBS.	KG
CASE 1 (DO201A)	PAPER BOX	8.8 x 3.1 x 1.8	22.5 x 8.0 x 4.5	1000	1.23	.56
CASE 7 (DO15)	PAPER BOX	8.8 x 3.1 x 1.8	22.5 x 8.0 x 4.5	1500	1.38	.626
CASE 25 (DO15)	PAPER BOX	8.8 x 3.1 x .1.8	22.5 x 8.0 x 4.5	1500	1.50	.677
SMDA (SO - 8)	ANTI-STATIC PLASTIC TUBES	19.7 x .125	50 x .32	100	.032	.014
8 PIN DIP ARRAY	ANTI-STATIC PLASTIC TUBES	19.7 x .62	50 x 1.6	50	.101	.046
16 PIN DIP ARRAY	ANTI-STATIC PLASTIC TUBES	19.7 x .62	50 x 1.6	25	.104	.047

AMMO BOX PACKAGING

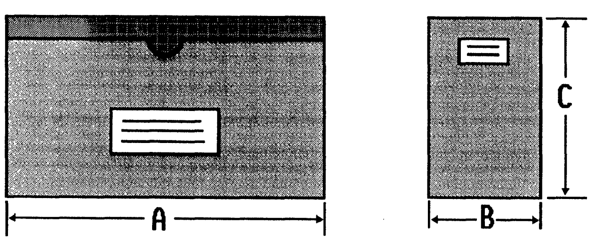


TABLE 4

Packaging	Available Product Outlines	Packaging Codes	Dimension "A"	Dimension "B"	Dimension "C"	Quantity Box
26mm Horizontal Tape, Ammo Pack	DO-41,MPG06 DO204AP, DO-15	Pkg 3	9.7" (247mm)	1.7 (44mm)	"3.7" (95mm)	3.0K 1.5K
52mm Horizontal Tape, Ammo Pack	DO204AP, DO-41, MPG06, DO15 DO201AD, G3,G4,GP20 P600	Pkg 23	10.0" (254mm)	3.1" (79mm)	4.3" (110mm)	3.0K 2.0K 1.0K 0.3K
Radial (Avisert, Panasert, Euroform) Tape, Ammo Pack	GP10-E, RGP10-E DO-41	Pkg 8,15, 41	13.4" (340mm)	1.8" (47mm)	7.9" (200mm)	2.5K
Pseudo /Radial Tape, Ammo Pack	MPG06	Pkg 50	13.4" (340mm)	1.8" (47mm)	7.9" (200mm)	2.5k

GI TAIWAN HORIZONTAL TAPE-REEL PACKAGING

All Axial leaded devices are packed in accordance with EIA Standard RS-296-E and the diagrams given below which refer to these specifications.

TABLE 1

COMPONENT CASE TYPE	UNITS PER REEL	COMPONENT SPACING "A" FIG. 1		TAPE SPACING "B" FIG. 1		REEL DIMENSION "D" FIG.2		MAX. OFF ALIGNMENT "E"FIG. 1		GROSS WEIGHT PER REEL	
	ea.	In.	mm	In.	mm	In.	mm	In.	mm	lbs.	kg.
1.5KA (PAR)	2000	.200	5.0	2.06	52.4	13.0	330	.047	1.2	7.1	3.2
DO15	4000	.200	5.0	2.06	52.4	13.0	330	.047	1.2	5.00	2.29
DO201AD	1400	.395	10.0	2.06	52.4	13.0	330	.047	1.2	4.9	2.22
DO204AP	4500	.200	5.0	2.06	52.4	13.0	330	.047	1.2	5.4	2.44
DO204MB	5000	.200	5.0	2.06	52.4	13.0	330	.047	1.2	4.6	2.07
DO41	5500	.200	5.0	2.06	52.4	13.0	330	.047	1.2	5.5	2.51
DFS Surface Mount	1500	.472	12.0	-	-	13.0	330	See Fig. 12		1.95	.885
G3/G4	1600/2000	.395	10.0	2.06	52.4	13.0	330	.047	1.2	5.2/4.4	2.36/2.02
GF1 Surface Mount	.500/1500	.157	4.0	-	-	7/13.0	178/330	See Fig. 12		.31/1.39	.14/.63
GL34 Surface Mount	2500	.157	4.0	-	-	7/13.0	178/330	See Fig. 12		.471	.214
GL41 Surface Mount	1500/5000	.157	4.0	-	-	7/13.0	178/330	See Fig. 12		.62/1.49	.281/.68
GP10E Radial	2500	.500	12.7	-	-	13.0	330	.079	2.0	3.0	1.34
GP10E	5500	.200	5.0	2.06	52.4	13.0	330	.047	1.2	4.4	1.99
GP20	1400	.395	10.0	2.06	52.4	13.0	330	.047	1.2	4.9	2.22
MPG06	5500	.200	5.0	2.06	52.4	13.0	330	.047	1.2	3.8	1.71
MPG06 Radial	2500	.500	12.7	-	-	-	-	.080	2.0	3.0	1.34
P600	800	.395	10.0	2.06	52.4	13.0	330	.047	1.2	5.3	2.39
SMA Surface Mount	1800/7500	.157	4.0	-	-	7.0/13.0	178/330	See Fig. 12		.24/.99	.11/.45
SMB Surface Mount	750/3200	.157	4.0	-	-	7.0/13.0	178/330	See Fig. 12		.24/.99	.11/.45
SMC Surface Mount	850/3500	.472	12.0	-	-	7.0/330	178/13.0	See Fig. 12		.44/1.39	.20/.63

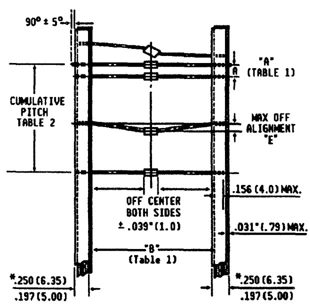
GI IRELAND HORIZONTAL TAPE / REEL PACKAGING

