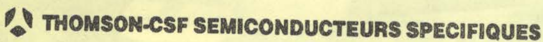
THOMSON COMPOSANTS MICROONDES

THE COMPLETE GaAs COMPANY

NEW NAME AND ADDRESS:



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SHORT FORM CATALOGUE

THOMSON-CSF

8149

TCM PROFILE

LEADERSHIP

It has been 20 years since THOMSON COMPOSANTS MICROONDES (TCM) manufactured its first GaAs FET (Field Effect Transistor). Throughout this period, TCM has increased its know-how and expertise in compound III-V technologies and devices.

Today, this broad-based experience allows TCM to offer several different leading-edge technologies and a wide range of products and services, including FETs, microwave diodes, MMICs (Monolithic Microwave Integrated Circuits), amplifiers, sources, hybrid modules, monolithic and hybrid foundries.

THOMSON COMPOSANTS MICROONDES, strengthened by commercial and technological agreements with leading American GaAs companies — Anadigics Inc (Warren, NJ) and Vitesse Semiconductor Corp. (Camarillo, CA) — is now the leading European supplier of GaAs devices, offering digital, analog, mixed and microwave products and services for military, telecommunications, computer, industrial and consumer applications.

TECHNOLOGIES

Semiconductor and hybrid technologies handled by TCM are:

FOUNDRY COMMERCIAL NAME	MATERIAL AND BASIC DEVICE	PRODUCTS	STATUS
	GaAs Diode	Pin, Impatt, Schottky, Varactor, Pulsed gunn diodes	PROD
	InP Diode	CW gunn diode	PROD
	Si Diode	CW & pulsed impatt diodes	PROD
	GaAs depletion 0.2 μm	Discrete ultra low noise MESFET up to 40 GHz	PROD
	GaAs HEMT 0.2 μm	Discrete ultra low noise HEMT up to 40 GHz	DEV
	GaAs depletion MESFET 0.5 μm	Discrete power MESFET up to 20 GHz	PROD
LN05	GaAs depletion MESFET 0.5 μm	MMICs low-noise, low & medium level up to 20 GHz	PROD
HP07	GaAs depletion MESFET 0.7 μm	Power MMICs up to 10 GHz	PROD
VLN02	GaAs HEMT 0.2 μm	Low-noise, low-level amplifiers up to 40 GHz	DEV
HP05	GaAs depletion MESFET 0.5 μm	Power MMICs up to 20 GHz	DEV
SAGA08	GaAs enhancement/depletion MESFET 0.8 μm	Digital ICs 100 MHz to 3 GHz up to 50 000 gates	(1)
SAGA06	GaAs enhancement/depletion MESFET 0.6 μm	High density digital ICs up to 350.000 gates	(2)
MHMIC	Thin film microwave hybrids	Microwave subsystems, oscillators	PROD

(1) Transfer from vitesse semiconductor, production 1992
(2) Transfer from vitesse semiconductor, production 1994

MESFET: MEtal Schottky Field Effect Transistor
GaAs: Gallium Arsenide
InP: Indium Phosphide
HEMT: High Electron Mobility Transistor
MHMIC: Miniaturized Hybrid Microwave Integrated Circuit

TCM PLANTS AND OFFICES

TCM company headquarters are in Orsay, near Paris. Located on this site are the sales and marketing departments, R&D labs and a 3″ GaAs wafer fabrication facility dedicated to microwave production (FETs, diodes, MMICs) and technological R&D.

The production plant in Grenoble (southern France) houses the new 4″ GaAs wafer fabrication facility built to satisfy the growing need for more digital and mixed digital-analog ICs. It is totally dedicated to production.

The plant in Massy, also near Paris, groups R&D labs and production clean rooms, and is dedicated to microwave hybrid modules and subsystems.

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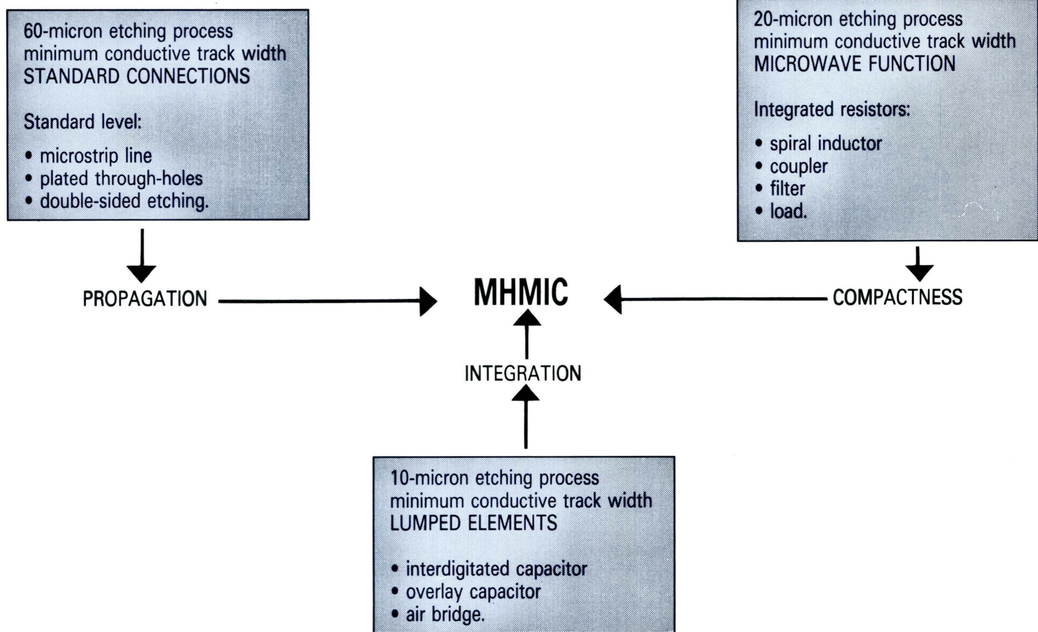
MHMIC
FOUNDRY

MHMIC FOUNDRY

Miniaturized Hybrid Microwave Integrated Circuits

THOMSON COMPOSANTS MICROONDES offers a fully qualified process for thin film hybrid microwave circuits featuring custom integration of passive elements characterized up to 40GHz. The Miniaturized Hybrid Microwave Integrated Circuit (MHMIC) technology complements the MMIC chip, as well as other active discrete components (FET,etc.) ensuring compatibility for interconnection, low loss associated circuits and size reduction.



A FOUNDRY SERVICE IS ASSOCIATED WITH THE MHMIC TECHNOLOGY

MHMIC FOUNDRY

INTEGRATED PASSIVE COMPONENTS

- conductive tracks - 10-micron etching
- plated through-holes (dia. 300 microns)
- air bridges
- RLC array

NiCr resistance: 20 Ω/□, 60 Ω/□
Spiral inductor: 1 to 5 nH
Interdigitated capacitor: 0 to 0.5 pF
Overlay capacitor: 0.5 to 15 pF

Other complementary services are offered: chip packaging, assembly (standard or T–PAK®)
- special environmental tests.

TECHNOLOGY - STANDARD DATA

Passive substrate (alumina)
Thin film technology
Adhesive layers: NiCr, Cr
Resistive layer: NiCr
Conductive layers: Au, Cu
Barrier layers: Ni, Ti, Pd
Dielectric layers: $Si_3 N_4$
Deposition processes:
- cathode sputtering
- PECVD (Plasma Enhanced Chemical Vapor Deposition)
- galvanoplasty.

THIN FILM HYBRID TECHNOLOGICAL PROCESSES (MHMIC)

Thin film circuits are made using the following techniques:
- selective wet etching of resistive and conductive layers
- dry etching (reactive ion milling)
- plasma deposit and etching
- electrolytic deposit
- simple or double face photolithography
- trimming of resistors by laser
- cutting with saw or laser

STANDARD MHMIC PROCESSES OF TCM

- Simple Level (SL)
- Integrated Resistors (IR)
- High Definition (HD)

MHMIC FOUNDRY

"Simple Level" and "Integrated Resistors" make use of wet etching techniques. These are the most economical.

Other processes call on ion etching techniques and obtain high density circuits with excellent definition ($\pm$ 1.5 μm).

These techniques, already in use for a decade and featuring ongoing improvement enable the fabrication of circuits with excellent reproducibility, and also permit a certain amount of element integration on demand:

- from the simplest one, including conductors, spiral inductors and occasionally metalized holes,
- to the most complete, including R, L, C elements as a whole (resistors, spiral inductors, interdigited and overlay capacitors) and connections (metalized holes, air bridges). In this case, only active elements (FET, MMIC, etc.) have been transferred onto the circuit.

This advanced integration offers the following advantages:

- reduced circuit size and weight thanks to a more compact design,
- higher connection reliability,
- better control of connection length and thus better reproducibility,
- lower costs thanks to collective technology, diminution of the number of cabling and adjusting operations (the only added components are the active elements).

PROCESS	SINGLE LEVEL	INTEGRATED RESISTORS	HIGH DEFINITION
Circuit side metalization	CrNiCuAu	NiCrAu	NiCrAu
Back metalization	CrNiCuAu	CrNiCuAu	NiCrCuAu
Simple face etching	+	+	+
Double face etching	+	+	+
Level of integration (on demand)			
Conductors	+	+	+
Metalized via holes	+	+	+
Spiral inductors	+	+	+
Resistors		+	+
Air bridges		+	+
Interdigited Capacitors			+
Overlay Capacitors			+
Minimum line width	100 (4)	20 (0.8)	10 (0.4)
Minimum spacing width	60 (2.4)	20 (0.8)	10 (0.4)
Accuracy	± 15 (0.6)	± 3 (0.12)	± 1,5 (0.06)

All dimensions are in micrometers (mils).

The description of this process has been simplified, all the cleaning, masking and "lift off" operations being omitted. The complete process needs 5 levels of masks.

At the end of the process, wafers will be subjected to thermal stabilization before trimming of resistors by laser and dicing. After a last cleaning, circuits will be tested and delivered to the designer or the manufacturing section. They could also be delivered packaged or brazed on a "chip carrier".

TECHNOLOGICAL STEPS

Technological operations are described on the sequence diagram of figure 1, in the case of the more advanced integration.

The 2" x 2" polished alumina wafer is drilled by a laser then metalized on the back and front sides.

Conductor tracks are etched by ion etching on this substrate.

Resistors are made in the next stage.

If overlay capacitors are to be integrated, the collective process is continued by the deposit of a dielectric layer of silicon nitride.

The last operation is making air bridges, in a collective way, with resin coating, metalization, electrolytic deposition and wet etching.

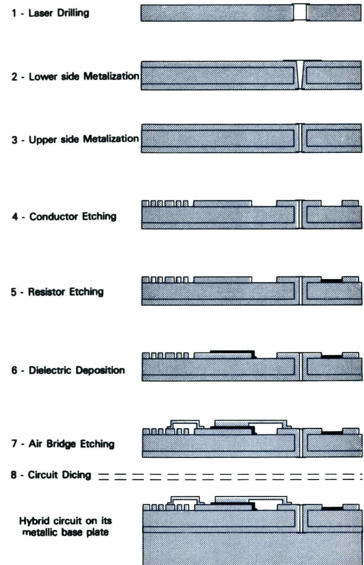


Fig. 1

THOMSON COMPOSANTS MICROONDES

STANDARD MICROWAVE OSCILLATORS

DIELECTRIC RESONATOR OSCILLATORS (DROs)

■ *Fixed frequency dielectric resonator oscillators,* COMMERCIAL PRODUCTS

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 10 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY STABILITY TYP.	CASE
GR1120-01	4-5 GHz	13 dBm	-95 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW1
GR1120-02	5-6.5 GHz	13 dBm	-95 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW2
GR1120-03	6.5-8 GHz	13 dBm	-95 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW3
GR2120-01	8-12 GHz	13 dBm	-90 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW3
GR3110-01	12-16 GHz	11 dBm	-85 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW4
GR4110-01	16-20 GHz	10 dBm	-80 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW4
GR5110-01	20-24 GHz	10 dBm	-75 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW4

■ *Fixed frequency dielectric resonator oscillators,* MILITARY PRODUCTS

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 10 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY STABILITY TYP.	CASE
GR1320-01	4-5 GHz	13 dBm	-95 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW1
GR1320-02	5-6.5 GHz	13 dBm	-95 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW2
GR1320-03	6.5-8 GHz	13 dBm	-95 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW3
GR2320-01	8-12 GHz	13 dBm	-90 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW3
GR3310-01	12-16 GHz	11 dBm	-85 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW4
GR4310-01	16-20 GHz	10 dBm	-80 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW4
GR5310-01	20-24 GHz	10 dBm	-75 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW4

■ *Mechanically tuned dielectric resonator oscillators,* COMMERCIAL PRODUCTS

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 10 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY STABILITY TYP.	CASE
GR1121-01	4-5 GHz	13 dBm	-90 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW1
GR1121-02	5-6.5 GHz	13 dBm	-90 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW2
GR1121-03	6.5-8 GHz	13 dBm	-90 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW3
GR2121-01	8-12 GHz	13 dBm	-85 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW3
GR3111-01	12-16 GHz	11 dBm	-80 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW4
GR4111-01	16-20 GHz	10 dBm	-75 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW4
GR5111-01	20-24 GHz	10 dBm	-70 dBc/Hz	0 to + 60 °C	3 ppm/°C	DRW4

■ *Mechanically tuned dielectric resonator oscillators,* MILITARY PRODUCTS

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 10 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY STABILITY TYP.	CASE
GR1321-01	4-5 GHz	13 dBm	-90 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW1
GR1321-02	5-6.5 GHz	13 dBm	-90 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW2
GR1321-03	6.5-8 GHz	13 dBm	-90 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW3
GR2321-01	8-12 GHz	13 dBm	-85 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW3
GR3311-01	12-16 GHz	11 dBm	-80 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW4
GR4311-01	16-20 GHz	10 dBm	-75 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW4
GR5311-01	20-24 GHz	10 dBm	-70 dBc/Hz	-45 to + 85 °C	4 ppm/°C	DRW4

STANDARD MICROWAVE OSCILLATORS

DIELECTRIC RESONATOR OSCILLATORS (DROs)

