

Design Guide for LXT901/907 Ethernet Interface

Connection to Motorola MC68EN360 Controller

General Description

This application note describes a method for connecting the LXT901 or LXT907 Ethernet Interface Adapter to the Motorola MC68EN360 Quad Integrated Communications Controller (QUICC) with Ethernet capability. The QUICC/LXT901 combination makes designing routers, bridges, print servers and other, similar products simple and fast.

The LXT901 and LXT907 devices have advanced features that make design and fabrication faster and cheaper than typical competitors' products. These two devices meet all of the Motorola QUICC design requirements with minimal external circuitry needed to use the MC68EN360 features. Either of these devices gives the lowest cost, highest performance possible with the Motorola QUICC.

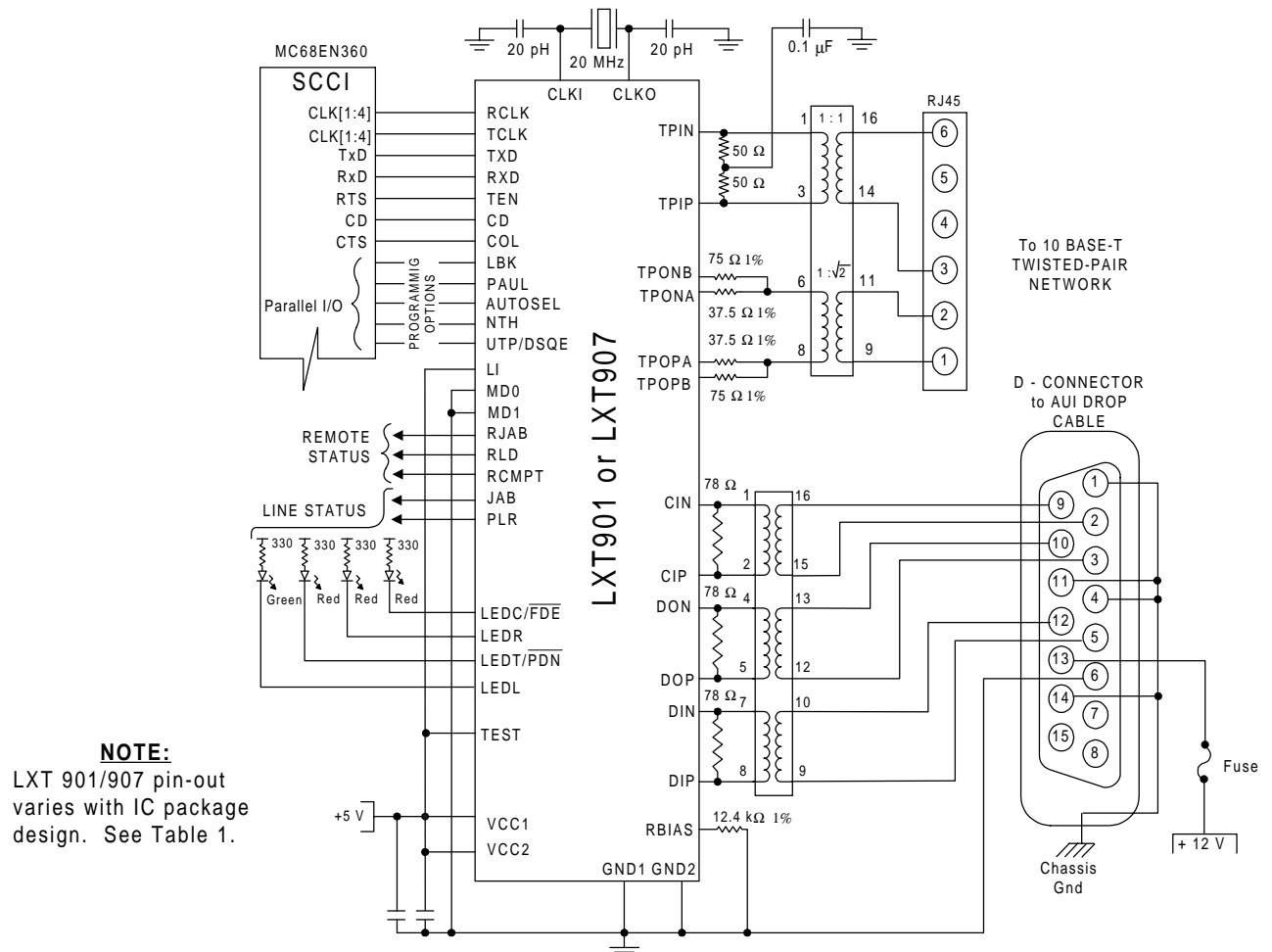
LXT901/LXT907 Device Features

- Glueless interface to the MC68EN360 QUICC controller in 10 Mbps Ethernet/IEEE 802.3 LAN with either twisted-pair connection or AUI transceiver
- Integrated filters make design faster, fabrication cheaper
- Integrated LED drivers for operation monitoring
- Supports full duplex operation
- Automatic port selection makes choosing between the twisted-pair and AUI options seamless

Applications

This application note addresses the Ethernet LAN side of the circuit only. To connect to a T1 or E1 network, use a Level One LXT301/305 family or an LXT310 or LXT318 transceiver.

