# Coaxial Transceiver Interface

#### **FEATURES**

- Compatible with ISO/IEEE 802.3 10Base5 (Ethernet) and 10Base2 (Cheapernet).
- Functionally compatible with National DP8392C.
- Internal squelch circuitry for noise rejection.
- Reception/transmission mode collision detection.
- Transceiver functions integrated except for signal and power isolation.
- CD heartbeat externally selectable.
- Advanced low-power, high-performance CMOS technology.
- ESD protection greater than 2000 volts.
- 16-pin plastic DIP package, 24-pin skinny plastic DIP package, or 20 and 28-pin PLCC packages.
- Built-in LED drivers for collision, reception, jabber and transmission status display (MTDX93/X94 only).
- Collision detection mode for reception, transmission and hybrid (MTDX94 only).
- Special test mode allowing continuous transmission for waveform testing (MTDX94 only).

#### **GENERAL DESCRIPTION**

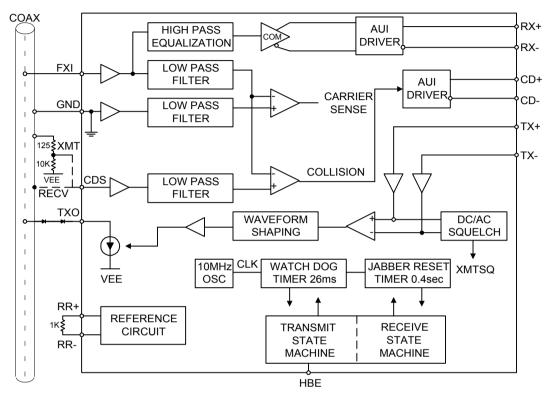
The MTD392 family includes a series of products, MTD392/3/4 and MTD492/3/4. The MTD392 product family is built for easy MAU interface in a coaxial Ethernet network. The MTD392 product family integrates the coaxial cable interface functions of Medium Attachment Unit (MAU) in Ethernet or Cheapernet LAN applications. In an Ethernet 10Base5 network, the MTD392 product family is mounted on the thick Ethernet coaxial cable and connects to a station through an AUI cable. For Cheapernet applications, the MTD392 product family is connected to the Cheapernet coaxial cable through a BNC connector and is usually mounted on the LAN adapter in a station.

Following is a table describing the differences among the MTD392 product family:

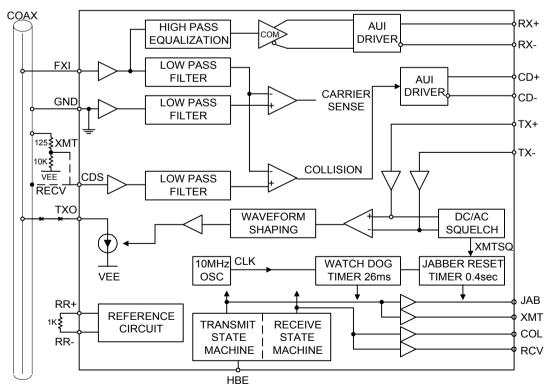
Product	Features	Package Types	Recommended Applications
MTD392	Basic transceiver	16-PDIP 28-PLCC	Adapter boards
MTD393	MTD392 with built-in LEDs	20-PLCC 24-PDIP	Adapter cards with status LEDs
MTD394	MTD393 with enhanced collision detection mode, special pin for testing	24-PDIP 28-PLCC	MTD393 applications with enhanced collision detection
MTD49X	MTD39X with improved performance		Basic MTD39X applications, Hub, repeater and MAU applications

This datasheet contains new product information. Myson Technology reserves the rights to modify the product specification without notice. No liability is assumed as a result of the use of this product. No rights under any patent accompany the sale of the product.