COMPONENT CASE TYPE	UNITS PER REEL	COMPONENT SPACING "A" FIG. 1		TAPE SPACING "B" FIG. 1		REEL DIMENSION "D" FIG.2		MAX. OFF ALIGNMENT "E"FIG. 1		GROSS WEIGHT PER REEL	
	ea.	In.	mm	In.	mm	In.	mm	In.	mm	lbs.	kg.
CASE 1 (1.5KE)	1400	.395	10	2.06	52.4	14.0	356	.047	1.2	4.9	2.22
CASE 7 / DO15	4000	.200	5.0	2.06	52.4	14.0	356	.047	1.2	5.0	2.29
CASE 25 / DO15	4000	.200	5.0	2.06	52.4	14.0	356	.047	1.2	5.0	2.29
DO214AA / 215AA (SMB)	1000/3000	.157	4.0	-	-	7.0/13.0	178/330	see fig. 12		1.43	.65
DO214AB/ 215AB (SMC)	3000	.472	12.0	-	-	13.0	330	see fig. 12		1.43	.65
SMDA (SO-8)	1000/2500	.315	8.0	-	-	7.0/13.0	178/330	see fig. 12		.73/1.12	.33/.51
.5A BRIDGE (SMD)	3000	.315	8.0	-	-	13.0	330	see fig. 12		1.43	.65

TABLE 2

COMPONENT AND INSIDE TAPE SPACING

Component Body Diameter	Components Spacing "A"(Lead to Lead)	Inside Tape Spacing "B"	Cumulative Pitch Tolerance
0mm to 5mm (0" to .197")	5.0mm ± 0.5mm (.197"± .020")	26mm ± 0.75mm (1.024" ± .030)	Not to Exceed 1.5mm (.059") over 6 Consecutive
0mm to 5mm (0" to 197")	5.0mm ± 0.5mm (197" ± .020")	52.4mm ± 1.5mm (2.062" ± .059")	
5.01mm to 10mm (.197" to .394")	10mm ± 0.5mm (.394" ± .020")	52.4mm± 1.5mm (2.062" ±. 059")	



*These are mounted values and have a ± .0157"(.40) tolerance range at each value

FIG. 1

The "C" dimension of Fig.2 is between the flanges of the component reel and shall be .059"(1.5) to .315"(8.00) greater than the overall taped component width "W".

Dimensions in inches and (millimeters)