Electronically tuned dielectric resonator oscillators, COMMERCIAL PRODUCTS

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 10 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY STABILITY TYP.	CASE
GR1122-01	4-5 GHz	13 dBm	-85 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW1
GR1122-02	5-6.5 GHz	13 dBm	-85 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW2
GR1122-03	6.5-8 GHz	13 dBm	-85 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW3
GR2122-01	8-12 GHz	13 dBm	-80 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW3
GR3112-01	12-16 GHz	11 dBm	-75 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW4
GR4112-01	16-20 GHz	10 dBm	-70 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW4
GR5112-01	20-24 GHz	10 dBm	-65 dBc/Hz	0 to + 60 °C	4 ppm/°C	DRW4

Electronically tuned dielectric resonator oscillators, MILITARY PRODUCTS

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 10 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY STABILITY TYP.	CASE
GR1322-01	4-5 GHz	13 dBm	-85 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW1
GR1322-02	5-6.5 GHz	13 dBm	-85 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW2
GR1322-03	6.5-8 GHz	13 dBm	-85 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW3
GR2322-01	8-12 GHz	13 dBm	-80 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW3
GR3312-01	12-16 GHz	11 dBm	-75 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW4
GR4312-01	16-20 GHz	10 dBm	-70 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW4
GR5312-01	20-24 GHz	10 dBm	-65 dBc/Hz	-45 to + 85 °C	5 ppm/°C	DRW4

STANDARD MICROWAVE OSCILLATORS

VOLTAGE CONTROLLED OSCILLATORS (VCOs)

■ *Narrow band VCOs* WITHOUT HEATER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY DRIFT OVER TEMPERATURE RANGE	CASE
GV2311-01	6.5-8.5 GHz	10 dBm	-75 dBc/Hz	-45 to + 85 °C	130 MHz	DV1
GV3311-01	8.5-11.5 GHz	10 dBm	-70 dBc/Hz	-45 to + 85 °C	150 MHz	DV1
GV4311-01	11.4-15 GHz	10 dBm	-60 dBc/Hz	-45 to + 85 °C	200 MHz	DV1
GV4311-02	14.9-18 GHz	10 dBm	-50 dBc/Hz	-45 to + 85 °C	300 MHz	DV1

■ *Narrow band VCOs* WITH HEATER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY DRIFT OVER TEMPERATURE RANGE	CASE
GV2315-01	6.5-8.5 GHz	10 dBm	-75 dBc/Hz	-45 to + 85 °C	50 MHz	DV1H
GV3315-01	8.5-11.5 GHz	10 dBm	-70 dBc/Hz	-45 to + 85 °C	75 MHz	DV1H
GV4315-01	11.4-15 GHz	10 dBm	-60 dBc/Hz	-45 to + 85 °C	100 MHz	DV1H
GV4315-02	14.9-18 GHz	10 dBm	-50 dBc/Hz	-45 to + 85 °C	100 MHz	DV1H

■ *Narrow band and low noise VCOs* WITHOUT HEATER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY DRIFT OVER TEMPERATURE RANGE	CASE
GV1411-01	3-4 GHz	10 dBm	-100 dBc/Hz	-45 to + 85 °C	150 MHz	DV2
GV2411-01	6.8-7.8 GHz	10 dBm	- 96 dBc/Hz	-45 to + 85 °C	150 MHz	DV2
GV3411-01	8.5-10.5 GHz	10 dBm	- 90 dBc/Hz	-45 to + 85 °C	300 MHz	DV2

■ *Narrow band and low noise VCOs* WITH HEATER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY DRIFT OVER TEMPERATURE RANGE	CASE
GV1415-01	3-4 GHz	10 dBm	-100 dBc/Hz	-45 to + 85 °C	50 MHz	DV2H
GV2415-01	6.8-7.8 GHz	10 dBm	- 96 dBc/Hz	-45 to + 85 °C	50 MHz	DV2H
GV3415-01	8.5-10.5 GHz	10 dBm	- 90 dBc/Hz	-45 to + 85 °C	150 MHz	DV2H

■ *Wide band VCOs* WITHOUT HEATER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY DRIFT OVER TEMPERATURE RANGE	CASE
GW2311-01	4-8 GHz	10 dBm	-75 dBc/Hz	-45 to + 85 °C	130 MHz	DV1
GW3311-01	8-12 GHz	10 dBm	-65 dBc/Hz	-45 to + 85 °C	250 MHz	DV1
GW4311-01	12-18 GHz	10 dBm	-60 dBc/Hz	-45 to + 85 °C	400 MHz	DV1

■ *Wide band VCOs* WITH HEATER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FREQUENCY DRIFT OVER TEMPERATURE RANGE	CASE
GW2315-01	4-8 GHz	10 dBm	-75 dBc/Hz	-45 to + 85 °C	60 MHz	DV1H
GW3315-01	8-12 GHz	10 dBm	-65 dBc/Hz	-45 to + 85 °C	100 MHz	DV1H
GW4315-01	12-18 GHz	10 dBm	-60 dBc/Hz	-45 to + 85 °C	150 MHz	DV1H

YIG TUNED OSCILLATORS (YTOs)

YTOs WITHOUT DRIVER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	FM PORT	CASE
GY1311-01 GY1311-02	6-18 GHz	11/21 dBm	-80 dBc/Hz	-45 to + 85 °C	YES	DYW1 DYW2
GY2311-01 GY2311-02	8-16 GHz	11/21 dBm	-85 dBc/Hz	-45 to + 85 °C	YES	DYW1 DYW2
GY2312-01 GY2312-02	6-18 GHz	11/21 dBm	-85 dBc/Hz	-45 to + 85 °C	NO	DYW1 DYW2

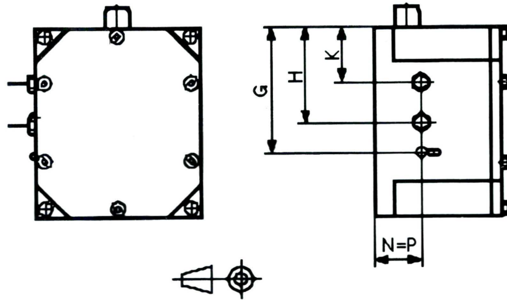
YTOs WITH DRIVER

MODEL	FREQUENCY RANGE	OUTPUT POWER	SSB PHASE NOISE AT 100 kHz OFF CARRIER	OPERATING TEMPERATURE RANGE	CASE
GY2315-01 GY4315-02	6-18 GHz 6-18 GHz	10 dBm 10 dBm	-80 dBc/Hz -85 dBc/Hz	-45 to + 85 °C -45 to + 85 °C	DYW3 DYW3

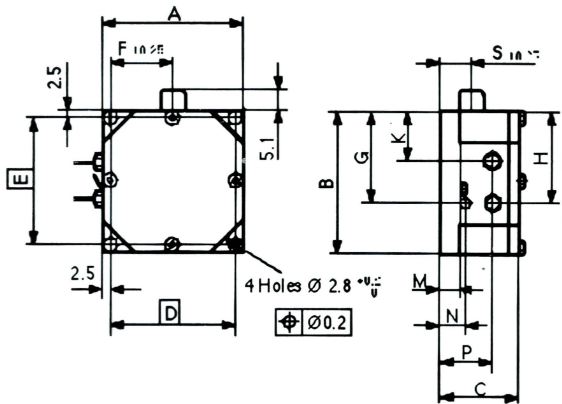
STANDARD MICROWAVE OSCILLATORS

PACKAGE OUTLINES

DRW1 AND DRW2



DRW3 AND DRW4

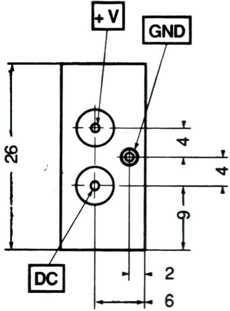


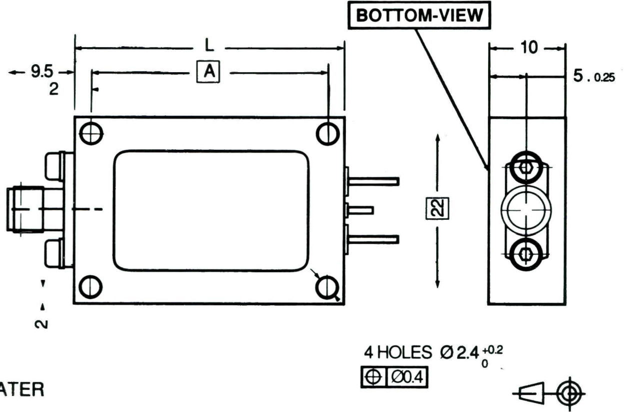
DIMENSIONS (mm)	DRW1	DRW2	DRW3	DRW4
A	48	48	42	35
B	52	48	41	35
C	37	34	23	19
D	43	43	37	30
E	47	43	36	30
F	21.5	21.5	18.5	15
G	34	34	27	23
H	26	26	27	25
K	15	15	14	10
M	5	5	5	16
N	13	13	7	4
P	13	13	15	11
S	9	9	8	7

STANDARD MICROWAVE OSCILLATORS

PACKAGE OUTLINES

DV1 AND DV2



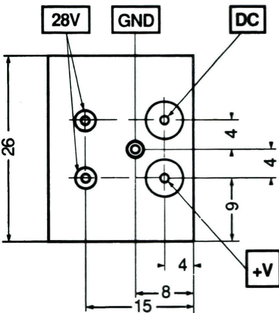


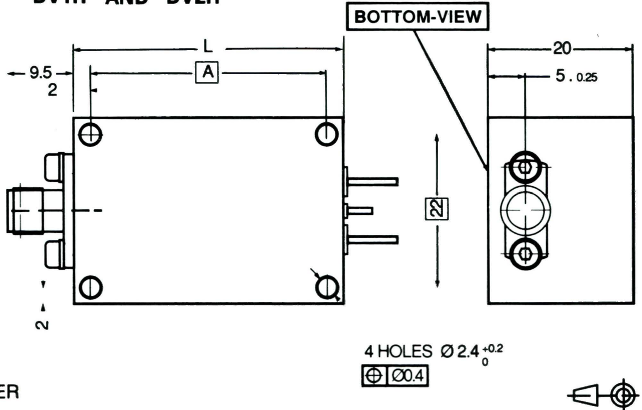
WITHOUT HEATER

	L	A
DV1 DV2	37 47	33 43

GENERAL TOLERANCES ± 0,5

DV1H AND DV2H





WITH HEATER

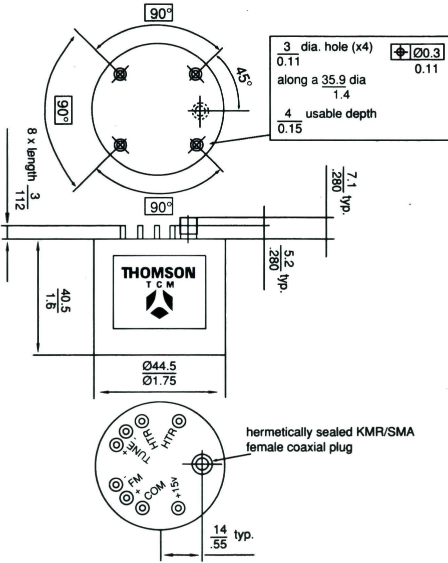
	L	A
DV1H DV2H	37 47	33 43

GENERAL TOLERANCES ± 0,5

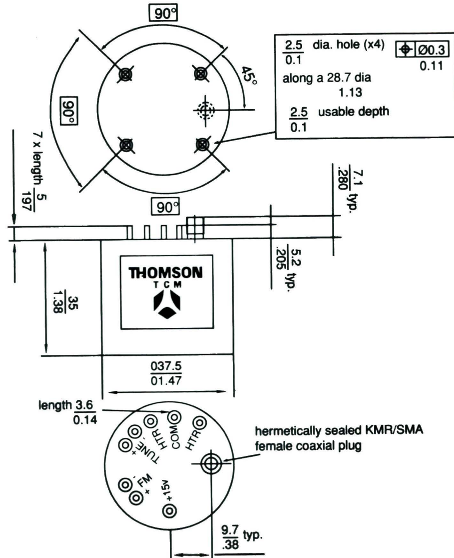
Dimensions in millimeter

PACKAGE OUTLINES

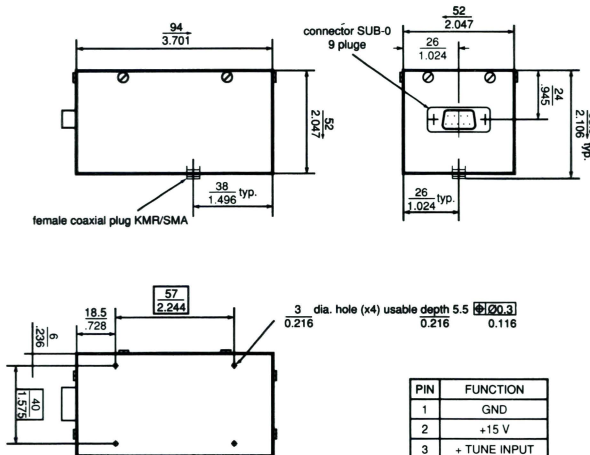
DYW1



DYW2

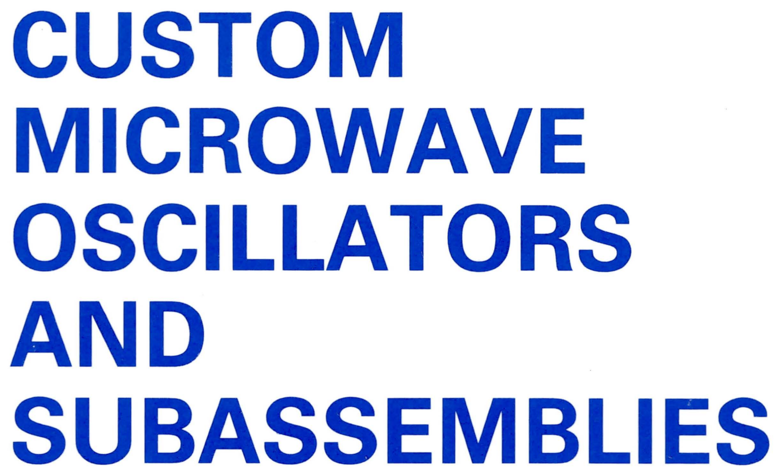


DYW3



PIN	FUNCTION
1	GND
2	+15 V
3	+ TUNE INPUT
4	HEATER 20-28 V
5	- FM
6	-15 V
7	- TUNE INPUT
8	HEATER 20-28 V
9	- FM

Dimensions in: millimeter / (inch)


CUSTOM
MICROWAVE
OSCILLATORS
AND
SUBASSEMBLIES

CUSTOM MICROWAVE OSCILLATORS AND SUBASSEMBLIES

Besides its "Standard Microwave Oscillators" and MHMIC product lines, TCM offers design skills and manufacturing capability to realize custom products. TCM takes advantage of its technologies, product lines and know-how — MMICs, GaAs foundry, digital foundry, MHMIC thin film technology, microwave expertise — to answer to specific customer request with integrated solutions: custom oscillators with built-in specific functions and features, synthesizers, phase locked systems, multifunction assemblies, short distance communication microwave systems,...