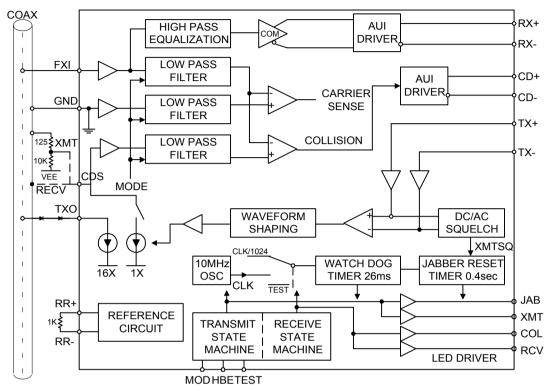
## **BLOCK DIAGRAM FOR MTD392 FAMILY**



Block Diagram for MTDX92



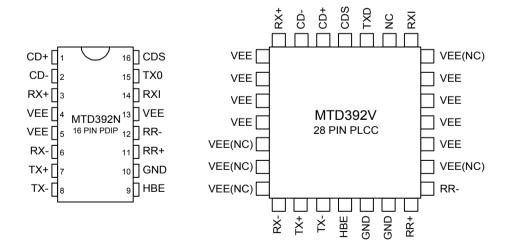
Block Diagram for MTDX93



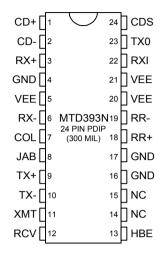
Block Diagram for MTDX94

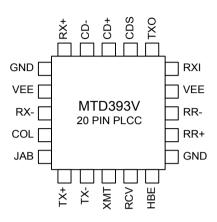
#### 1.0 CONNECTION DIAGRAM

#### (1) MTDX92 Pin Diagram

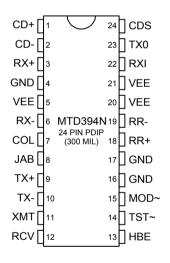


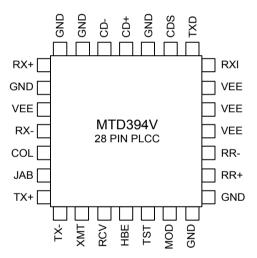
#### (2) MTDX93 Pin Diagram





#### (3) MTDX94 Pin Diagram





### 2.0 PIN DESCRIPTIONS

Name	I/O	MTD X92	MTD X93	MTD X94	Description
		PIN#	PIN#	PIN#	
TX+,TX-	I	7	9	9	Transmission Data Input. A balanced differential line
		8	10	10	receiver that receives input from the off-chip Manchester
					Code Converter (MCC) to the Transmitter. The common
					mode voltage on TX± is set internally.
HBE	ı	9	13	13	Heartbeat Enabler. The CD heartbeat test is enabled when
					HBE is connected to Ground and disabled when HBE is
					connected to VEE.
RR+,RR-	I	11	18	18	<b>External Resistor.</b> A $1k\Omega$ ,/1% resistor should be connected
		12	19	19	across these pins to correctly set internal operating currents.
					RR+ is internally shorted to GND.

					Ţ
RXI	I	14	22	22	<b>Network Receiving Input.</b> Should be connected to the COAX center conductor. Signals meeting receiver squelch limits are recovered and output on RX±/RXI also detects the collision voltage level.
CDS	_	16	24	24	Collision Detecting Sense. Connects directly to the COAX shield, providing a reference for the collision detection voltage level for receiving-mode detection. An external bias network can be used to shift the detection threshold for transmission-detection mode. For hybrid mode collision detection, a $400\Omega$ resistor should be connected from CDS to GND.
RX+,RX-	0	3	3	3	Receiving Data Output. A balanced differential output drives
		6	6	6	data recovered from the network to the MCC. These outputs are also open sources, and pull-down resistors from $510\Omega$ to VEE are required. To minimize power dissipation, both open source outputs are disabled during idle conditions, allowing the common mode on the pull-down resistor to be pulled to VEE.
CD+,CD-	0	1 2	1 2	1 2	<b>Collision Output.</b> A balanced differential line driver drives this output pair from the collision detection circuitry. A 10MHz signal from the internal oscillator is transferred to these outputs in the event of collision or excessive transmission (jabber), or during heartbeat condition. These outputs are open sources, and pull-down resistors from $510\Omega$ to VEE are required. To minimize power dissipation, both open source outputs are disabled during idle condition, allowing the common mode on the pull-down resistors to be pulled to VEE.
TXO	0	15	23	23	<b>Transmitter Output.</b> Should be connected to the coaxial cable via one serial isolation diode for Cheapernet/Thinnet (10 Base2) or 2 serial isolation diodes for Thicknet (10 Base5).
GND		10	4	4	Positive Supply Pin (Ground). Should be connected to the
		10	16 17	16 17	COAX shield.
VEE		4 5 13	5 20 21	5 20 21	<b>Negative Power Supply.</b> -9 volts. A 0.1μF decoupling capacitor must be connected across GND and VEE as close to the device as possible.
COL, JAB, XMT, RCV,	0			7 8 11 12	Transceiver Status Indicators. LED displays for collision, jabber, transmission and reception. These pins are opendrain output buffers that are used to drive LED status indicators. They are designed to supply 8 mA sinking capability.
TST-	_			14	<b>Test Enabler.</b> When both TST- and MOD- pins are shorted to VEE, MTDX94 enters into test mode. In this mode, the jabber function is disabled and all state timing is accelerated by 1024 times. This pin has a $50$ kΩ internal pull-up resistor.
MOD-	-			15	Mode Selection. Along with the TST- pin, determines the collision detection method of MTDX94. If both MOD- and TST- are connected to GND, MTDX94 implements receiving-mode collision detection. The typical detection threshold in receiving-mode is -1.53V. To implement transmission-mode collision detection, the detection threshold can be lowered by placing a resistor bias network on the CDS pin. When the TST- pin is connected to GND and the MOD- pin is connected to VEE, MTDX94 uses hybrid-mode for collision detection. In this mode, the threshold is set at -0.42V during idle or