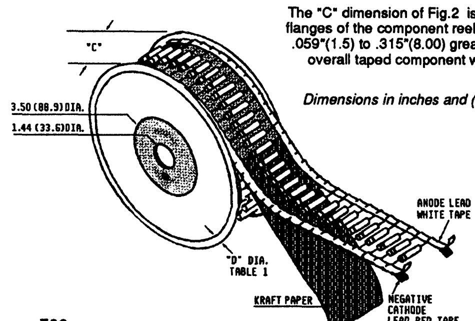


FIG. 2

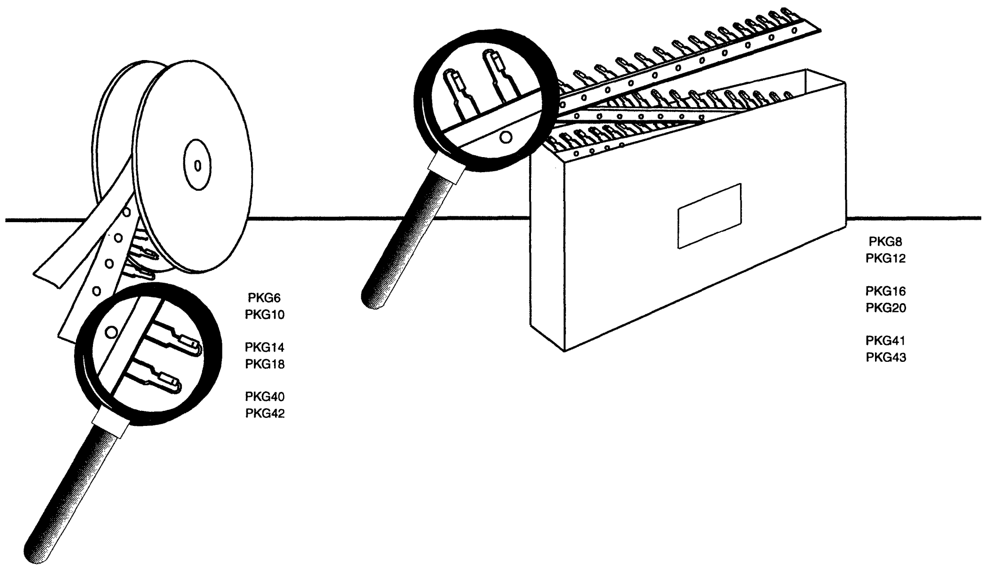


FIG.4 **REEL PACKAGING** **AMMO BOX PACKAGING**

AVISERT	PANASERT	EUROFORM
PKG6	PKG14	PKG40
PKG8	PKG16	PKG41
PKG10	PKG18	PKG42
PKG12	PKG20	PKG43

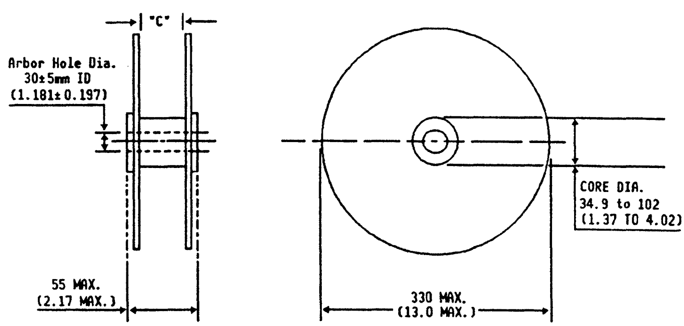


FIG. 5 - REEL DIMENSIONS

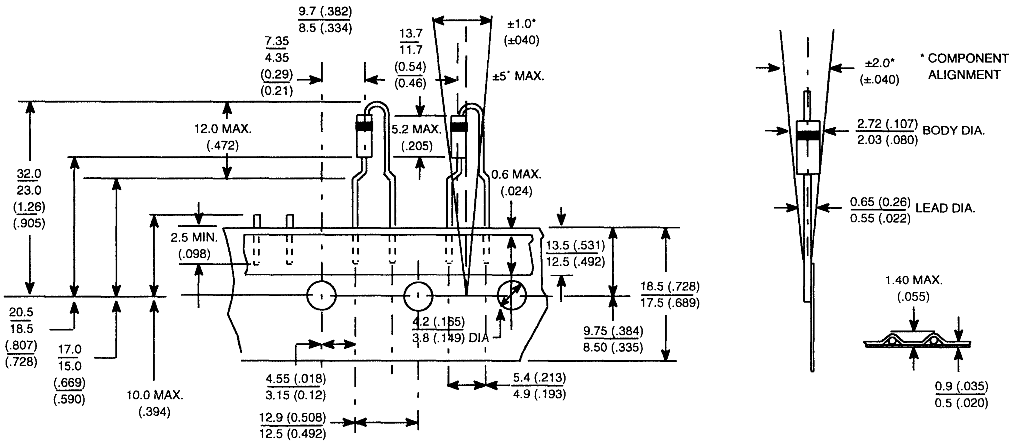
"C" Dimension between the reel flanges shall be governed by the overall width of the taped components and shall be 1.5mm(0.057) to 8.0mm(0.315") greater than the overall width

Package per EIA Standard RS-468-A. Available on reels or fan fold box (ammo pack).

All dimensions in millimeters and (inches)

All dimensions in millimeters and (inches)

FIGURE 6 - EUROFORM



Available for GP10 products only utilizing 0.65mm (0.25") diameter leads for Euroform Tape and Reeling by adding suffix "E" (GP10GE, 1N4004GPE). Lead coating is standard.

FIGURE 7 - PANASERT

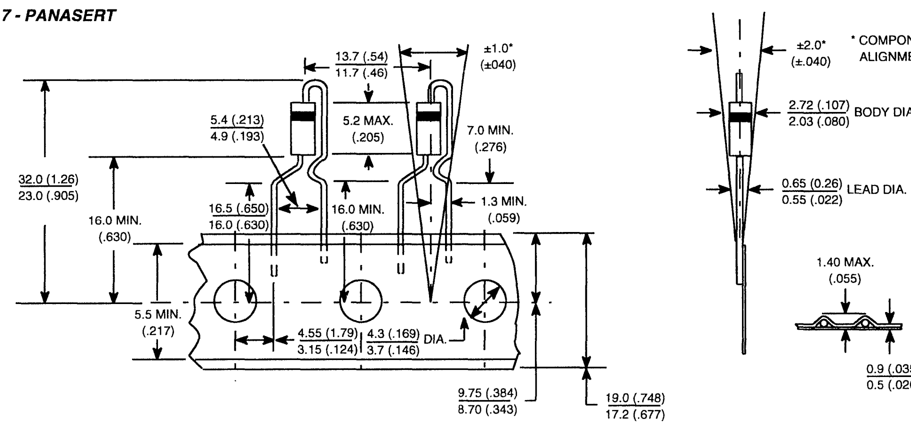
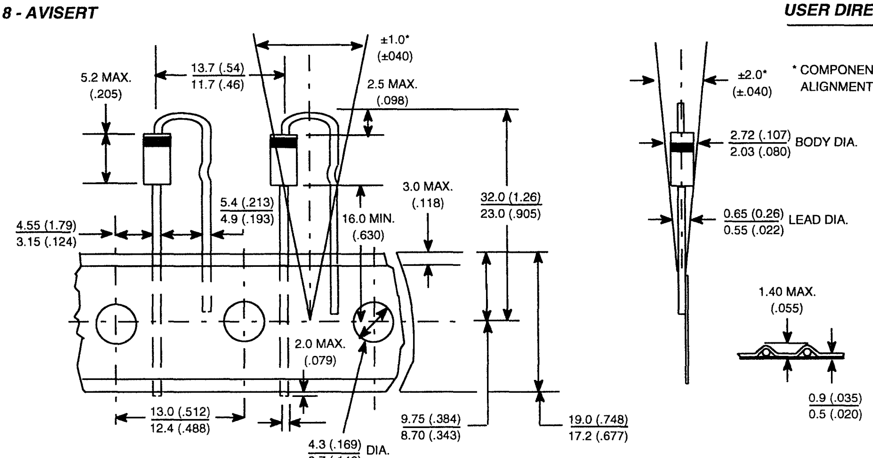


FIGURE 8 - AVISERT

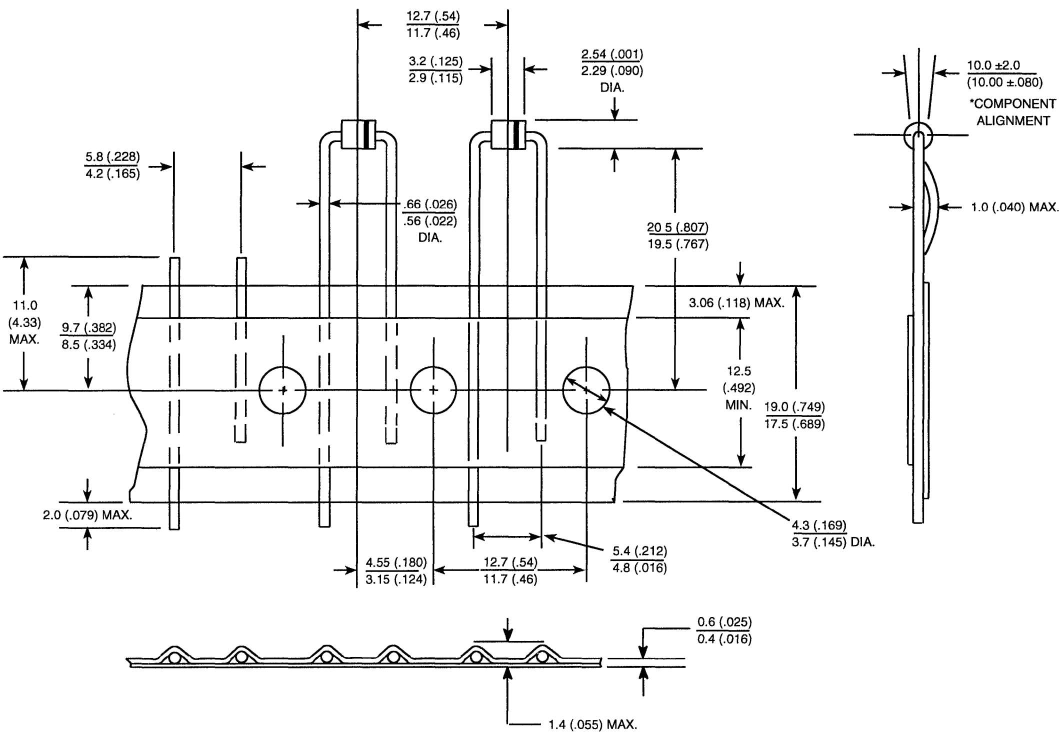
USER DIRECTION FEED



Available only for D-41 style products utilizing 0.65mm (0.25") or 0.76mm (.030) diameter leads for Panasert and Avisert Tape and Reeling. Lead coating is not available.