Contact TCM representative or Field Sales Engineer for any request.

DISCRETE
SEMICONDUCTORS

GaAs and InP DIODES

POWER GENERATION DIODES

GaAs GUNN DIODES (8 to 100 GHz)

CHARACTERISTICS Tc + 25 C							BIAS				P_o
							Vop V		Iop mA		mW
FREQUENCY RANGE GHz						CASE	TYP	MAX	TYP	MAX	MIN
X band (8-12 GHz)											
8-9	9-10	10-11	11-12								
AH443	AH444	AH445	AH446			W2 (1)	10	14	600	650	100
AH447	AH448	AH449	AH450			W2 (1)	10	14	700	850	200
AH451	AH452	AH453	AH454			W2 (1)	10	14	900	950	300
AH455	AH456	AH457	AH458			W2 (1)	10	14	1 000	1 150	400
Ku Band (12-18 GHz)											
12-13.5	13.5-15	15-16.5	16.5-18								
AH479	AH480	AH481	AH482			W2 (2)	8	12	600	700	100
AH483	AH484	AH485	AH486			W2 (2)	8	12	800	900	150
AH487	AH488	AH489	AH490			W2 (2)	8	12	800	900	200
AH491	AH492	AH493	AH494			W2 (2)	8	12	900	1 000	250
AH495	AH496	AH497				W2 (2)	8	12	1 000	1 100	300
K Band (18-26 GHz)											
18-20	20-22	22-24	25-26								
AH365	AH366	AH367	AH368			W2 (3)	6	9	500	650	50
AH369	AH370	AH371	AH372			W2 (3)	6	9	750	1 000	100
AH373	AH374	AH375	AH376			W2 (3)	6	9	800	1 000	150
AH377	AH378	AH379	AH380			W2 (3)	6	9	800	1 000	200
Ka Band (26-40 GHz)											
26-28	28-31	31-34	34-37	37-40							
AH601	AH602	AH603	AH604	AH605		W3 (4)	5	7	700	800	50
AH606	AH607	AH608	AH609	AH610		W3 (4)	5	7	1 000	1 200	100
AH611	AH612	AH613	AH614	AH615		W3 (4)	5	7	1 200	1 400	150
AH651	AH652	AH653	AH654	AH655		W3 (4)	5	7	1 200	1 400	200
Millimeter (> 40 GHz)											
40-43	43-46	46-50	50-55	55-60							
AH616	AH617	AH618	AH619	AH620		W3 (5)	4	5	1 000	1 300	50
AH621	AH622	AH623	AH624			W3 (5)	4	5	1 000	1 300	100
60-65	65-70	70-75	75-80	80-85	85-90						
AH680	AH681	AH682	AH683	AH684	AH685	W3 (5)	4	6	1 000	1 300	30
Millimeter											
			AH800	94 GHz		W3 (5)	4	5	750	1 000	10
			AH801	94 GHz		W3 (5)	4	5	900	1 200	20
			AH802	94 GHz		W3 (5)	4	5	1 000	1 300	30

InP GUNN DIODES

						CASE	Vop TYP	Vop MAX	Iop TYP	Iop MAX	P_o MIN
AH901	94 GHz					W5		5	350		30
AH902	94 GHz					W5		5	500		40
AH903	94 GHz					W5		5	700		50
AH904	94 GHz					W5		5	800		60

(1) Other cases on request : F27d, F60, W1.
(2) Other cases on request : W4, (F27d, F60, W1).
(3) Other cases on request : W4 (W3, W5).
(4) Other cases on request: W5, (W4, W2). (5) Other cases on request : W5.
NOTE : Pulsed devices available on request.

GaAs and InP DIODES

POWER GENERATION DIODES

GaAs IMPATT DIODES (LOW - HIGH - LOW PROFILE)

CW devices

TYPE	ELECTRICAL CHARACTERISTICS: T_C = + 25 °C									
	F (GHz)	CASE	V_{BR} (1) (V) TYP.	C_{JO} (pF) TYP.	V_{op} (2) (V) TYP.	I_{op} (2) (mA) TYP.	P_o (2) (W) MIN.	n (%) TYP.	R_{TH} (°C/W) TYP.	Δ T_J (3) (°C) TYP.
AH720	10	W4	40	25	50	375	3	20	10-12	190
AH721	10	W4	40	35	50	400	4	20	10-12	200
AH722	10	W4	40	45	50	500	5	20	10-12	245
AH730	14	W4	30	20	38	300	2	18	10-12	130
AH731	14	W4	30	30	38	425	3	18	10-12	170
AH732	14	W4	30	40	38	550	4	18	10-12	215
AH740	16	W4	25	20	35	350	2	16	10-12	140
AH741	16	W4	25	30	35	500	3	16	10-12	190

(1) Measured at I_R = 100 mA.
(2) Measured in a radial resonator cavity.
(3) Mean values.

Pulsed devices (operating performance: τ = 1 μs; τ/T = 25 %)

TYPE	ELECTRICAL CHARACTERISTICS: T_C = + 25 °C									
	F (GHz)	CASE	V_{BR} (1) (V) TYP.	C_{JO} (pF) TYP.	V_{op} (2) (V) TYP.	I_{op} (2) (mA) TYP.	P_o (2) (W) MIN.	n (%) TYP.	R_{TH} (°C/W) TYP.	Δ T_J (3) (°C) TYP.
AH750	10	W4	42	40	52	950	10	20	7-10	110
AH751	10	W4	42	50	52	1 100	12	20	7-10	125
AH752	10	W4	42	60	52	1 450	15	20	7-10	150
AH760	14	W4	32	40	40	1 100	8	18	7-10	100
AH761	14	W4	32	50	40	1 400	10	18	7-10	125
AH762	14	W4	32	60	40	1 600	12	18	7-10	140
AH770	16	W4	27	40	37	1 300	8	16	7-10	110
AH771	16	W4	27	50	37	1 700	10	16	7-10	140

(1) Measured at I_R = 100 mA.
(2) Peak values, measured in radial resonator cavity.
(3) Mean values.

GaAs and InP DIODES

RECEIVING DIODES

GaAs SCHOTTKY BARRIER MIXER DIODES

Packaged diodes: (2 to 40 GHz)

TEST CONDITIONS			(1)		DE LOACH METH.	V = 0V f = 1 MHz		10 mA < I_F < 20 mA	I_R = 10 μA		I_F = 1 mA	LIMITING CONDITIONS	
CHARACTERISTICS Tc = + 25 °C		FREQUENCY RANGE**	NF_{SSB}		f_{CO}	C_{TO}		r_{SF}	V_{BR}		V_F	TEMPERATURE OPERATING	STORAGE
TYPE	CASE* ***	GHz	dB TYP.	MAX.	GHz TYP.	pF TYP.	MAX.	Ω TYP.	V MIN.	TYP.	V MAX.	°C	
DH 378	F 51	8-12	4.5	5.0	1 000	0.22	0.26	3.0	4	10	0.9	— 40, + 125	— 65, + 175
DH 379	F 51	12-18	4.5	5.0	1 000	0.20	0.24	3.0	4	10	0.9		
DH 385	F 51	18-40	5.5	6.0	800	0.17	0.20	3.5	4	8	0.9		

* Other case styles upon request. BH 10-MH 208 - ** Higher frequencies. Please, contact our sales department - *** Available in chip.
(1) P_{LO} = 1 mW — IF = 30 MHz — NF_{IF} = 1 dB.
Chip form available on request.

Beam lead diode (up to 94 GHz)

TEST CONDITIONS				PLO = + 6 dBm IF = 30 MHz IDC = 3 mA			f = 1 MHz V = 0V	I_F = 1 mA	I_R = 10μA	10 mA< If < 20 mA	CW	LIMITING CONDITIONS	
				f = 13 GHz	f = 35 GHz	f = 94 GHz							
CHARACTERISTICS T = + 25 °C			RECOMMENDED FREQUENCY	NF_{SSB}*			C_{TO}	V_F	V_{BR}	r_{SF}	P_{rf}	TEMPERATURE OPERAT.	STORAGE
TYPE	CONFIGURATION SINGLE	DOUBLE	GHz MAX.	dB MAX.	MAX.	TYP.	pF TYP.	V TYP.	V TYP.	Ω TYP.	mW MAX.	°C	
APX 378	C 116		94			7.5	0.045	0.9	5	3	200	— 40, + 125	—65, + 175

* Including NF_{IF} = 1.5 dB - Balanced mixer.

This structure is suitable for the integration of diodes in "micro strip" or "fin-line" transmission systems.
APX 377 Air-Bridge structure : ultra-low parasitic capacitance (0.03 pF) - APX 378 Twice smaller tham APX 376, with the same lead strength.

Flip chip diode (94 GHz)

TEST CONDITIONS			PLO = + 6 dBm IF = 30 MHz IDC = 3 mA f = 94 GHz	f = 1 MHz V = 0V	I_f = 1 mA	I_R = 10μA	10 mA< If < 20 mA	CW	LIMITING CONDITIONS	
CHARACTERISTICS T = + 25 °C		RECOMMENDED FREQUENCY	NF_{SSB}*	C_{TO}	V_F	V_{BR}	r_{SF}	P_{rf}	TEMPERATURE OPERAT.	STORAGE
TYPE	CONFIGURATION	GHz MAX.	dB TYP.	pF TYP.	V TYP.	V TYP.	Ω TYP.	mW MAX.	°C	
AFC 378	C 118	94	7.5	0.032	0.9	5	3	200	—40 + 125	—65 + 175

* Including NF_{IF} = 1.5 dB - Balanced mixer, and tested by sampling.

GaAs and InP DIODES

RECEIVING DIODES

GaAs PARAMETRIC VARACTOR DIODES

Packaged diodes

"PN" JUNCTION

TEST CONDITIONS		VR = 0V	IR = 10μA	VR = 3V	V = 0V f = 1 MHz		VR1 = 0V VR2 = −6 V	LIMITING CONDITIONS	
CHARACTERISTICS Tc = + 25 °C		f_{CO}**	V_{BR}	I_R	C_{jo}		$\frac{Cj1-Cj2}{Cj1}$	TEMPERATURE OPERATING	STORAGE
TYPE	CASE*	GHz MIN.	V MIN.	μA MAX.	pF MIN.	MAX.	MIN.	°C	
AH108	F54	300	15	0.1	0.3	0.4	0.5	− 55, + 85	− 65, + 125
AH110	BH10	500	15	0.1	0.2	0.3	0.5		

SCHOTTKY BARRIER DIODES

TEST CONDITIONS		VR = 0V	IR = 10μA	VR = 3V	V = 0V f = 1 MHz		VR1 = 0V VR2 = −6 V	LIMITING CONDITIONS	
CHARACTERISTICS Tc = + 25 °C		f_{CO}**	V_{BR}	I_R	C_{jo}		$\frac{Cj1-Cj2}{Cj1}$	TEMPERATURE OPERATING	STORAGE
TYPE	CASE*	GHz MIN.	V MIN.	μA MAX.	pF MIN.	MAX.	MIN.	°C	
AH111	BH10	600	6	20	0.16	0.21	0.5	− 55, + 85	− 65, + 125
AH112	BH10	800	6	20	0.13	0.16	0.5		
AH113	BH10	1 000	6	20	0.10	0.13	0.5		

* Other case styles upon request.
** De Loach measurement method.

GaAs and InP DIODES

CONTROL DIODES

GaAs ABRUPT AND HYPERABRUPT JUNCTION TUNING VARACTORS*

	C_{TO} pF (± 20 %)	0.7	1.0	1.4	2.2	3.0	5.0
GAMMA	V_{BR}(V) MIN.	ABRUPT VARACTORS					
0.5	30 45 60	AH152 AH160 AH165	AH153 AH161 AH166	AH154 AH162 AH167	AH155 AH163 AH168	AH156 AH164 AH169	AH157

	Ct-4 pF (± 20 %)	0.7	1.0	1.4	2.2	3.0	4.2	5.8	6.9	9.5
GAMMA	V_{BR}(V) MIN.	HYPER ABRUPT VARACTORS								
1.00 1.00	15 22	AH202 AH212	AH203 AH213	AH204 AH214	AH205 AH215	AH206 AH216	AH207 AH217	AH208 AH218	AH209 AH219	AH210 AH220
1.25 1.25	15 22	AH222 AH232	AH223 AH233	AH224 AH234	AH225 AH235	AH226 AH236	AH227 AH237	AH228 AH238	AH229 AH239	AH230 AH240

Packaged diodes (abrupt varactors)

TEST CONDITIONS		VR = 0V f = 1 MHz	f = 1 MHz	VR = –4 V f = 50 MHz	I_R = 10 μA	V_R = 10 V	LIMITING CONDITIONS	
CARACTERISTICS Tc = + 25 °C		C_{TO} ± 20 %	$C_{to}/C_{t\ (VR1)}$	(1) Q-4	V_{BR}	I_R	TEMPERATURE OPERATING	STORAGE
TYPE	CASE*	pF	MIN.	MIN.	V (MIN.)	μA (MAX.)	°C	
V_{R1} = 30 V								
AH152	F27d	0.7	2.25	11 000	30	0.1	– 40 + 85	– 65 + 175
AH153	F27d	1	2.6	9 500	30	0.1		
AH154	F27d	1.4	3	8 000	30	0.1		
AH155	F27d	2.2	3.4	6 000	30	0.1		
AH156	F27d	3	3.7	5 000	30	0.1		
AH157	F27d	5.0	4	4 000	30	0.1		
V_{R1} = 40 V								
AH160	F27d	0.7	2.35	9 500	45	0.1		
AH161	F27d	1	2.7	8 000	45	0.1		
AH162	F27d	1.4	3.1	7 000	45	0.1		
AH163	F27d	2.2	3.7	5 500	45	0.1		
AH164	F27d	3	4	4 500	45	0.1		
V_{R1} = 55 V								
AH165	F27d	0.7	2.45	8 000	60	0.1		
AH166	F27d	1	2.9	6 600	60	0.1		
AH167	F27d	1.4	3.4	5 500	60	0.1		
AH168	F27d	2.2	4	4 500	60	0.1		
AH169	F27d	3	4.3	4 000	60	0.1		

* Other cases or chip form available on request.
(1) Determined on a sample basis.