	receiving operation. During transmission, the detection threshold is increased to -0.42V plus its own transmission level on the CDS pin. When TST- is connected to VEE and MOD- is connected to GND, MTDX94 uses the transmithybrid mode for collision detection. This mode is identical to hybrid-mode, except that during idle or receiving operation, the detection threshold is set at -1.53V. For proper operation of hybrid and transmission-hybrid mode, a 400 $\Omega$ resistor should be connected between the CDS pin and GND. This pin has a 50 k $\Omega$ internal pull-up resistor.
--	--

## 3.0 ABSOLUTE MAXIMUM RATINGS

DC Supply Voltage (VEE)
Input Voltage
Storage Temperature
Ambient Operating Temperature
ESD Protection except RXI

-12V
GND+0.3 to VEE-0.3V
-65° to 150°C
0° to 70°C
2000V

#### **4.0 OPERATING CONDITIONS**

DC Supply Voltage (VEE) 8.55-9.45V Operating Temperature 0° to 70°C

## **5.0 ELECTRICAL CHARACTERISTICS** (under operating conditions) (Note 1)

Parameter	Symbol	Min	Тур	Max	Unit
Recommended Supply Voltage	VEE	-8.55	-9.0	-9.45	V
Non-transmitting Supply Current (VEE to GND)	IEE	-	-25	-35	mA
Transmission		ı	-70	-80	mA
Receiving Input Bias Current (RXI)	Irxi	-2	-	+25	μΑ
Transmitting Output DC Current (TXO)	Itdc	37	41	45	mA
Transmitting Output AC Current (TXO)	Itac	±28	-	Itdc	mA
Collision Threshold (Receiving Mode)	Vcd	-1.45	-1.53	-1.62	V
Collision Threshold (Hybrid Mode) (MTDX94 only)	Vhcd	-0.38	-0.45	-0.52	V
Carrier Sense Threshold (RXI)	Vcs	-0.38	-0.45	-0.52	V
Differential Output Voltage (RX±,CD±)	Vod	±500	-	±1500	mV
DC Common Mode Output Voltage (RX±,CD±) (Note2)	Voc	-1.0	-2.0	-3.0	V
Idle State Differential Offset Voltage(RX±,CD±)	Vob	-	0	±40	mV
Transmission Squelch Threshold(TX±) (Note 3)	Vts	-175	-225	-300	mV
Input Capacitance (RXI)	Сх	-	1.5	-	pF
Shunt Resistance-Non-transmitting	Rrxi	100	-	-	kΩ
Shunt Resistance-Transmitting	Rtxo	10	-	-	kΩ

Notes:1. Testing is done under the testing load defined in Figure 6.

- 2. During idle condition, Voc is pulled down to VEE to minimize the power dissipation across the load resistors connected to RX± and CD±pins.
- 3. For a minimum pulse width of  $\geq$ 40 ns.