Standard polarity cathode oriented away from sprocket holes (Optional polarity cathode oriented toward sprocket holes)

FIG.9 - PSEUDO RADIAL



Dimensions in inches
and
(millimeters)

Available only for MP606 product utilizing 0.6mm diameter leads.
Maximum cumulative pitch tolerance: 1.0mm/20 pitch.

Packaged per EIA Standard RS-481-1 & -2

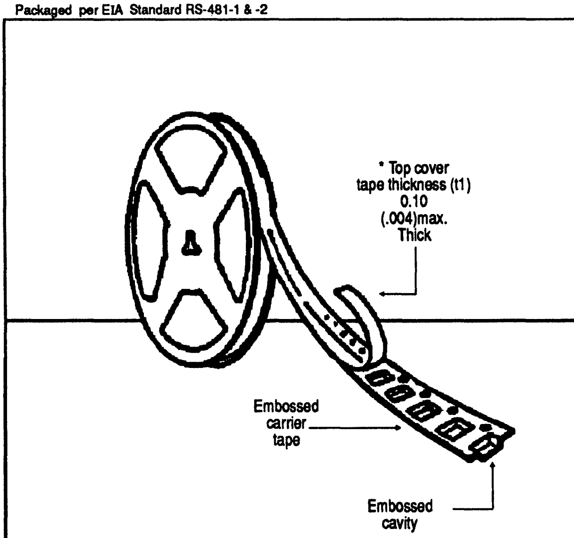


FIG. 10

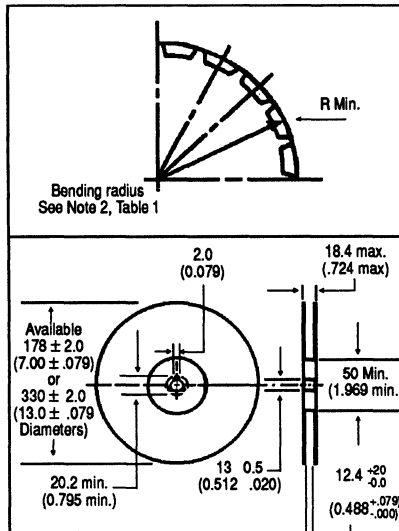


FIG. 11

TABLE 5

8,12,16 MM Embossed Tape — All Dimensions in Millimeters and (Inches)

	Tape Size	D	E	P_0	t	Ao Bo Ko				
	8, 12,16 MM	1.5 [illegible] (.059) [illegible]	1.75 ± 0.10 (.069 ± .004)	4.0 ± 10 (.157± .004)	0.400 (.016)	See Note 1 Table 2				Constant Dimensions
Product Type	**Tape Size**	**Max. B1**	**Min. D1**	**F**	**Max. K**	**P2**	**Min. R**	**W**	**P**	
GL34	8MM	4.2 (.165)	1.0 (.39)	3.5 ± 0.051 (.138 ± .002)	2.4 (.094)		25 (.984)	8.0± .30 (.315 ± .012)		
GL41					4.5 (.177)			12.0± .30 (.472 ± .012)	4.0± 0.10 (1.57±.004)	
GF1					3.15± .10 (1.24±.004)	2.0±0.051 (.079±.002)				Variable Dimensions
SMA	12MM	8.2 (.323)	1.5 (.059)	5.5± 0.051 (.217± .002)	2.54 ± .10 (.100±.004)		30 (1.81)	12.0 ± .008 (473 ± .008)		
SMB .5A Bridge SMDA					2.67± .10 (.105±.004)				8.0 ± .10 (.315 ± .004)	
SMC					2.5 ± 0.10 (.100±.004)					
DFS	16MM	12.1 (.476)		7.5± 0.051 (.295± .002)	3.8± 0.07 (.150±.003)	4.0 ± 0.10 (.57± .004)		16.0 ± 0.2 (.630 ±. 008)	12.0 ± 0.10 (.472 ± .004)	

NOTES: 1. Ao Bo Ko are determined by component size. The clearance between the component and the cavity must be within 0.05 min. to 0.5 max. for 8MM tape and 0.05 min. to 0.650 max. for 12MM tape. In addition, the components cannot rotate more than 20 within the determined cavity.
2. Tape and components will pass around radius "R" without damage.

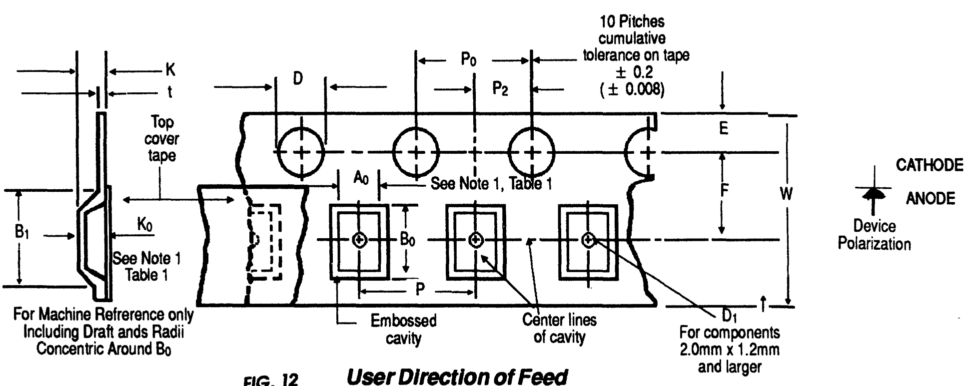
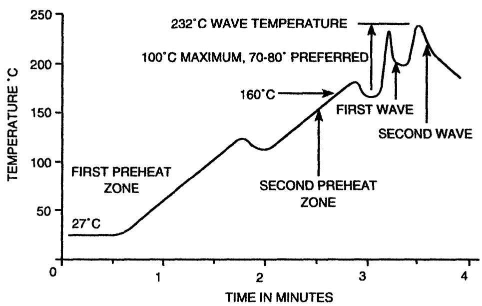