GaAs and InP DIODES

CONTROL DIODES

Packaged diodes (hyperabrupt varactors)

TEST CONDITIONS		VR = −4V f = 1 MHz	F = 1 MHz	VR = −4V f = 50 MHz	I_R = 10 µA	V_R = −10 V	LIMITING CONDITIONS		TEST CONDITION FOR CAPACITANCE RATIO
CHARACTERISTICS Tc = + 25 °C		C_{T-4} ± 20%	C_{T-2}/C_{T-A}** ± 12 %	(1) Q−4	V_{BR}	I_R	TEMPERATURE OPERATING	STORAGE	A
TYPE	CASE*	pF	TYP.	MIN.	V MIN.	µA MAX.	°C	°C	V
GAMMA = 1.00 ± 10 %									
AH202	F27d	0.7	2.8	4 000	15	0.1			12
AH203	F27d	1.0	3.1	4 000	15	0.1			12
AH204	F27d	1.4	3.3	3 000	15	0.1			12
AH205	F27d	2.2	3.5	3 000	15	0.1			12
AH206	F27d	3.0	3.7	2 000	15	0.1			12
AH207	F27d	4.2	3.8	2 000	15	0.1			12
AH208	F27d	5.8	3.9	1 500	15	0.1			12
AH209	F27d	6.9	3.9	1 500	15	0.1			12
AH210	F27d	9.5	3.9	1 500	15	0.1			12
AH212	F27d	0.7	3.6	4 000	22	0.1			20
AH213	F27d	1.0	4.1	4 000	22	0.1			20
AH214	F27d	1.4	4.5	3 000	22	0.1			20
AH215	F27d	2.2	5.1	3 000	22	0.1			20
AH216	F27d	3.0	5.4	2 000	22	0.1			20
AH217	F27d	4.2	5.7	2 000	22	0.1			20
AH218	F27d	5.8	5.7	1 500	22	0.1			20
AH219	F27d	6.9	6.0	1 500	22	0.1			20
AH220	F27d	9.5	6.1	1 500	22	0.1			20
GAMMA = 1.25 ± 10 %							− 40, + 85	− 65, + 175	
AH222	F27d	0.7	3.5	4 000	15	0.1			12
AH223	F27d	1.0	4.0	4 000	15	0.1			12
AH224	F27d	1.4	4.3	3 000	15	0.1			12
AH225	F27d	2.2	4.8	3 000	15	0.1			12
AH226	F27d	3.0	5.0	2 000	15	0.1			12
AH227	F27d	4.2	5.2	2 000	15	0.1			12
AH228	F27d	5.8	5.4	1 500	15	0.1			12
AH229	F27d	6.9	5.5	1 500	15	0.1			12
AH230	F27d	9.5	5.6	1 500	15	0:1			12
AH232	F27d	0.7	4.6	4 000	22	0.1			20
AH233	F27d	1.0	5.5	4 000	22	0.1			20
AH234	F27d	1.4	6.3	3 000	22	0.1			20
AH235	F27d	2.2	7.3	3 000	22	0.1			20
AH236	F27d	3.0	7.9	2 000	22	0.1			20
AH237	F27d	4.2	8.5	2 000	22	0.1			20
AH238	F27d	5.8	9.0	1 500	22	0.1			20
AH239	F27d	6.9	9.2	1 500	22	0.1			20
AH240	F27d	9.5	9.5	1 500	22	0.1			20

(1) Determined on a sample basis.
* Other cases on request.
** Total capacitance ratios will vary with case style.

CONTROL DIODES

GaAs PIN DIODES

CHARACTERISTICS		C_{jo} ± 20 % (pF) V_R = 0v and F = 1 MHz									
T_c = + 25 °C		0.03	0.05	0.07	0.1	0.14	0.22	0.3	0.4	0.6	0.8
V_{BR} I_R = 10 µA	$V_{BR} \geqslant 25$ V			AH 501	AH 502	AH 503	AH 504	AH 505	AH 506	AH 507	AH 508
	$V_{BR} \geqslant 40$ V			AH 511	AH 512	AH 513	AH 514	AH 515	AH 516	AH 517	AH 518
	$V_{BR} \geqslant 80$ V	AH 521	AH 522	AH 523	AH 524	AH 525	AH 526	AH 527	AH 528	AH 529	
	$V_{BR} \geqslant 100$ V	AH 531	AH 532	AH 533	AH 534	AH 535	AH 536	AH 537	AH 538	AH 539	
CASE*		M208b	M208b	M208b	M208b	M208b	M208b	M208b	M208b	M208b	M208b

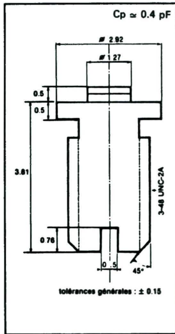
* Other cases or chip form available on request.

GaAs PIN Flip Chip Diodes (94 GHz)

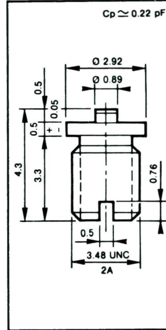
TEST CONDITIONS			f = 1 MHz V = 0V	I_f = 1 mA	I_R = 10µA	I_f = 30 mA	CW	LIMITING CONDITIONS	
CHARACTERISTICS T = + 25 °C		RECOMMENDED FREQUENCY	C_{TO}	V_F	V_{BR}	R_{SF}	P_{RF}	TEMPERATURE OPERAT.	STORAGE
TYPE	CONFIGURATION	GHz MAX.	fF TYP.	V TYP.	V MIN.	Ω TYP.	mW TYP.	°C	
AFC 500	C 119	94	26	1.2	100	3	200	–65 +150	–65 +150

PACKAGE OUTLINES

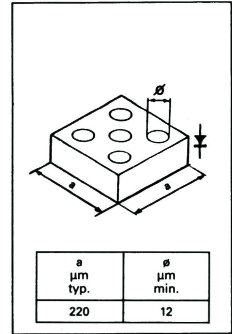
W4



W5

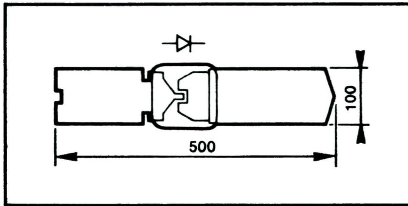


C12

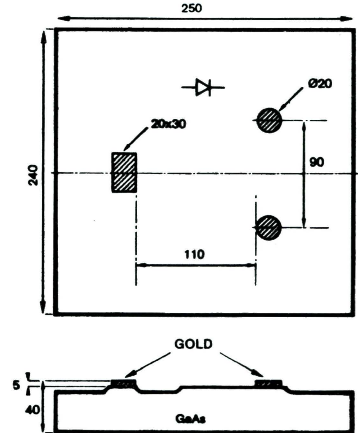


a µm typ.	ø µm min.
220	12

C 116

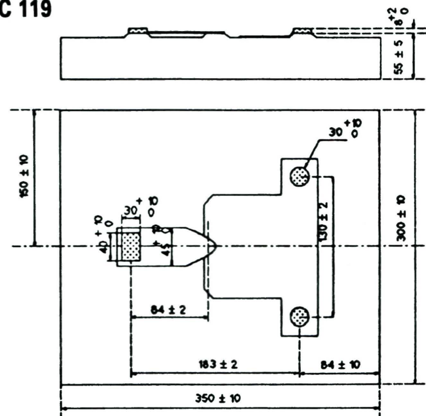


C 118



Dimensions in millimeter

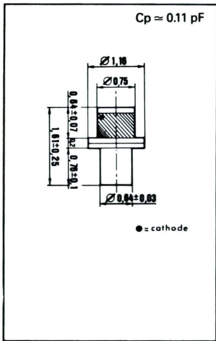
C 119



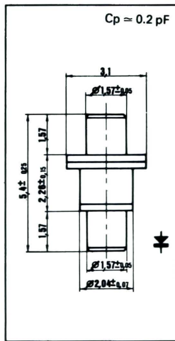
GaAs and InP DIODES

PACKAGE OUTLINES

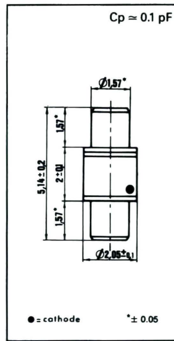
BH 10



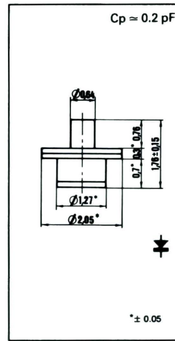
F 27 d



F 51



F 54



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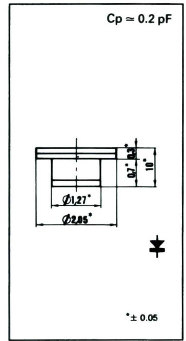

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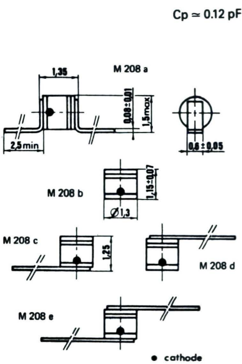

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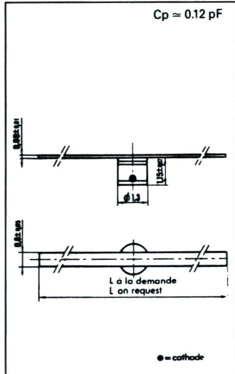

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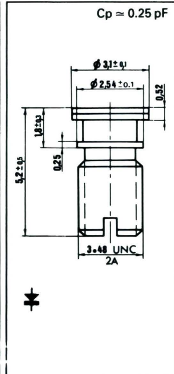

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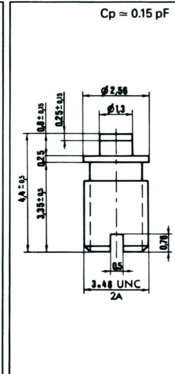

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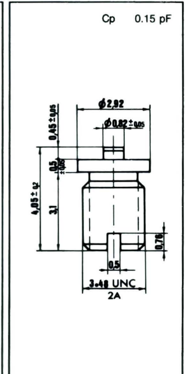


Dimensions in millimeter

DIODE CODIFICATION

PRODUCTS REF.	DESCRIPTION	CODIFICATION	
AH108 to AH113	GaAs Parametric Varactors		
AH152 to AH169	GaAs Abrupt tuning Varactors	AH XXX-00	standard catalog specification.
AH202 to AH240	GaAs Hyperabrupt tuning Varactors		
AH365 to AH380	GaAs Gunn Diodes (18-26 GHz)		
AH443 to AH497	GaAs Gunn Diodes (9-18 GHz)	-01 to 49	detailed specification for a customized product.
AH501 to AH539	GaAs PIN Diodes		
AH601 to AH685	GaAs Gunn Diodes (26-90 GHz)		
AH720 to AH771	GaAs Impatt Diodes (10-16 GHz)	-50 to 98	standard product in a different package.
AH800 to AH802	94 GHz GaAs Gunn Diodes		
AH901 to AH904	94 GHz InP Gunn Diodes	-99	standard product delivered in chip.
DH378 to DH385	GaAs Schottky Diodes		
APX378	GaAs Beam-lead Schottky Diodes single	AP XXX	-00 standard product.
AFC378	GaAs Flip-Chip Schottky Diodes single	AFC XXX	-01 to 49 customized product.
AFC500	GaAs Flip-Chip PIN Diodes		

PACKAGE CODIFICATION

PACKAGE	CODIFICATION	PACKAGE	CODIFICATION
BH10	53	M208D	83
L1	68	M208E	84
L1R	69	M208F	85
F27	70	W1	90
F51	72	W2	91
F54S	74	W3	92
M208A	80	W4	93
M208B	81	W5	95
M208C	82		

FIELD EFFECT TRANSISTORS

LOW NOISE GaAs FETs AND HEMTs

PART NUMBER	FREQUENCY RANGE	NF_{min} (Typ) (dB)	Ga (dB) (TYP)	F TEST (GHz)	ABSOLUTE MAX RATINGS			Idss (mA)		-Vp (V)		gm (mS)		PACKAGE CODE
					VDS	VGS	IDS	MIN	MAX	MAX	TYP	MIN	TYP	
EC1840**	1-40	1.5	11	18	3.5	2	20	5	20	2.0	1.2	12	15	CHIP
EC2623*	1-18	0.75	10.5	12	3	2	60	10	60	1.0	0.6	35	45	CHIP
TC2623*	1-15	0.75	10.5	12	3	2	60	10	60	1.0	0.6	35	45	BmH204
EC2827*	1-40	1.0	11	18	3	2	20	5	20	1.0	0.6	12	15	CHIP