## 6.0 SWITCHING CHARACTERISTICS (under operating conditions) (Note 1)

Parameter	Symbol	Min	Тур	Max	Unit
Receiving Start-up Delay (RXI to RX±)	Tron	ı	2.5	5	bits
Receiving Propagation Delay (RXI to RX±)	Trd	ı	25	50	ns
Differential Output Rise Time (RX±,CD±)	Trr	ı	4	7	ns
Differential Output Fall Time (RX±,CD±)	Trf	-	4	7	ns
Reception and Cable Total Jitter	Trj	ı	±2	-	ns
Transmission Start-up Delay	Ttst	•	1	2	bits
Transmission Propagation Delay	Ttd	ı	25	50	ns
Transmission Rise Time (10%-90%) (TXO)	Ttr	20	25	30	ns
Transmission Fall Time (10%-90%) (TXO)	Ttf	20	25	30	ns
Ttr and Trf Mismatch	Ttm	ı	±0.5	±3.0	ns
Transmission Skew(TXO)	Tts	ı	±0.5	±2	ns
Transmission Turn-on Pulse Width at Vts(TX+) (Note 4)	Tton	10	20	40	ns
Transmission Turn-off Delay	Ttoff	130	200	300	ns
Collision Turn-on Delay	Tcon	ı	7	13	bits
Collision Turn-off Delay	Tcoff	-	-	20	bits
Collision Frequency (CD±)	Fcp	8.5	10	12.5	MHz
Collision Pulse Width (CD±)	Тср	40	50	60	ns
CD Heartbeat Delay (TX± to CD±)	Thon	0.6	1.1	1.6	μS
CD Heartbeat Duration(CD±)	Thw	0.5	1.0	1.5	μS
Jabber Activation Delay(TX± to CD±)	Tja	20	26	32	ms
Jabber Reset Timeout (TX±to TXO and CD±)	Tjr	300	420	550	ms

Notes: 4. For a minimum pulse amplitude of  $\geq$  -300 mV.

## 7.0 TIMING DIAGRAM FOR MTD392 FAMILY

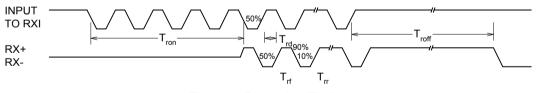


Figure 1. Reception Timing

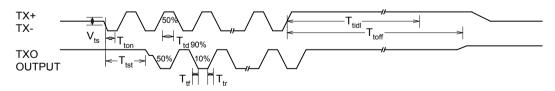


Figure 2. Transmission Timing

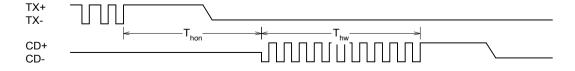


Figure 3. Heartbeat Timing

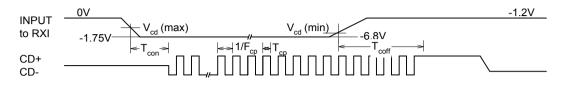


Figure 4. Collision Timing

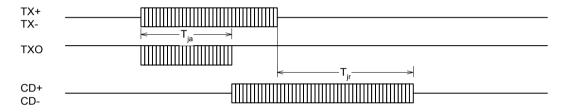


Figure 5. Jabber Timing

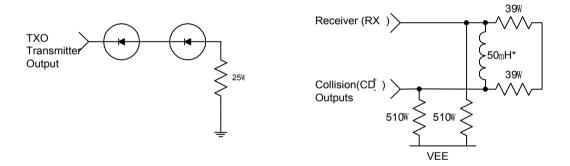
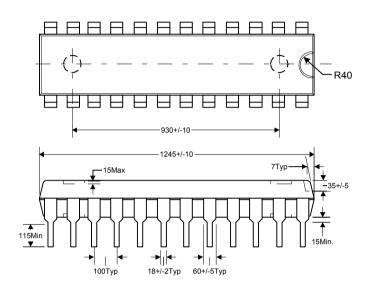
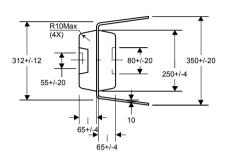


Figure 6. Test Loads

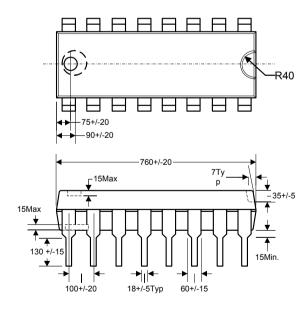
#### 8.0 PACKAGE DIMENSION FOR 392 FAMILY

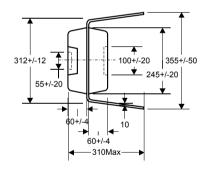
A. 24-PIN PDIP UNIT: MIL



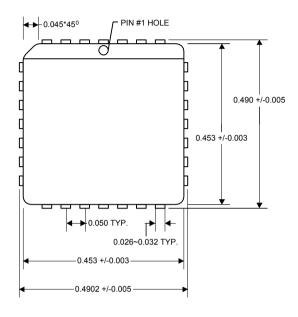


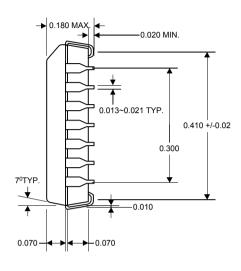
B. 16-PIN PDIP UNIT: MIL





### C. 28-PIN PLCC UNIT: INCH





### D. 20-PIN PLCC UNIT: INCH