FIG. 12

WAVE SOLDERING

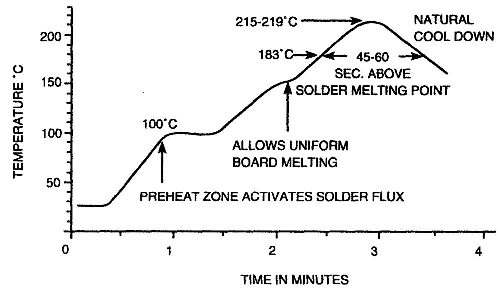
Wave soldering has the highest solder temperatures and heat transfer rates that are imposed by small resin molded parts like transistors, integrated circuits and surface mount components. The profile has short dwell time in the solder pot and high preheat to minimize thermal shock in ceramic components and temperature problems with resin molded parts.



Wave Soldering Profile

INFRARED REFLOW SOLDERING (IR)

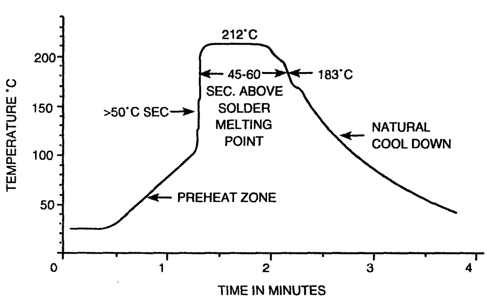
Soldering with IR has the highest yields due to controlled heating rates and solder liquidus times. Only the dwell time and peak temperature limitations of resin molded components need to be considered.



IR Reflow Solder Profile

VAPOR PHASE REFLOW SOLDERING

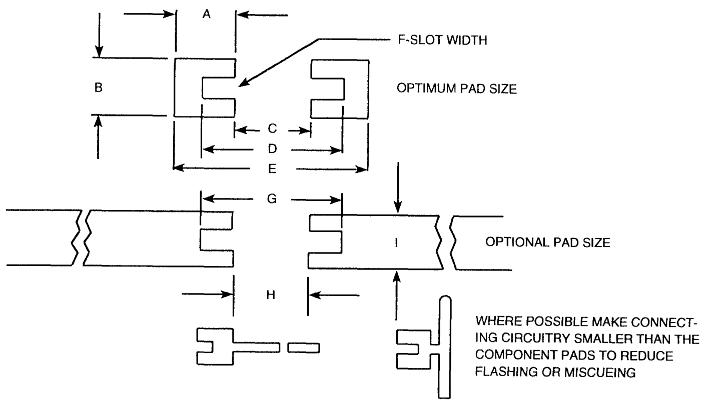
Vapor phase soldering has the second highest heat transfer rate so care must be used. Preheating the assembly and minimizing the dwell time above the solder liquidus temperature is needed for minimum defects.

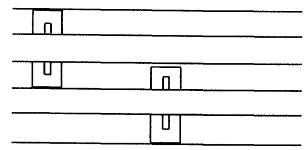


Vapor Phase Profile

General Instrument Recommended Soldering Processes for Surface Mount and Axial-Leaded Components

GI RECOMMENDED MINIMUM MOUNTING PAD LAYOUT SIZES FOR THE MELF SURFACE MOUNT RECTIFIER





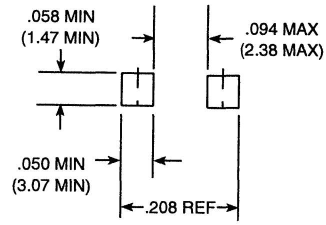
FOR LARGE BUSS ATTACHMENT USE A SOLDER MASK TO REDUCE EFFECTIVE PAD SIZE

DIMENSION	GL34 DO-213AA	GL41 DO-213AB
A	.069 (1.75)	.100 (2.54)
B	.063 (1.60)	.100 (2.54)
C	.069 (1.75)	.100 (2.54)
D	.138 (3.50)	.200 (5.08)
E	.207 (5.26)	.300 (7.62)
F	.016 (.406)	.025 (.635)
G	.138 (3.50)	.200 (5.08)
H	.035 to .080 (.89 to 2.03)	.050 to .125 (1.27 to 3.17)
I	.048 (1.22) min	.075 (1.90) min

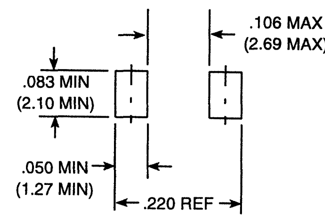
NOTE: ALL DIMENSIONS IN INCHES AND (MILLIMETERS)

General Instrument Recommended Minimum Mounting Pad Layout Sizes
for the MELF Surface Mount Rectifiers

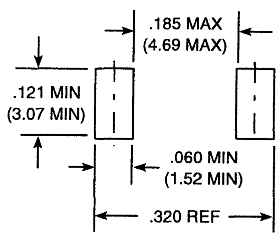
GI RECOMMENDED MINIMUM MOUNTING PAD LAYOUT SIZES FOR THE SURFACE MOUNT RECTIFIER AND THE FLAT PACK



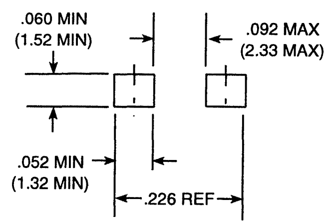
SMA/DO-214AA



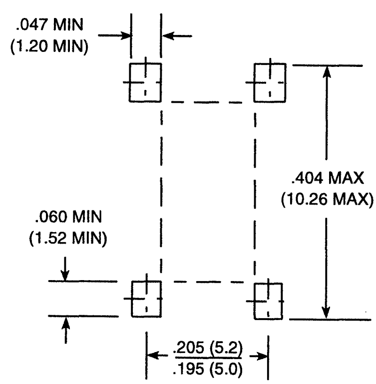
SMB/DO-214AA



SMC/DO214AB



GF1/DO-214BA



DFS BRIDGE

DIMENSIONS IN INCHES
AND (MILLIMETERS)