* HEMT in development - ** MESFET Typical MAG: 10 dB at 40 GHz

POWER GaAs FETs

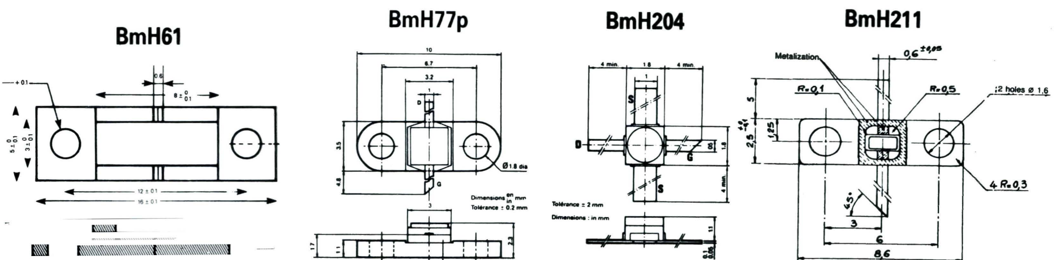
PART NUMBER	Tch °C MAX	BIAS		ABSOLUTE MAX RATING			IDSS (mA)		-Vp (V)		gm (mS)		FREQUENCY MAX. (GHz)	Ga (dB) (TYP)	P_{1dB} (mW) (TYP)	Rth (ch-c) (°C/W) (TYP)	PACKAGE CODE
				VDS	VGS	IDS	TYP	MAX	MAX	TYP	MIN	TYP					
EC4711	175	8 V	60 mA	10	– 8	150	110	150	4	3	30	40	18	8	120	100	CHIP
TC4711	175	8 V	60 mA	10	– 8	150	110	150	4	3	30	40	15	8	120	110	BmH211
TC4731	175	8 V	100 mA	10	– 8	220	170	220	4	3	50	60	8	10	300	80	BmH77p
EC4790	175	8 V	200 mA	10	– 8	440	340	440	4	3	100	120	18	8	400	35	CHIP
EC5724	175	8 V	530 mA	10	– 8	1 200	900	1 200	4	3	270	300	18	7	1 000	14	CHIP
TC5735	175	8 V	200 mA	10	– 8	440	340	440	4	3	100	120	8	10	600	40	BmH77p

INTERNALLY MATCHED POWER GaAs FETs

PART NUMBER	Tch °C MAX	BIAS		ABSOLUTE MAX RATINGS			IDS* (mA)		FREQUENCY RANGE (GHz)	Ga (dB)	P_{1dB} (mW)	Rth (ch-c) (°C/W)	PACKAGE CODE
				VDS	VGS	IDS	TYP	MAX					
TC9302	175	10 V	60 mA	10	—	60	25	60	8.5 - 9.6	7	50	200	BmH61
TC9303	175	10 V	120 mA	10	—	120	50	120	8.5 - 9.6	6.5	100	100	BmH61
TC9311	175	10 V	60 mA	10	—	60	25	60	9 - 10.2	7	50	200	BmH61
TC9312	175	10 V	120 mA	10	—	120	50	120	9 - 10.2	6.5	100	100	BmH61

* Self biased MESFET.

PACKAGE OUTLINES



GaAs
INTEGRATED
CIRCUITS

GATE ARRAYS

TGAII SERIES

TGAII series is full second source (manufactured by TCM in St-Egrève plant) of Vitesse Semiconductor Corporation FURY series. TGAIIxxK is equivalent to VSCxxK.

- High density channelled architecture (up to 100 % utilization)
- Three layer aluminium interconnect
- Proven 0.8 μm GaAs E/D MESFET process
- Array performance
  - D flip-flop toggle rates: > 1 GHz
  - Typical gate delay: 177 ps @ 1.1 mW
  - ECL inputs/outputs @ 1 GHz
  - TTL inputs/outputs @ 100 MHz
- SRAM performance
  - Cycle time: 3.5 ns (min.)
  - Clock to Q: 1.5 ns (max.)
- ECL or TTL compatible inputs/outputs
- MIL - STD - 883 C, level B screening and qualification available
- Supported on MENTOR, VALID or CADENCE
- Behavioral and mixed mode simulation support for VERILOG XL™ (CADENCE) and for LASAR (Teradyne)
- Logic synthesis supported with Synopsis Design Compiler™

ARRAY NAME	≠ OF INTERNAL GATES		≠ OF INPUT CELLS		≠ OF I/O CELLS	OUTPUT ONLY CELLS	TOTAL SIGNAL PINS (2)	PACKAGE OPTIONS
	TOTAL CELLS	NOR2 / DFF	TTL, ECL, GaAs	HI-DRIVE	TTL, ECL, GaAs			
TGAII3K	3.584	3.584 / 290	40	4	52	—	92	52 pin LDCC 132 pin LDCC
TGAII5K	6.400	6.400 / 520	52	4	68	—	120	149 pin PGA 164 pin LDCC
TGAII10K	13.376	13.376 / 1.100	74	8	100	—	174	211 pin PGA
			96	8	100	—	196	256 pin LDCC
TGAII15K	16.896	16.896 / 1.408	74	8	100	—	174	211 pin PGA
			96	8	100	—	196	256 pin LDCC
TGAII20K8R(1)	20.736	20.736 / 1.728	96	8	132	19	256	344 pin LDCC
TGAII30K	30.528	30.528 / 2.544	100	8	156	—	256	344 pin LDCC

(1) RAM array (8 Kbits SRAM; (256 x 4 bit) x 8) - (2) Excluding power supply pins.

FX® SERIES

- Ultra high density channelless architecture
- Four layer aluminium interconnect
- Proven 0.6 μm H-GaAs E/D MESFET process
- Array performance:
  - D Flip-flop toggle rates: > 1.6 GHz
  - Typical gate delay: 115 ps @ 0.15 mW
- ECL or TTL compatible inputs/outputs
- Embedded SRAM (RAM Compiler tool)
- Supported on MENTOR, VALID or CADENCE
- Behavioral and mixed mode simulation support for VERILOG XL™ (CADENCE) and for LASAR (Teradyne)
- Logic synthesis supported with Synopsis Design Compiler™

ARRAY NAME	≠ OF INTERNAL GATES		≠ OF INPUT CELLS			≠ OF I/O CELLS		TOTAL SIGNAL PINS	PACKAGE OPTIONS
	TOTAL RAW CELLS	NOR2 / DFF	TTL	ECL GaAs	HI-DRIVE	TTL	ECL GaAs		
VGFX20K	20K	13K / 1.5K	40	40	4	52	52	92	52 LDCC 132 LDCC 132 PGA
VGFX40K	42.5K	28K / 3K	48	56	4	144	152	144	184 PGA
VGFX100K	102K	51K / 6K	88	88	8	100	100	196	211 pin PGA 265 pin LDCC
VGFX200K	195K	98K / 12K	92	92	8	156	156	256	344 pin LDCC
VGFX350K	350K	177K / 17K	128	128	...	250	250	378	557 PPGA

DIGITAL ICs

STANDARD CELLS

TCB50K LIBRARY

TCB50K is full second source (manufactured by TCM in St-Egrève plant) of Vitesse Semiconductor Corporation VCB50K.
TCB50K is equivalent to VSC50K.

- VLSI complexity: > 50.000 gates
- Superior performance: 300MHz to 3GHz
- ECL or TTL compatible inputs/outputs
- High yield, 4 layer metal, VLSI process
- Very low power dissipation
- Customized megacell capability
- DCFL and SCFL cells choice
- Supported on MENTOR and VALID
- VERILOG XL™ behavior modeling and simulation
- Synopsis logic synthesis tools supported
- COMPASS design tools supported
- Mil-Std-883 C, level B screening and qualification available
- Very low sensitivity to total dose radiation
- Complete family of high pin count ceramic packages

SCFL

FUNCTION	DELAY	DELAY/F.O.	WIRE DELAY	P_D
Inverter	90 ps	15 ps	70 ps/mm	25 mW
D Flip-flop	150 ps	15 ps	70 ps/mm	50 mW
2:1 Mux Select → Output	150 ps	15 ps	70 ps/mm	25 mW

DCFL

FUNCTION	DELAY	DELAY/F.O.	WIRE DELAY	P_D
Inverter	90 ps	13 ps	80 ps/mm	1.0 mW
D Flip-flop	390 ps	13 ps	80 ps/mm	3.9 mW
2:1 Mux Select → Output	300 ps	13 ps	80 ps/mm	2.1 mW

STANDARD PRODUCTS

DIGITAL TELECOM PRODUCTS

NAME	FUNCTION	DATA RATE	PACKAGE
VS8001/VS8002	12:1 Mux/1:12 Demux	1.25 Gb/s	52 pins ceramic LCC/LDCC
VS8004/VS8005	4:1 Mux/1:4 Demux	2.5 Gb/s	28 pins ceramic LCC/LDCC
VS8010	SONET 8:1 and 1:8 Mux & Demux	1.25 Gb/s	52 pins ceramic LCC/LDCC
VS8011/VS8012	SONET 8:1 Mux/1:8 Demux	1.25 Gb/s	52 pins ceramic LCC/LDCC
VS8021/VS8022	SONET 8:1 Mux/1:8 Demux	2.5 Gb/s	52 pins ceramic LCC/LDCC
VSC864	64 x 64 Crosspoint switch	200 Mb/s	344 pins ceramic LDCC
VSC7101	G-TAXI Data Communication Transmitter	1.25 Gb/s	28 pins ceramic LCC/LDCC
VSC7102	G-TAXI Data Communication Receiver	1.25 Gb/s	28 pins ceramic LCC/LDCC
VSC7103	G-TAXI Data Communication Multiplexer	1.25 Gb/s	132 pins MQUAD
VSC7104	G-TAXI Data Communication Demultiplexer	1.25 Gb/s	132 pins MQUAD

Evaluation boards available.

STANDARD PRODUCTS

DIVIDER PRODUCTS

PART NUMBER	DESCRIPTION	PACKAGE	OPERATING FREQUENCY RANGE (TYPICAL)	INPUT LEVEL (TYPICAL)	OUTPUT VOLTAGE (TYPICAL)	POWER DISSIPATION (TYPICAL)	NEW PRODUCT
CHD2073	DYNAMIC DIVIDER by 4	MS 16L or Flat Pack	4 – 9 GHz	+ 10 dBm	0.6 Vpp	600 mW	UNDER DEVELOPMENT
CHD2074	"	"	3.5 - 7.5 GHz	"	"	400 mV	"

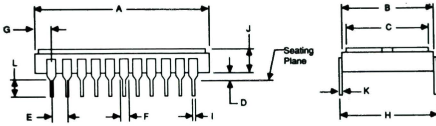
Power supplies : CHD2073 : + 5 V, CHD2074 : + 3 V

Notes : - Low phase noise
- Civil or military temperature range
- Ceramic package or chip form

PACKAGE OUTLINES

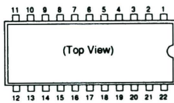
22 CERDIP

22 Pin Ceramic DIP



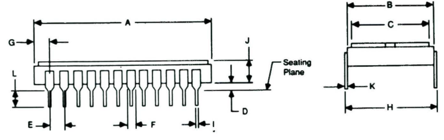
22-pin leaded (400 mil) sidebraze dual in-line package

Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	27.43/28.57	1.080/1.125	G	0.191 TYP	0.075 TYP
B	9.65/10.54	0.380/0.415	H	10.16 REF	0.400 REF
C	7.75/8.00	0.305/0.315	I	0.38/0.63	0.015/0.025
D	0.51/1.27	0.020/0.050	J	2.16/2.79	0.085/0.110
E	2.54 TYP	0.100 TYP	K	0.229/0.304	0.009/0.012
F	1.14/1.40	0.045/0.055	L	2.286/4.318	0.090/0.170



24 CERDIP

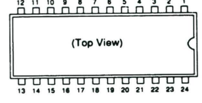
24 Pin Ceramic DIP



24-pin Leaded (400 mil) Sidebraze Dual In-Line Package (DIP)

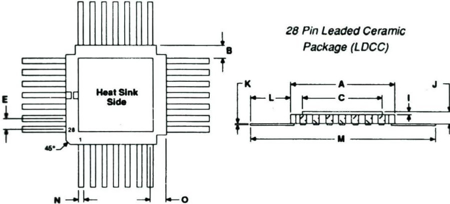
Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	29.97/30.98	1.180/1.220	G	0.76/1.78	0.030/0.070
B	9.65/10.54	0.380/0.415	H	10.16 REF	0.400 REF
C	7.62/8.00	0.300/0.315	I	0.38/0.63	0.015/0.025
D	0.51/1.27	0.020/0.050	J	2.03/3.05	0.080/0.120
E	2.54 TYP	0.100 TYP	K	0.23/0.30	0.009/0.012
F	1.14/1.65	0.045/0.065	L	2.29/4.32	0.090/0.170

Package: Ceramic (alumina); Heat sink: Copper-tungsten; Leads: Alloy 42 with gold plating



28 LCC/LDCC

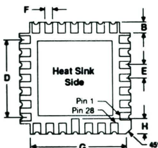
28 Pin Leaded and Leadless Ceramic Packages

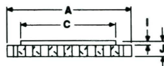


28 Pin Leaded Ceramic Package (LDCC)

Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	11.18/11.68	0.440/0.460	I	0.406/0.610	0.016/0.024
B	1.026/1.52	0.040/0.060	J	1.91/2.16	0.075/0.085
C	9.65/10.16	0.320/0.330	K	0.09/0.24	0.003/0.009
D	7.49/7.75	0.295/0.305	L	4.83/5.08	0.190/0.200
E	1.27 TYP	0.050 TYP	M	24.13 TYP	0.950 TYP
F	0.76/1.02	0.030/0.040	N	0.36/0.56	0.014/0.022
G	9.271 TYP	0.365 TYP	O	1.65/1.90	0.065/0.075
H	1.778 TYP	0.070 TYP			

Package: Ceramic (alumina); Heat sink: Copper-tungsten; Leads: Alloy 42 with gold plating