Typical LXT901/LXT907 Device and MC68EN360 QUICC Connection



LXT90x / QUICC Interface

The LXT901 device is available in either a 44-pin PLCC format or a 64-pin TQFP package. The LXT907 device is available in the 44-pin PLCC form. The two PLCC packages are pin compatible except for pin 37. This pin is UTP (unshielded/shielded twisted-pair select) on the LXT901 and DSQE (Disable SQE) on the LXT907 device.

The following pins on the LXT901 or LXT907 device connect to the MC68EN360 SCC1 signals as shown.

Table 1: Pin Connections

LXT901/LXT907 Device			Motorola QUICC MC68EN360 SCC1 Signal
PLCC Pin	TQFP Pin	Signal	
28	47	RCLK	CLK1-4 ¹
11	23	TCLK	CLK1-4 ¹
12	24	TXD	TXD
26	45	RXD	RXD
13	25	TEN	RTS ²
27	46	CD	CD ²
16	28	COL	CTS ²
22	38	LBK	Connect these bits to the Parallel I/O bus on the QUICC ³ and program as needed.
40	3	PAUI	
17	29	AUTOSEL	
4	13	NTH	
37 (901)	59	UTP	
37 (907)	n/a	DSQE	

1. The design must provide separate clocks for TCLK and RCLK. Any of the clocks on the QUICC will do.
2. These signals are active high in this application.
3. Please check the Motorola specification for the connections needed for the desired result.

Setting QUICC Parameters

Refer to the Motorola MC68360 Quad Integrated Communications Controller User's Manual for settings required to make the QUICC function. Be aware of the following:

Only SCC1 has Ethernet communications capability. Use SCC1 for the LAN connection, and use another SCC (or a parallel) port for the other side of the connection.

Bypass both the Digital Phase-Locked Loop (DPLL) and Manchester Encoding/Decoding function for Ethernet operation.

The TCI (Time Clock Invert) bit must be High to allow the QUICC to clock the data out to the LXT901 or LXT907 device on the rising edge of the clock pulse. This improves data setup time at the 10 Mbps speed used by Ethernet. TCI is bit 28 of the General SCC Mode Register (GSMR).

The MODE bits (0~3) must be set to 1, 1, 0, 0 respectively. The Transparent Receiver (TRX) and Transparent Transmitter bits (TTX), bits 43 and 44, must both be 0 (normal operation) or 1 (transparent operation). Do not mix TRX and TTX values. The 0 setting is recommended; in transparent mode, the QUICC does not manipulate protocols in the data stream.

The Transmit FIFO Length (TFL) bit should be 0. TFL is bit 38 in the GSMR. The Receive FIFO Width (RFW) bit, bit 37, should also be 0.

GSMR bits 19 and 20 are the Transmit Preamble Pattern (TPP) bits. For Ethernet operation, set them to 0, 1 to transmit a repeating 10 pattern as a preamble.

Figure 1 shows a typical set up for a full duplex 10BASE-T LAN connection, using the LXT907 device. This application requires only the TP transformer, two 18 pF capacitors, two 330 Ω resistors, two 24.9 Ω 1% resistors, one 12.4 kΩ 1% resistor, and a green LED. The 20 MHz clock signal is common in all 10BASE-T applications, so no crystal is required. All QUICC parameters remain the same.

This completes the Ethernet/IEEE 802.3 LAN side of the circuit setup. There are other steps in designing a working circuit that go beyond the scope of this application note.

Layout Guidelines

Fabricate the circuit as shown in the diagram on page 1. Take care to isolate the bias circuit at RBIAS and locate the resistor close to the pin. If this resistor is not positioned properly it may act as an antenna and cause erratic performance. Keep it away from other components or signal traces, and do not run any signals under the resistor. Be sure to use a bypass capacitor at each Vcc pin.

External Components

The application on page 1 requires two DIP transformer packages for isolation and impedance matching on the AUI or twisted-pair transmit and receive lines. Recommended transformers are listed in Table 2.

The application on page 1 also requires a 20 MHz clock and several resistors, diodes and capacitors. That example uses the following parts:

- 20 MHz crystal (one each, or external 20 MHz clock)
- 300 Ω, 1% resistor (four each)
- 50 Ω, 1% resistor (two each)
- 75 Ω, 1% resistor (two each)
- 78 Ω, 1% resistor (three each)
- 37.5 Ω, 1% resistor (two each)
- 12.4 kΩ, 1% resistor (one each)
- 0.1 μF capacitor (three each)
- 20 pF capacitor (two each, required with Xtal only)
- 18 pF capacitor (one each)
- Red LED (three each, optional)
- Green LED (one each, optional)

Table 2: Transformer Manufacturers

Mfgr	Part Number	TP/AUI
Bel Fuse	S553-0716/A553-0716	TP
	A553-0756/S553-0756	AUI
Fil-Mag	23Z128/23Z128	TP
	23Z90/23Z90SM	AUI
HALO Electronics	TD42-2006Q	TP
	TG42-2006WH1	AUI
	TD01-0756K	
	TG01-0756W	
Valor	PT4069/SM4069	TP
	LT6030/SM6030	AUI

Figure 1: Typical Full Duplex 10BASE-T Connection