General Instrument Recommended Minimum Mounting Pad Layout Sizes for the Flat Pack Surface Mount Rectifiers

HEADQUARTERS:
10 Melville Park Road, Melville, NY 11747
Tel: (516) 847-3000

Northeast Regional Sales Office
General Instrument Corporation
10 Melville Park Road
Melville, NY 11747
Tel: (516) 847-3200

Central Regional Sales Office
General Instrument Corporation
85 West Algonquin Rd.
Suite 300
Arlington Heights, IL 60005
Tel: (708) 364-5880
Fax: (708) 364-0649

Southeast Regional Sales Office
General Instrument Corporation
6855 Jimmy Carter Blvd.
Suite 2250
Norcross, GA 30071
Tel: (404) 446-1265
Fax: (404) 446-1286

Western Regional Sales Office
General Instrument Corporation
8222 South 48th St.
Suite 250
Phoenix, AZ 85044
Tel: (602) 438-6840
Fax: (602) 438-6844/6836

UNITED STATES

ALABAMA

Group 2000 Sales
655 Gallatin Street
Suite 100
Huntsville, 35801
Tel: (205) 536-2000
Fax: (205) 533-5525

ARIZONA

O'Donnell Assoc. S.W. Inc.
2432 West Peoria Ave.
Suite 1026
Phoenix, 85029
Tel: (602) 944-9542
Fax: (602) 861-2615

O'Donnell Assoc. S.W. Inc.
11449 N. Copper Springs
Trail, Tucon, 85737
Tel: (602) 797-2047
Fax: (602) 742-6039

CALIFORNIA

Ewing-Foley Inc.
895 Sherwood Ave.
Los Altos, 94022
Tel: (415) 941-4525
Fax: (415) 941-5109

Ewing-Foley Inc.
185 Linden Ave.
Auburn, 95603
Tel: (916) 885-6591
Fax: (916) 885-6594

ProSales
8745 Magnolia Ave.
Suite D
Santee, 92071-4592
Tel: (619) 596-2190
Fax: (619) 596-2194

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Select Electronics
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Suite 106, Bldg. F
La Mirada, 90638
Tel: (714) 739-8891
Fax: (714) 739-1604

Solid State Sales
1770 Orange Ave.
Costa Mesa, 92627
Tel: (714) 650-8414
Fax: (714) 650-8415

CANADA

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5468 Dundas St. West
Suite 206
Islington, Ontario
M9B 6E3
Tel: (416) 236-2355
Fax: (416) 236-3387

Pipe-Thompson Ltd.
17 Brandy Creek Cresent
Kanata, Ontario
K2M 2B8
Tel: (613) 591-1821
Fax: (613) 591-0461

Davetek Marketing
107-3738 North Fraser
Way
Burnaby, British Columbia
V5J 5G1
Tel: (604) 430-3680
Fax: (604) 435-5490

COLORADO

Meridian Marketing, Inc.
6801 South Emporia St.
Suite 203
Englewood, 80112
Tel: (303) 790-7171
Fax: (303) 790-2744

FLORIDA

Graham Assoc. Inc.
9123 North Military Trail
Suite 103
Palm Beach Gardens,
33410
Tel: (407) 622-4049
Fax: (407) 622-4595

Graham Assoc. Inc.
P.O. Box 771628
Winter Garden, 34777-
1628
Tel: (407) 656-9369
Fax: (407) 656-6972

Graham Assoc. Inc.
P.O. Box 397
Melbourne, 32902-0397
Tel: (407) 773-6631
Fax: (407) 773-6576

Graham Assoc. Inc.
14101 Martin Sr. Drive
Dade City, 33525
Tel: (904) 523-0996
Fax: (904) 523-0998

FLORIDA (cont.)

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Coral Springs, 33065
Tel: (305) 341-5102
Fax: (305) 341-5118

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Group 2000 Sales
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Suite 140
Norcross, 30092
Tel: (404) 729-1889
Fax: (404) 729-1896

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Metcom Assoc.
Two Talcott Rd.
Park Ridge, 60068
Tel: (708) 696-1490
Fax: (708) 696-2568

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Valentine Assoc. Inc.
1030 Summit Drive
Carmel, 46032
Tel: (317) 846-0008
Fax: (317) 846-0255

IOWA

Lorenz Sales, Inc.
5270 North Place
N.E. Cedar Rapids, 52402
Tel: (319) 377-4666
Fax: (319) 377-2273

KANSAS
Lorenz Sales, Inc.
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Fax: (913) 469-1238

Lorenz Sale, Inc.
1530 Maybelle
Wichita, 67212
Tel: (316) 721-0500
Fax: (316) 721-0566*

KENTUCKY
Valentine Assoc.
3215 Brentwood Dr.,
Henderson, 42420
Tel: (502) 826-9444
Fax: (502) 826-9108

MASSACHUSETTS
Power Component Sales, Inc.
352 Boston Turnpike
Shrewsbury, 01545
Tel: (508) 754-9840
Fax: (508) 754-9858

MICHIGAN
Rathsburg Assoc.
41100 Bridge Street
Novi, 48375
Tel: (810) 615-4000
Fax: (810) 615-4001

MINNESOTA
Hanna-Lind Ltd.
5909 Baker Rd.
Suite 510
Minnetonka, 55345
Tel: (612) 931-1242
Fax: (612) 931-3015

MISSOURI
Lorenz Sales, Inc.
10176 Corporate Square Dr.
St. Louis, 63132
Tel: (314) 997-4558
Fax: (314) 997-5829

NEBRASKA
2801 Garfield St.
Lincoln, 68502
Tel: (402) 475-4660
Fax: (402) 474-7094

NEW MEXICO
O'Donnell Assoc. Southwest Inc.
3200 Carlisle Blvd. N.E.
Suite 104
Albuquerque 87110
Tel: (505) 889-4522
Fax: (505) 889-4598

NEW YORK
Neptune Electronics Co. Inc.
255 Executive Dr.
Suite 211
Plainview, 11803
Tel: (516) 349-1600
Fax: (516) 349-1343

Quality Components
116 East Fayette St.
Manlius, 13104
Tel: (315) 682-8885
Fax: (315) 682-2277