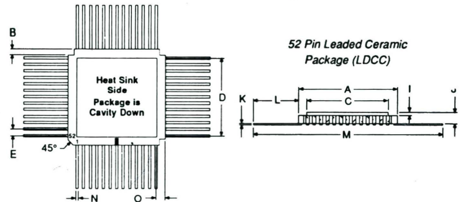




28 Pin Leadless Ceramic Package (LCC)

52 LCC/LDCC

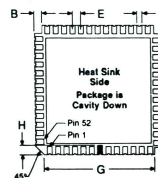
52 Pin Leaded and Leadless Ceramic Packages

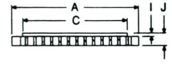


52 Pin Leaded Ceramic Package (LDCC)

Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	18.54/19.56	0.730/0.770	I	0.41/0.61	0.016/0.024
B	1.02/1.52	0.040/0.060	J	2.03/2.79	0.080/0.110
C	15.49/16.51	0.610/0.650	K	0.09/0.24	0.003/0.009
D	15.24 TYP	0.600 TYP	L	4.83/5.08	0.190/0.200
E	1.27 TYP	0.050 TYP	M	29.46 TYP	1.160 TYP
F	0.76/1.02	0.030/0.040	N	0.36/0.56	0.014/0.022
G	16.94 TYP	0.667 TYP	O	1.75/1.90	0.069/0.075
H	1.91/2.41	0.075/0.095			

Package: Ceramic (alumina); Heat sink: Copper-tungsten; Leads: Alloy 42 with gold plating



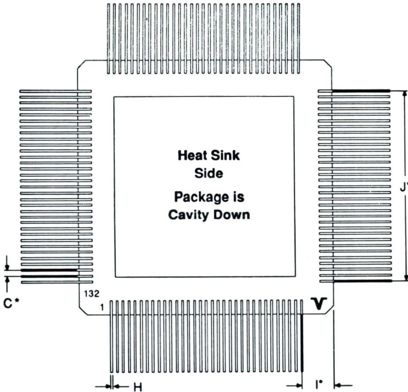


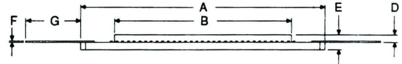
52 Pin Leadless Ceramic Package (LCC)

PACKAGE OUTLINES

132 LDCC

132 Pin Ceramic LDCC *(Top View)*



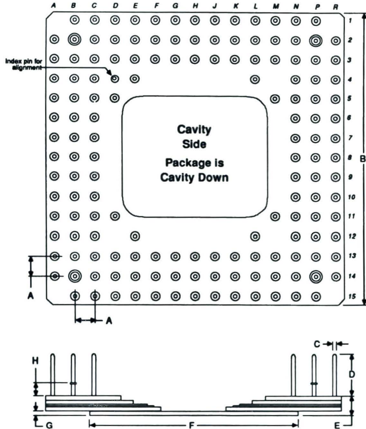


Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	23.75/24.51	0.935/0.965	F	0.09/0.22	0.004/0.008
B	18.67/19.43	0.735/0.765	G	5.08/7.62	0.200/0.300
C*	0.64 TYP	0.025 TYP	H	0.15/0.26	0.006/0.010
D	0.38/0.63	0.015/0.025	I*	1.91 TYP	0:075 TYP
E	2.16/2.52	0.085/0.115	J*	20.32 TYP	0.800 TYP

* At package body

149 PGA

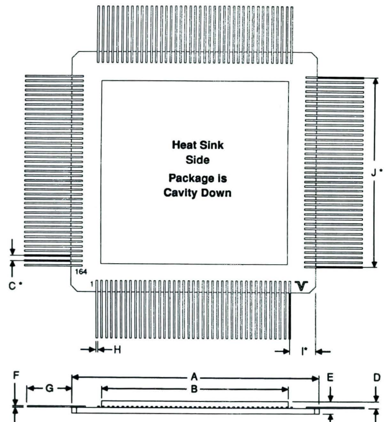
149 Pin Ceramic PGA *(Top View)*



Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	25.40 TYP	0.100 TYP	E	2.25/2.92	0.085/0.115
B	37.85/38.61 SQ	1.490/1.520 SQ	F	27.40 TYP (Heatsink)	1.08 TYP (Heatsink)
C	0.41/0.51 DIA	0.016/0.020 DIA	G	0.38/0.63	0.015/0.025
D	4.45/4.95	0.175/0.195	H	1.14/1.40 (4 Plcs)	0.045/0.055 (4 Plcs)

164 LDCC

164 Pin Ceramic LDCC *(Top View)*



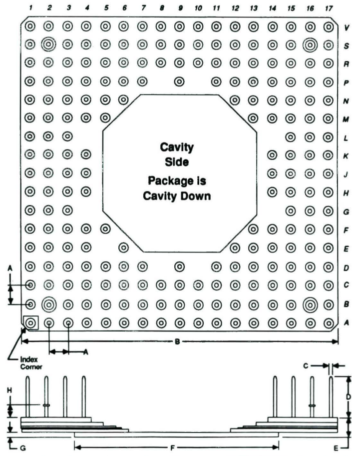
Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	28.58/29.84 SQ	1.125/1.175 SQ	F	0.09/0.22	0.004/0.008
B	Ref 24 SQ	Ref 0.95 SQ	G	5.08/7.62	0.200/0.300
C*	0.64 TYP	0.025 TYP	H	0.15/0.25	0.006/0.010
D	0.38/0.63	0.015/0.025	I*	Ref 1.91 TYP	Ref 0.075 TYP
E	2.16/2.92	0.085/0.115	J*	25.40 TYP	1.00 TYP

* At package body

PACKAGE OUTLINES

211 PGA

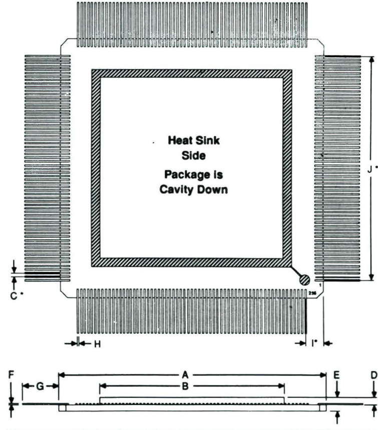
211 Pin Ceramic PGA (Top View)



Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	2.54 TYP	0.100 TYP	E	2.16/2.92	0.085/0.115
B	42.42/43.69	1.670/1.720	F	27.4 REF (Heatsink)	1.08 REF (Heatsink)
C	0.41/0.51 DIA	0.016/0.020 DIA	G	0.38/0.63	0.015/0.025
D	4.45/4.95	0.175/0.195	H	1.14/1.40 (4 Plcs)	0.045/0.055 (4 Plcs)

256 LDCC

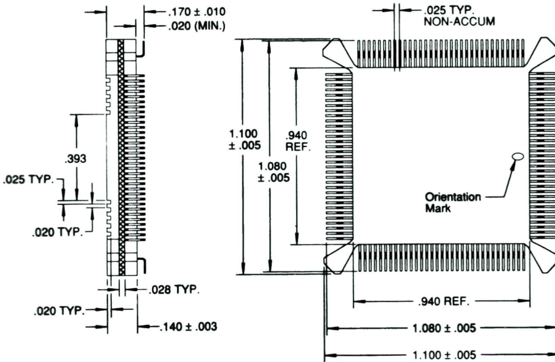
256 Pin Ceramic LDCC (Top View)



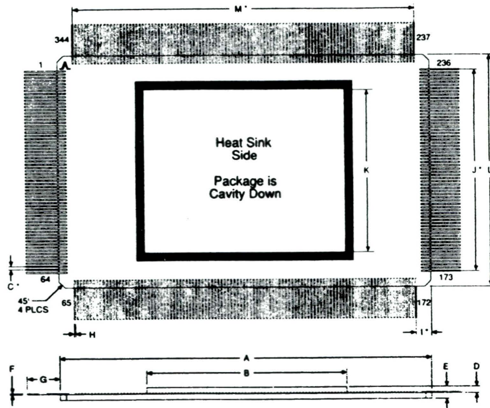
Item	mm (Min/Max)	In (Min/Max)	Item	mm (Min/Max)	In (Min/Max)
A	36.57/37.59 SQ	1.440/1.480 SQ	F	0.09/0.216	0.004/0.008
B	TYP 28 SQ	TYP 1.1 SQ	G	5.08/7.62	0.200/0.300
C*	0.51 TYP	0.020 TYP	H	0.15/0.25	0.006/0.010
D	0.38/0.63	0.015/0.025	I*	REF 2.54 TYP	REF 0.100 TYP
E	2.16/2.92	0.085/0.115	J*	32.00 TYP	1.26 TYP

* At package body

132 MQUAD

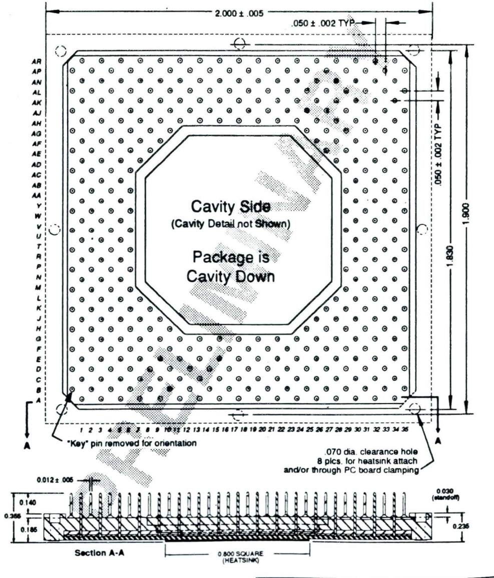


344 LDCC

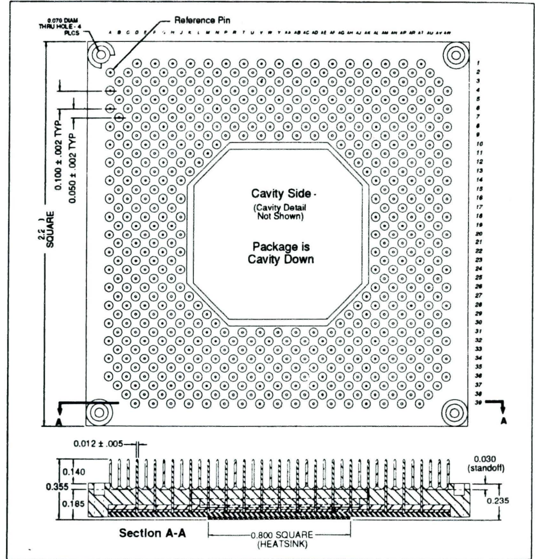


PACKAGE OUTLINES

415 PPGA



557 PPGA



TRANSIMPEDANCE AMPLIFIERS

PART NUMBER	TRANS-RESISTANCE AT R_L = TYP. (K ohms)	BANDWITH – 3 dB TYP (MHz)	INPUT NOISE SPECTRAL DENSITY MAX (pA/VHz)	SUPPLY CURRENT TYP mA I_{DD}	I_{SS}	OUTPUT OFFSET VOLTAGE TYP. (V)	INPUT BIAS VOLTAGE TYP. (V)	OUTPUT 1 dB COMPRESSION TYP. (dBm)	OUTPUT 3 rd ORDER INTERCEPT TYP. (dBm)	PACKAGE
ATA 03010 F1C	10	325	1.8 typ (1)	85	55	+ 0.22	– 0.7	+ 10	+ 18	F1
ATA 30011 D1C	1.9	2 500	10 (2)	90	70	– 1	– 0.7	+ 8	+ 20	Die
ATA 30011 F1C	1.9	1 700	10 (2)	90	70	– 1	– 0.7	+ 8	+ 20	F1
ATA 10011 F1C	0.25	1 000	6	80	—	—	—	+ 22	+ 30	F1

TRANSIMPEDANCE AMPLIFIERS WITH AGC

PART NUMBER	TRANS-RESISTANCE AT R_L = TYP. (K ohms)	BANDWITH – 3 dB TYP (MHz)	INPUT NOISE SPECTRAL DENSITY MAX (pA/VHz)	SUPPLY CURRENT TYP mA I_{DD} I_{SS}	OUTPUT OFFSET VOLTAGE TYP. (V)	INPUT BIAS VOLTAGE TYP. (V)	OPTICAL OVERLOAD TYP. (dBm)	OPTICAL SENSITIVITY TYP. (dBm)	PACKAGE
ATA 00500	28	70	1 (6)	35	+ 1.8	+ 2	– 3	– 43	Die
ATA 12000	1.5	900	5 (5)	35	+ 1.8	+ 1.8	– 3	– 31	Die/S08
ATA 01500	20	150	1.5 (4)	25	+ 1.8	+ 2	– 3	– 38.5	Die/S08
ATA 06210	10	450	3.75 (5)	30	+ 1.8	+ 1.8	– 3	– 32	Die/S08

Notes: (1) 1 MHz - 30 MHz; (2) 1 MHz - 1 GHz; (3) 1 MHz - 300 MHz; (4) 1 MHz - 100 MHz - (5) 1 MHz - 450 MHz - (6) 1 - 50 MHz

10 kHz - 3 GHz LASER DRIVER

PART NUMBER	PROPAGATION DELAY TYP. (ps)	BANDWITH – 3 dB MIN (GHz)	INPUT RETURN LOSS MIN (dB)	REVERSE ISOLATION TYP. (dB)	LARGE SIGNAL RISE AND FALL TIME (ms)	PEAK MODULATION CURRENT MIN (mA)	QUIERCENT SUPPLY CURRENT TYP. (mA)	PEAK BIAS CURRENT MIN (mA)	PACKAGE
ALD 30011 F4C	100	3	15	30	120	80	60	80	F4
ALD 30011 D1C	"	"	"	"	max	"	"	"	Die

WIDEBAND AMPLIFIERS

PART NUMBER	FREQUENCY RANGE (GHz)	GAIN TYP (dB)	GAIN FLATNESS TYP (+/— dB)	OUTPUT POWER TYP (dBm) (1)	POWER SUPPLY (V)	SUPPLY CURRENT TYP (mA)	PACKAGE
CHA 1051	2-18	6	0.5	15	3.0	100	Die
CHA 1074	2-18	6	0.3	13	3.0	100	Die
CHA 2029	2-18	20	1	13	3.0	300	T-PAK TPD1

(1) at 1 dB compression gain.