Quality Components
3343 Harlem Rd.
Buffalo, 14225
Tel: (716) 837-5430
Fax: (716) 837-0662

NORTH CAROLINA
Group 2000 Sales
875 Walnut Street
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Cary, 27511
Tel: (919) 481-1530
Fax: (919) 481-1958

OHIO
Makin & Assoc.
3165 Linwood Rd.
Cincinnati, 45208
Tel: (513) 871-2424
Fax: (513) 871-2524

Makin & Assoc.
32915 Aurora Rd.
Solon, 44139
Tel: (216) 248-7370
Fax: (216) 248-7372

Makin & Assoc.
6400 Riverside Dr.
Bldg. A
Dublin, 43017
Tel: (614) 793-9545
Fax: (614) 793-0256

OKLAHOMA
Comptech Sales
18700 Woodbriar Lane
Catoosa, 74015
Tel: (918) 266-1966
Fax: (918) 266-1808

OREGON
Electronic Sources Inc.
6700 S.W. 105th
Suite 305
Beaverton, 97005
Tel: (503) 627-0838
Fax: (503) 627-0238

PENNSYLVANIA
Bresson Assoc.
107 Forrest Ave.
Narberth, 19072
Tel: (215) 664-6460
Fax: (215) 664-7020

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Isla Caribe Electro Sales Inc.
Calle Alejandrino
C#5 Villa Clementina
Guaynabo, 00657
Tel: (809) 720-4430
Fax: (809) 720-1097

TEXAS
Comptech Sales
2401 Gateway Dr.
Suite 114
Irving, 75063
Tel: (214) 751-1181
Fax: (214) 550-8113

Comptech Sales
11130 Jollyville Rd.
Suite 200
Austin, 78759
Tel: (512) 343-0300
Fax: (512) 345-2530

Comptech Sales
15415 Katy Freeway
Suite 209
Houston, 77094
Tel: (713) 492-0005
Fax: (713) 492-6116

TEXAS (cont.)
Comptech Sales
1325 South 77th Sunshine Strip
Apt. E-2
Harlingen, 78550
Tel: (512) 421-4501
Fax: (512) 421-3265

O'Donnell Assoc. Southwest Inc.
5959 Gateway West
Suite 558
El Paso, 79925
Tel: (915) 778-6429
Fax: (915) 778-2581

WASHINGTON
Electronic Sources Inc.
1603 116th Ave. N.E. #115
Suite 115
Bellevue, 98004
Tel: (206) 451-3500
Fax: (206) 451-1038

WISCONSIN
Metcom Assoc.
237 South Curtis Rd.
West Allis, 53214
Tel: (414) 476-1300
Fax: (414) 476-4368

MEXICO
Ciber Electronica S.A.DE C.V.
Arbol 207
Colonia Chapalita Sur
C.P. 45000
Guadalajara, Jalisco
Tel: 52-36-47-5217
Fax: 52-36-22-9394

AUSTRIA
Key Components
Elektronik Handelsges. mbH
Heiligenkreuzerstr. 51
A- 2393 Sittendorf (Vienna)
Tel.: 02/237 83 61- 0
Telefax: 02/23 76 63

Burisch
Elektronik- Bauteile GmbH
Leopoldauerstr. 29
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BELGIUM / HOLLAND
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Rodelco N.V./S.A.
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Telex: 246 10
Telefax: 02/460 02 71

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32321 Pilsen

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Sylbaekvej 33
DK- 8230 Aabyhoj
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FINLAND
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Tyopajakatu 5
SF- 00581 Helsinki
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91120 Palaiseau
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Telefax: 030/7 92 76 60

Enatechnik GmbH
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25451 Quickborn
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Telefax: 041 06/61 22 68

RSC- Halbleiter GmbH
Industriestr. 2
75228 Ispringen
Tel.: 072 31/80 10
Telefax: 072 31/822 82

Sinus Electronic GmbH
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74257 Untereisesheim
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GERMANY cont.
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Telefax: 06 103/30 43 44

Semitron W.Rock GmbH
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79790 Kussaberg
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GREECE
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9, L.Koromila
GR- 11745 Athens
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Telex: 22 15 27
Telefax: 09/23 96 98

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7Kehilat Saloniki Street
IL- 69513 Tel- Aviv
Tel.: 034/932 72
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Distributors:
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SS.16- Via Adriatica km 314
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Via Matteo di Giovanni, 6
50143 Firenze
Tel.: 055/71 74 02
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Via Gramsci, 156
20037 Paderno Dugnano (MI)
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20151 Milano
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20026 Novate Milanese (MI)
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Telefax: 02/354 22 62

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Telefax: 063/83 20 07

PORTUGAL
COMPONENTA Lda
Rua Luis de Camoes 128
1300 Lisboa
Tel.: 13 62 12 83/84
Telex: 61562
Telefax: 13 63 76 55

SOUTH AFRICA
HI- Q Electronics
97 Bedford Avenue
Benoni 1500
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Telefax: 011/420 29 14

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Avda de Valladolid 47D
28008 Madrid
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Telex: 45550
Telefax: (91) 2 48 79 58

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28045 Madrid
Tel.: (910 467 75 12
Telefax: (91) 530 29 34

SUTELCO S.A.
Pilar de Zaragoza 23
28028 Madrid
Tel.: (91) 355 86 03/02/01
Telefax: (91) 355 81 20

SWEDEN
Bexab Sweden AB
Kemistvagen 10A
S- 18325 Taby
Tel.: 08/630 88 00
Telefax: 08/732 70 58

SWITZERLAND
Elbatex AG
Hardstr. 72
CH- 5430 Wettingen
Tel.: 056/27 51 11
Telefax: 056/27 19 24

UNITED KINGDOM
Distributors:
Farnell Electronic Components
Armley Road
Leeds
LS12 2QQ
Tel.: 05 32/79 01 01
Telefax: 05 32/63 34 04

Future House
Poyle Road
Colnbrook
SL3 OEZ
Tel.: 07 53/68 70 00
Telefax: 07 53/68 91 00

Hunter Electronic Components Ltd.
Unit 3, Central Estate
Denmark Street
Maidenhead
Berks SL6 7BN
Tel.: 06 28/759 11
Telefax: 06 28/756 11