NARROWBAND AMPLIFIERS

PART NUMBER	FREQUENCY RANGE (GHz)	GAIN TYP (dB)	NOISE FIGURE TYP (dB)	OUTPUT POWER MIN (dBm) (1)	POWER SUPPLY (V)	SUPPLY CURRENT TYP (mA)	PACKAGE
CHA 2025	4.5-7	19	3	11	3	60	Die, T-PAK
CHA 2001	6.4-8.6	20	3.3	11	3	60	Die, T-PAK
CHA 1063	8.5-10.5	18	2.8	10	3	60	Die, T-PAK TPS1

(1) at 1 dB compression gain.

POWER AMPLIFIERS

PART NUMBER	OPERATING FREQUENCY RANGE (GHz)	SMALL SIGNAL GAIN TYP. (dB)	1 dB COMP OUTPUT POWER TYP. (W)	POWER SUPPLY		PACKAGE
				VD V	ID TYP. (mA)	
CHA 1027	4.5-6.2	17	1	7.5	750	Die
CHA 5005	5-6.5	25	0.5	9	360	Die

950 - 1750 MHz DBS TUNER IC

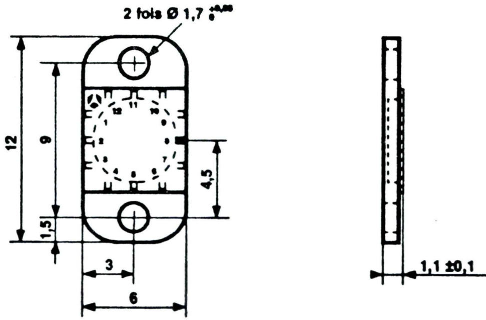
PART NUMBER	FREQUENCY (MHz)			CONVERSION GAIN TYP. (dB)	SSB NOISE FIGURE TYP (dB)	INPUT OUTPUT VSWR	OUTPUT POWER TYP. (dBm)	POWER SUPPLY TYP.	PACKAGE
	RF	IF	LO						
ADC 20010	950 1750	480	1430 2230	9	8	2:1	−2	5V 60 mA	SO

Ku-BAND DBS DOWNCONVERTERS

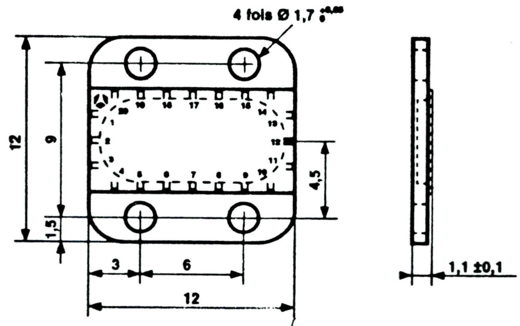
PART NUMBER	FREQUENCY			CONVERSION GAIN TYP (dB)	SSB NOISE FIGURE TYP (dB)	GAIN FLATNESS MAX. (+/− dB)	OUTPUT POWER TYP (dBm)	POWER SUPPLY (V)	SUPPLY CURRENT TYP (mA)	PACKAGE
	RF GHz	IF MHz	LO GHz							
CHA 12000	10.95 11.7	950 1700	10	35	6.0	1.5	+ 6	+ 6 − 5	120 3.5	TO
AKD 12000	10.95 11.7	950 1700	10	35	6.0	1.5	+ 6	+ 6 − 5	120 3.5	TO
AKD 12010	11.7 12.2	950 1750	10.75	35	5.8	1.5	+ 6	+ 6 − 5	120 3.5	TO
AKD 12011	11.7 12.5	950 1750	10.75	35	6.0	2	+ 6	+ 6 − 5	120 3.5	TO

PACKAGE OUTLINES

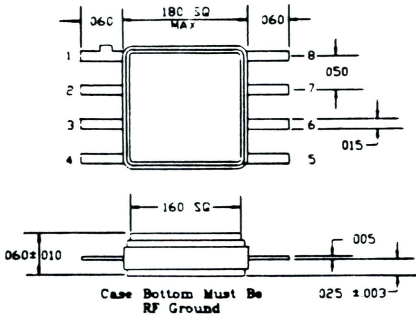
TPS1



TPD1

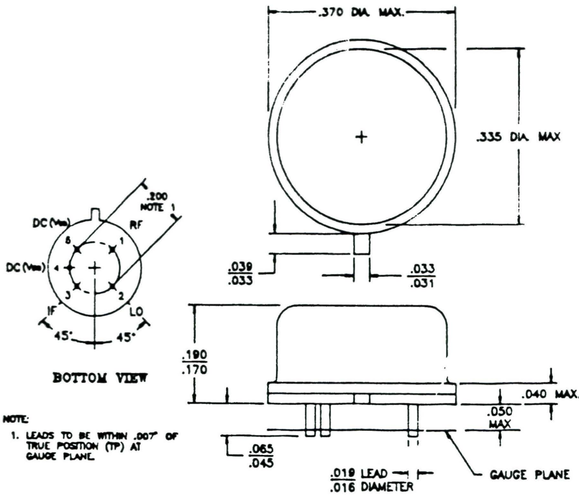


F1

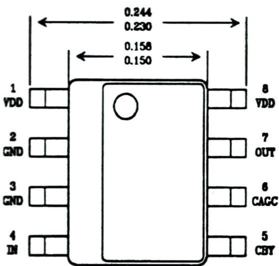


PACKAGE OUTLINES

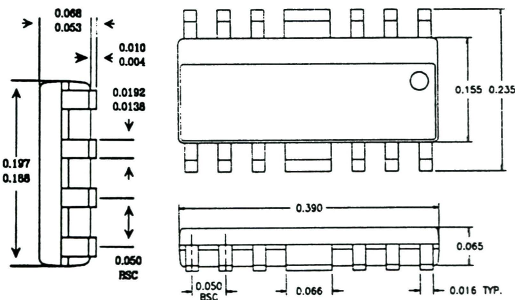
TO



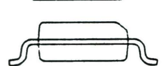
SO8



SO16



PIN	SIGNAL
1	GND
2	IF
3	VDD
4	GND
5	GND
6	RF
7	GND
8	GND
9	GND
10	GND
11	LO
12	GND
13	GND
14	OSC
15	VDD
16	GND



GaAs DIGITAL
FOUNDRIES

GaAs DIGITAL FOUNDRIES

SAGA08 DIGITAL FOUNDRY

SAGA08 ENHANCEMENT/DEPLETION MESFET PROCESS

Features

- Enhancement/depletion GaAs process
- VLSI complexity
- Self-aligned active devices
- 0.6 micron effective gate length
- 4 inch diameter GaAs wafers
- Sub-100 ps gate delays
- Five interconnect levels
- Extended temperature range operation
- Radiation resistant
- Mil 883C processing

The SAGA08 process

TCM offers a NMOS-like, planar process for the fabrication of digital and mixed analog-digital integrated circuits. The high yield and manufacturability of this approach has been established through volume shipment of VLSI complexity circuits for use in a wide array of applications.

The SAGA08 process employs up to five levels of metallization requiring as little as thirteen mask levels to produce self-aligned MESFETs and diodes. The process has been specifically designed for the implementation of VLSI circuits with over one million active devices. SAGA08 is currently used by TCM to implement standard and semi-custom products including the TGAII Series of gate arrays.

The use of a tungsten-based refractory metal for gates and local interconnects ensures stability during high temperature processing. As in VLSI silicon processing, an aluminium alloy is used for the four levels of global interconnects. Dry etching of metals and dielectrics is used throughout in order to maximize yields.

SCFL (*)

MACRO	DELAY	DELAY/ F.O.	WIRE DELAY	P_D
Inverter	140 ps	15 ps	70 ps/mm	23 mW
D Flip-flop	230 ps	15 ps	70 ps/mm	45 mW
2:1 Mux Select → Output	160 ps	15 ps	70 ps/mm	23 mW

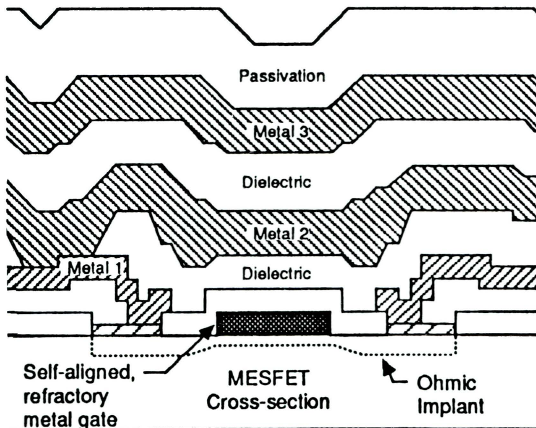
DCFL (*)

MACRO	DELAY	DELAY/ F.O.	WIRE DELAY	P_D
Inverter	90 ps	13 ps	80 ps/mm	1.0 mW
D Flip-flop	400 ps	13 ps	80 ps/mm	3.9 mW
2:1 Mux Select → Output	300 ps	13 ps	80 ps/mm	2.1 mW

(*) SCFL : Source Coupled FET Logic
DCFL : Direct Coupled FET Logic

The parameters shown above are provided as a quick reference to the performance of two commonly used logic families implemented using TCM's process. The data reflects the fact that the choice of logic depends heavily on the circuit, or portion of a circuit, being produced (more than one logic type may be mixed in a given design).

SAGA08 PROCESS



SAGA08 DIGITAL FOUNDRY

SAGA08 ENHANCEMENT/DEPLETION MESFET PROCESS

■ *Customer support*

TCM offers the designer an array of design tools and support services developed specifically for custom designs. These tools and services have been assembled to provide a designer with a high degree of confidence to implement high performance circuits which will function correctly the first time.

Before any instruction or design has begun, a joint review of the customer's requirements is performed and a TCM project manager is assigned to support and track each foundry program. This project manager is provided to insure timely response to a customer's needs during the program and to report the status of the customer's wafers at any time during the fabrication cycle.

The TCM Foundry Design Manual, a publication which is released to the customer on a non-disclosure basis, provides a road map through the design and fabrication process. This manual, when combined with the design training course offered by TCM provides a comprehensive method by which designers can familiarize themselves with the process, rules, aids, and tools, as well as specific examples of TCM's digital GaAs IC design process.

The guide provides complete instructions for designing custom cells compatible with the TCM standard cell library. In addition, it contains information on testing and packaging, including test vector formats and assembly/build diagrams for the entire line of TCM high-speed packages.

TCM supports the HSPICE* circuit simulator for use in full custom design projects. HSPICE is one of the most popular commercially available simulators and is characterized by excellent convergence and pre-and-post-processing facilities. TCM used model reflects the characteristics of MESFETs fabricated in the SAGA08 process. The temperature dependent model includes backgating, short and narrow channel effects, and velocity saturation.

Parameter files that represent device performance shifts due to process variations are supplied by TCM for use with the HSPICE simulator. With the aid of HSPICE, the designer can simulate circuit performance over all process corners, thereby simplifying performance/yield trade-offs.

Several other software tools are also provided, including ECAD-compatible files for physical layout design rule checking, electrical design rule checking, and layout-vs-schematic checking.

Design consultation with TCM senior circuit designers is included as part of the standard foundry program package, and an optional classroom course is offered for in-depth review of the design, testing, and packaging of VLSI GaAs circuits. Use of TCM's design center is also optionally available. Final design results can be submitted in the form of GDS II or CIF-format tapes.

■ *Optional services*

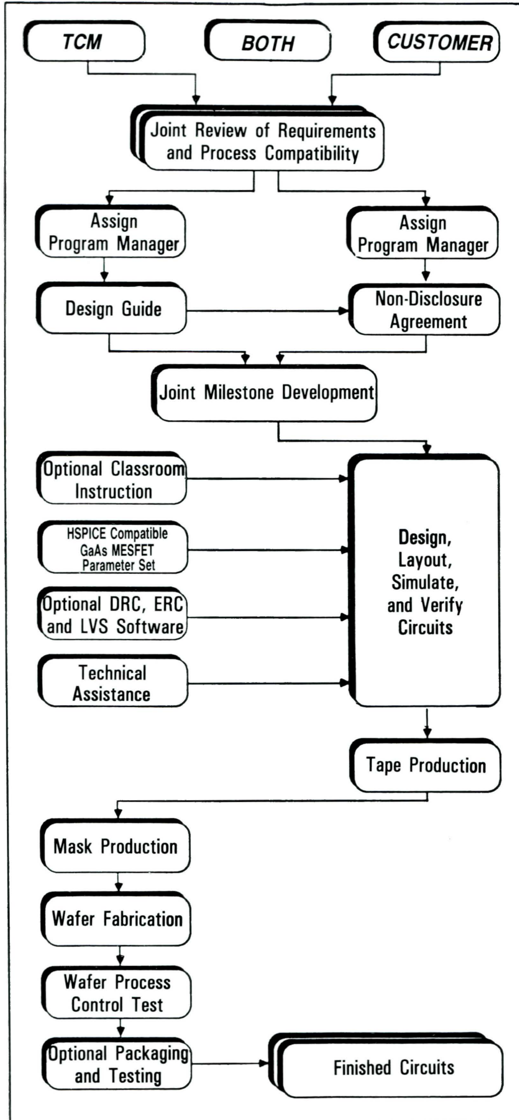
Assembly and testing are provided as customer options. This includes functional and critical path testing at both the wafer and for level packaged parts. TCM has a full complement of IC test equipment including a Teradyne J971 high pin count IC and memory tester. The J971 can accomodate up to 512 I/O signals with a maximum data rate of 100 MHz. The edge placement accuracy on both inputs and outputs is ± 225 psec. The J971 has also a built-in memory tester and is supporting scan test methodology. More detailed specifications of its capabilities are available upon requests.

Assembly and packaging services are available. Ceramic chip carriers, DIPs, and pin grid arrays capable of supporting edge rates of 150 ps are the standard package forms; custom package development will be considered as a special quote. TCM can provide Mil 883 compliant chips to customer specifications.

* HSPICE is a product of Meta-Software.

SAGA08 DIGITAL FOUNDRY

TECHNICAL FLOW CHART



DIGITAL GaAs MULTIPROJECT PROTOTYPING SERVICE

Thomson Composants Microondes is offering a digital prototyping service in 0.8 μm SAGA (Self Aligned Gallium Arsenide) through CMP, a national chip fabrication service created in 1981 by the CNRS, the CEA and CNET.

The service is proposed through CMP at the cost of 2700 FF/mm² exclusive of taxes and duties and subject to export regulations, and is available to support universities, research laboratories and companies. The service facilitates the development of innovative products between research institutes and industry.

The basic service provided by CMP is the delivery of twenty circuits, including five packaged parts from a GDSII description. Design rules are available against signed non disclosure agreements.

The SAGA process, already implemented at Thomson Composants Microondes' plant in Grenoble, France, includes enhancement/depletion GaAs MESFET and three layers of conventional aluminium interconnect. The GaAs performance and silicon MOS manufacturing techniques optimize yields, product speed/power/integration for new performance standards at prices equal to high performance silicon bipolar products. In addition it offers equal price and better performance ratios to BiCMOS products.

Thomson Composants Microondes (TCM) has a recognized expertise in the design and development of GaAs devices, with today more than 200 completed projects. Under the licencing agreement signed with Vitesse Semiconductor Corporation (VSC) in October 1990, TCM is second source for the Fury™ gate array and VCB50K standard cell families, with an option on all products. The TCM manufacturing facility at Saint-Egrève is the first European GaAs 4 inch production line. The current capacity of 6,000 wafers annually can be increased to 20,000.

CMP offers multiprojects chips in CMOS and bipolar technology down to 1.2 μm. CMP has already served over 60 institutions in twenty countries, with more than 1,000 projects prototyped, and 10 interfaced semiconductor houses. Recently CMP introduced a MCM prototyping service.

GaAs MICROWAVE
FOUNDRIES

GaAs MICROWAVE FOUNDRIES

STANDARD MICROWAVE FOUNDRIES

PROCESS NAME	LN05	HP07
Applications	Low noise up to 20 GHz	High power up to 10 GHz
Gate length	0.5 μm	0.7 μm
Active layer	Implanted	Implanted
FET Ft = gm/2 π Cgs	30 GHz	15 GHz
Noise figure	1.9 dB @ 12 GHz	—
Power (1 dB gain compr.)	—	0.5 W/mm
Associated gain	8 dB @ 12 GHz	10 dB @ 6 GHz
Air Bridges + via holes	Yes	Yes
Gate lithography	E-Beam	E-Beam
Other levels lithography	Wafer stepper	Wafer stepper
Wafer size	3"	3"

MICROWAVE FOUNDRIES UNDER DEVELOPMENT

PROCESS NAME	VLN02	HP05
Applications	Ultra low noise up to 40 GHz → 60 GHz	High power up to 18 GHz
Gate length	0.2 μm	0.5 μm
Active layer	Molecular beam epitaxy	Molecular beam epitaxy
FET Ft = gm/2 π Cgs	90 GHz	25 GHz
Noise figure	1.4 dB @ 18 GHz, 2.7 dB @ 40 GHz	—
Power (1 dB gain compr.)	—	0.5 W/mm
Associated gain	10 dB @ 18 GHz, 6.5 dB @ 40 GHz	6.5 dB @ 18 GHz
Air Bridges + via holes	Yes	Yes
Gate lithography	E-Beam	E-Beam
Other levels lithography	Wafer stepper	Wafer stepper
Wafer size	3"	3"

GaAs MICROWAVE FOUNDRIES

The **BASIC FOUNDRY** service includes:
- delivery of a fully documented design manual (electrical models, layout rules, technology, test pattern and acceptance criteria);
- delivery of a set of files and associated documentation for EESOF or HEWLETT-PACKARD workstations.
- delivery of the layout cell library (GDS II tape);
- processing of the customer's layout, mask generation, wafer processing;
- delivery of two processed 3" wafers (minimum order) with PCM probing.

In addition, THOMSON COMPOSANTS MICROONDES offers a range of optional services:
- design seminar (3-day intensive course);
- engineering support;
- on-wafer testing/sorting (DC or microwave);
- wafer dicing;
- chip packaging/assembly;
- special environment tests.

THE MMIC MULTIPROJECT PROTOTYPING SERVICE

- Enables up to 12 customers to share the same reticle and wafer.
- Available for LN05 or HP07 process.
- Two training sessions per year and per process.
- Supported on EESOF/ACADEMY and HP/HFDS workstations.
- Low cost course including a 3 day training course, a design kit, RF tested chips and chips on carriers.

THOMSON COMPOSANTS MICROONDES is also ready to design MMICs to customer specifications, which enables customers to take advantage of TCM design experience, based on more than 200 projects.

GaAs MICROWAVE FOUNDRIES

THE MANUFACTURING PROCESS

Figure 1 shows a cross-section of the GaAs MESFET structure which includes the base of the transistor: the monocrystalline GaAs substrate, which should be as non-conducting as possible, is naturally semi-insulating.

Active layers, n and n^+ types, are created by ion implantation starting on the upper side.

Placed on either side on this surface are source and drain ohmic contacts made of a gold-germanium-nickel alloy; in the middle is the titanium-platinium-gold gate: it is this metallic compound which give its name to the Field Effect Transistor for "**ME**tal **S**emiconductor **F**ield **E**ffect **T**ransistor" (MESFET).

Figure 2

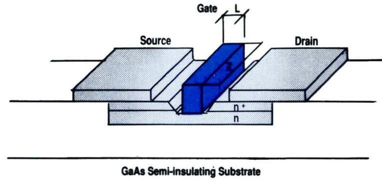
- Semi-insulating GaAs substrates
- Implantation of Si^+, n-n^+
- Stepper lithography
- E-beam direct writing of gates
- Evaporation by electron gun, lift-off technique
  - AuGeNi ohmic contacts
  - Gates, thickening of gates, first and second interconnection level in AuGeNi
  - Electrolytic Au air bridges
  - Electrolytic Au metalization on back side
- MIM passivation and capacity in S_{i3} N_4
- Air bridge crossover contacts
- Wafer thinning down to 100 μm
- Via holes
- In-line DC and RF tests

Figure 3 illustrates the sequence of the technological process.

The first stage of the process is the deposit of a thin Si_3 N_4 layer obtained by sputtering. The first level of masking is the prealignment level (mask 1) allowing localization of active zones obtained by ion implantation (mask 2). The activation of donors is obtained by thermal annealing. The activation ratio is superior to 90%. The AuGeNi ohmic contacts are then deposited (mask 3) and alloyed, with maximum resistance values of obtained contacts being inferior to 0.3 Ω.mm. FET gates are next defined by electronic writing (level 4).

Before the TiPtAu metallic deposit, the channel is recessed in order to remove the n^+ layer and to adjust the channel current. Mask 4 allows the gate pads to be recharged, the first level of metallization and the lower electrode of capacitors.

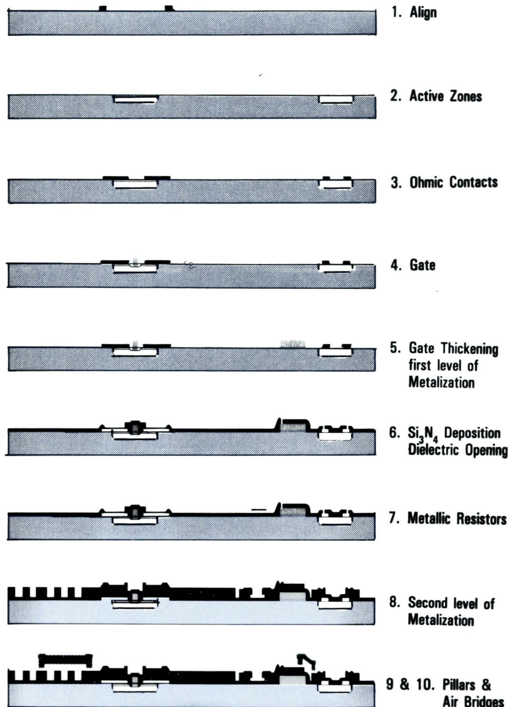
A passivation level (Si_3 N_4) protects the active zones of transistors and forms the dielectric of capacitors. The dielectric is then etched (mask 5) to realize the openings for contact recovery. The following level (mask 6) is a deposit of tantalum nitride (TaN) to make metallic resistors. The remaining steps involve interconnections to realize inductors, and the upper electrodes of capacitors with a TiPtAu level of thick metalization (mask 7).

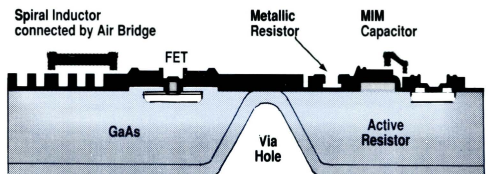


Transistor channel lengthes available are in the 0.5 to 0.7 μm range, normal width is around 200 μm.

Pillars (mask 8) and bridges, made of electrolytic gold (mask 9), will make the final connections between components of the circuit.

After thinning the wafer down to 100 μm, via holes are defined (mask 10) and GaAs is etched by RIE. The back side of the wafer is finally metallized with thick electrolytic gold layer.





PRODUCT INDEX

MODEL	PAGE	MODEL	PAGE	MODEL	PAGE	MODEL	PAGE	MODEL	PAGE
ADC20010	41	AH219	25	AH447	20	AH512	26	AH616	20
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AFC500	26	AH222	25	AH449	20	AH514	26	AH618	20
AH108	23	AH223	25	AH450	20	AH515	26	AH619	20
AH110	23	AH224	25	AH451	20	AH516	26	AH620	20
AH111	23	AH225	25	AH452	20	AH517	26	AH621	20
AH112	23	AH226	25	AH453	20	AH518	26	AH622	20
AH113	23	AH227	25	AH454	20	AH521	26	AH623	20
AH152	24	AH228	25	AH455	20	AH522	26	AH624	20
AH153	24	AH229	25	AH456	20	AH523	26	AH651	20
AH154	24	AH230	25	AH457	20	AH524	26	AH652	20
AH155	24	AH232	25	AH458	20	AH525	26	AH653	20
AH156	24	AH233	25	AH479	20	AH526	26	AH654	20
AH157	24	AH234	25	AH480	11	AH527	26	AH655	20
AH160	24	AH235	25	AH481	20	AH528	26	AH680	20
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Agreement between THOMSON COMPOSANTS MICROONDES and ANADIGICS INC. - MARCH 90

THOMSON COMPOSANTS MICROONDES (TCM) and ANADIGICS INC. of Warren, NJ, have signed an exclusive European Sales and Marketing agreement.
TCM, a unit of THOMSON-CSF, is specialized in designing and manufacturing Microwave Monolithic Integrated Circuits (MMIC) based on gallium arsenide (GaAs) for specialized applications.

ANADIGICS is a leading designer and manufacturer of Microwave Integrated Circuits for consumer applications (satellite receivers, etc.).

This exclusive agreement designates TCM as the sole representative and only supplier of ANADIGICS products in Europe.

Those products concern high-volume markets: Direct Broadcast Satellite equipment, Cable Television, etc.

TCM and ANADIGICS also have a second source agreement for the DBS downconverter MMIC. The CHA12000 from TCM, manufactured in Orsay plant, France, is pin to pin and electrically compatible with ANADIGICS AKD 12000.

Subordinate agreements will subsequently be added to the commercial agreement.

The GaAs Technology used by ANADIGICS is D-mode MESFET Technology, 0.5 micron channel length, direct implantation. Standard FET transistors have 24GHz F_t as well as outstanding noise characteristics. The process is optimized in order to obtain high-performance MMICs.

ANADIGICS products marketed by TCM include:
- AGC Transimpedance Amplifier 150MHz
- AGC Transimpedance Amplifier 250MHz
- Transimpedance Amplifier (Fiber optic) 2.5GHz
- DBS Ku-Band down converter
- Laser Driver 10MHz - 3GHz
- and other components.

Agreement between THOMSON COMPOSANTS MICROONDES and VITESSE - MARCH 90

VITESSE SEMICONDUCTOR CORPORATION and THOMSON COMPOSANTS MICROONDES (TCM), a fully owned subsidiary of THOMSON-CSF announced today the completion of a comprehensive agreement in the field of GaAs components. Simultaneously, THOMSON-CSF through its THOMSON-CSF VENTURES subsidiary has made an equity investment in VITESSE. The agreement between TCM and VITESSE covers marketing, second source and product license and provides VITESSE with foundry capability at a new THOMSON-CSF facility in Grenoble, France. Under the marketing agreement, TCM will have exclusive distribution rights for all VITESSE products in Western Europe. Under the license agreement, TCM has an option to second source all VITESSE products. TCM is full second source of VITESSE FURY series and VCB50K through its TGAII series and TCB50K ASIC product lines, manufactured in St-Egrève plant, France.

The foundry agreement will provide VITESSE with the capacity to expand its manufacturing potential for its current and future customers by using TCM manufacturing facilities and, through the license agreement, VITESSE will for the first time have a fully qualified second source for all its products.

TCM has been for many years involved in the design and development of microwave GaAs devices for Defense applications and has acquired a recognized expertise in that field. This agreement provides TCM with new digital GaAs products and an established digital GaAs manufacturing process which complements the microwave GaAs MMIC developed by THOMSON-CSF R&D and gives TCM a unique product portfolio in Europe to serve a broader customer base.

VITESSE Semiconductor Corporation is the world's leading supplier of digital gallium arsenide integrated circuits. The company was founded in 1984 to develop, manufacture and market cost effective VLSI GaAs IC's. Using a proprietary GaAs process incorporating proven silicon manufacturing technology, VITESSE supplies a broad family of ASIC, standard logic and RAM products to the computer, telecommunications, equipment and defense electronics markets. The company is headquartered in Camarillo, California, forty miles north of Los Angeles.

FURY and VITESSE are trademarks of VITESSE SEMICONDUCTOR CORPORATION.

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THOMSON COMPOSANTS MICROONDES (TCM) reserves the right to make changes to the products contained in this short-form catalogue.
Consequently, contact TCM for the latest available specifications and performance data.
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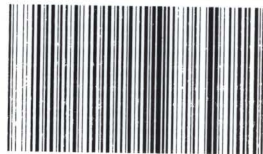

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