Polar Electronics Ltd.
Cherry Court Way
Leighton Buzzard
Beds LU7 8YY
Tel.: 05 25/37 70 93
Telex: 825238
Telefax: 05 25/37 83 67

Polar North
14 Howard Court
Manorpark Avenue
Manorpark
Runcorn
Cheshire
WA7 1SJ
Tel.: 09 28/57 90 09
Telefax: 09 28/57 91 23

UNITED KINGDOM cont.
Young ECC Electronics
Knaves Beech Estate
High Wycombe
Bucks
HP10 9QY
Tel.: 06 28/81 07 27
Telex: 848661 HYE UK
Telefax: 06 28/81 08 07

RS Components Ltd.
Po Box 99
Corby
Northants
NN17 9RS
Tel.: 05 36/20 12 34
Telex: 34 25 12
Telefax: 05 36/20 15 01

UNITED KINGDOM
Agents:
Rodgers Agencies
124 Orby Drive
Belfast BT5 6BB
Northern Ireland
Tel.: (Belfast) 70 49 85
Telefax: (Belfast) 79 25 63

DISTRIBUTOR	ADDRESS	CITY/STATE	TELEPHONE NO.
ACI Electronics	200 Newtown Road	Plainview, NY 11803	(516) 293-6630
Advent Electronics	1865 Miner St.	Des Plaines, IL 60016-8416	(708) 298-4210
All American	16085 N.W. 52nd Avenue	Miami, FL 33014	(305) 621-8282
Arrow Electronics	25 Hub Drive	Melville, NY 11746	(516) 391-1300
Bell Industries	11812 San Vicente, Suite 300	Los Angeles, CA 90049	(310) 826-2355
Digi-Key Corp.	701 Brooks Ave. S.	Thief River Falls, MN 56701	(218) 681-6674
Future Electronics	237 Hymus Boulevard	Pointe Claire, CN H9R5C7	(514) 694-7710
Garrett Instruments	3130 Skyway Dr. Suite 701	Santa Maria, CA 93455	(805) 922-0594
Hamilton/Hallmark Electronics	11333 Pagemill Road	Dallas, TX 75243-8399	(214)343-5000
Hammond Electronics	1230 W. Central Avenue	Orlando, FL 32805	(407) 849-6060
Jaco Electronics	145 Oser Avenue	Hauppauge, NY 11788	(516) 273-5500
Newark Electronics	4801 N. Ravenswood	Chicago, IL 60640	(312) 784-5100
NEP Electronics	805 Mittle Drive	Wood Dale, IL 60191	(708) 595-8500
Nu-HorizonsElectronics	6000 New Horizons Blvd.	Amityville, NY 11701	(516) 226-6000
Pioneer-Standard Electronics	4800 E. 131st Street	Cleveland, OH 44105	(216) 587-3600
Pioneer-Technologies, Inc.	15810 Gaither Drive	Gaithersberg, MD 20877	(301) 921-3864
Solid State	46 Ferrand Street	Bloomfield, NJ 07003	(201) 429-8700
Seymour Electronics	357 Crossways Park Drive	Woodbury, NY 11797-2042	(516) 496-7474
Taitron Components Inc.	25202 Anza Drive	Valencia, CA 91355	(800) 247-2232
Taylor Electronics	1000 W. Donges Bay Road	Mequon, WI 53092	(414) 241-4321

Note: AS OF AUGUST 1994, THE SINGAPORE SALES OFFICE ADDRESS WILL BE:

80, Marine Parade Road
#07-09 Parkway Parade
Singapore 1544
(the telephone and fax numbers will remain unchanged)

GENERAL INSTRUMENT CORPORATION

Power Semiconductor Division Headquarters:
10 Melville Park Road, Melville, N.Y. 11747
Tel: 516-847-3000

NORTH AMERICAN SALES OFFICES

North Eastern Regional Sales Office:
10 Melville Park Road, Melville N.Y. 11747
Tel: 516-847-3200

South Eastern Regional Sales Office:
6855 Jimmy Carter Blvd., Suite 2250, Norcross,
GA, 30071 (404)446-1265 · FAX: 404-446-1286

Central Regional Sales Office:
85 W. Algonquin Road, Suite 300,
Arlington Heights, IL 60005 (708)364-5880
FAX: 708-364-0649

Western Regional Sales Office:
8222 South 48th Street, Suite 250, Phoenix, AZ
85044 (602) 438-6840 · FAX: 602-438-6844

EUROPEAN SALES OFFICES

European Headquarters, German Sales Office *:
General Instrument Deutschland
GmbH,Freischützstrasse 96,
81927 München, Fed. Rep. of Germany
Tel: 49 (0) 89/95997-0 · Telex: 26 2435
FAX: 49 (0) 89/957-0489

France, Spain, and Portugal:
General Instrument France, 9/11 Rue G. Enesco,
94008 Créteil Cedex, France Tel: 33 (1) 43771263
FAX: 33 (1) 43991524

Italy, Greece and Turkey:
General Instrument Italia S.r.L., Via Cantu 11,
20092 Cinisello Balsamo, Milano, Italy
Tel: 39 (02) 66010274/285/287 · Telex: 32 03 48
FAX: 39 (02) 66010324

United Kingdom and Ireland:
General Instrument (UK) Ltd., Power
Semiconductor Div., Colne House Business Centre,
Colne House, Highbridge Estate, Uxbridge,
UB8 1LX, United Kingdom
Tel: 44 (0) 895/272911 ·Telex: 919084 EURO G
FAX: 44 (0) 895/270049

FAR EAST SALES OFFICES

Taiwan:
General Instrument of Taiwan, Ltd., 233 Pao Chiao
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FAX: 9-011-8862-917-5991

Hong Kong:
General Instrument H.K. Ltd., Unit 211, Tower II,
South Seas Centre, 75 Mody Road, Tsimshatsui
East, Kowloon, Hong Kong Tel: (852) 722-6577
FAX: (852) 723-9239

Japan:
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Toranomon, Minato-ku, Tokyo, Japan 105
Tel: 81-3-3437-0281 · FAX: 81-3-3434-3938

Singapore:
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Parade Central, #03-09 Parkway Builder's Centre,
Singapore, 1544 Tel: (65) 3444711
Telex: RS 24424 · Fax: (64) 3446878

**Any European countries not listed, please contact the European Headquarters*

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Power Semiconductor Division