TC3198N

ETHERNET COAX TRANSCEIVER

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Ethernet Coax Transceiver

1. Features

- Low power coaxial transceiver suitable for portable Computer/Energy star Desktop Communication.
- Together with TMI TC3098HN module (Coax filter module), to accomplish conventional 8392+DC/DC+pulse transformer equivalent function.
- Compatible with IEEE 802.3 standards for 10BASE2 and 10BASE5.
- Jabber timer function included.
- Externally selectable Heartbeat function disable or enable.
- Squelch circuitry at all inputs rejects noise.
- 20 pin SOP package.
- Single+5V power supply, CMOS technology.
- PCMCIA LAN MAU/MAM, pocket LAN, print server module application.

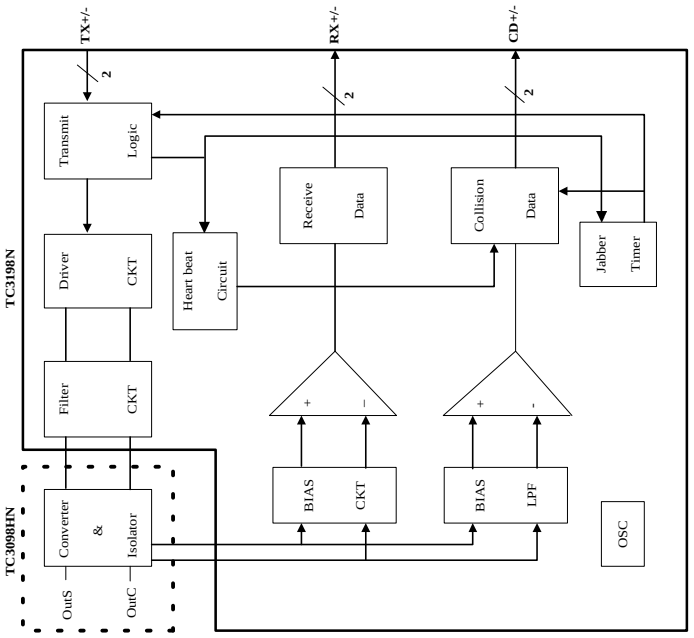
2. General Description

The TC3198N COAX Transceiver Interface is a coaxial cable driver/receiver for Ethernet. TC3198N has digital functions to interface TC3098HN analog module, and is compatible with IEEE 802.3 standards for 10Base2 (cheapernet).

COAX Mode

TC3098HN supplies isolation from coax cable and converts digital signal to analog signal. TC3198N implements functions of jabber timer, collision detector, receiver and transmitter. During transmitting a jabber timer is initiated to disable the transmitter in the event of a longer than legal length data packet. Collision detector circuitry monitors the signal on the coax to determine the presence of colliding packets and signals the DTE in the event of the collision.

TC3198N Block Diagram



3. Functional Description

Logic blocks of TC3198N, as follow:
⇒ The Oscillator
⇒ The Receiver (coax)
⇒ The Transmitter (coax)
⇒ The Collision Detect Circuitry
⇒ Heart Beat Circuit
⇒ The Jabber Timer
⇒ The Differential Driver/Receiver
⇒ The Coaxial Cable Signal Converter

3.1 OSCILLATOR

The oscillator is controlled by a 20MHz parallel resonant crystal connected between X1 -- and X2 or by external clock on X1.
The 20MHz crystal connection to TC3198N requires special care. THE IEEE802.3 requires a 0.01% absolute accuracy on the transmitted signal frequency, stray capacitance can shift the crystal's frequency out of range, causing the transmitted frequency to exceed its 0.01% tolerance.

CRYSTAL SPECIFICATION	
Resonant Frequency	20MHz
Tolerance	±0.001% at 25C°
Stability	±0.005% 0-70C°
Type	AT-Cut
Circuit	Parallel Resonance

3.2 RECEIVER FUNCTIONS

The Receiver includes an input buffer, a squelch circuit.
The buffer provides high input impedance and low capacitance to minimize loading and reflections on the coax.
The squelch circuit prevents noise on the coax from falsely triggering the Receiver in the absence of the signal.

3.3 TRANSMITTER FUNCTIONS

The transmitter has a differential line driver and a squelch circuit.
The differential line driver transfers signals to the ECL level for the coax transmitting.
The Transmitter squelch circuit rejects noise caused by internal or external disturbance to ensure correct transmitting to the coax.

3.4 COLLISION FUNCTIONS

The collision circuitry consists of a comparator, a heartbeat generator, and a 10MHz oscillator.
The collision comparator monitors the signal from the Receiver. If the Receiver is active, the collision detect function is enabled after a few cycles. At the end of every transmission, the heartbeat generator creates a pseudo collision for a short time to ensure that the collision circuitry is properly functioning. This burst on collision output occurs typically 1.1 uS after the transmission, and has a duration of about 1 uS. The function can be disabled externally with the HBENB (Heartbeat Enable) pin to allow operation with repeaters. The 10MHz oscillator generates the signal for the collision and heartbeat functions. It is also used as the timebase for all the jabber functions.

3.5 JABBER FUNCTIONS

The jabber Timer monitors the Transmitter and inhibits transmission if the Transmitter is active for longer than 26 mS (fault). It also enables the collision output for the fault duration. After the fault is removed, the Jabber Timer waits for about 500 mS (unjab time) before re-enabling the Transmitter. The transmit input must stay inactive during the unjab time.

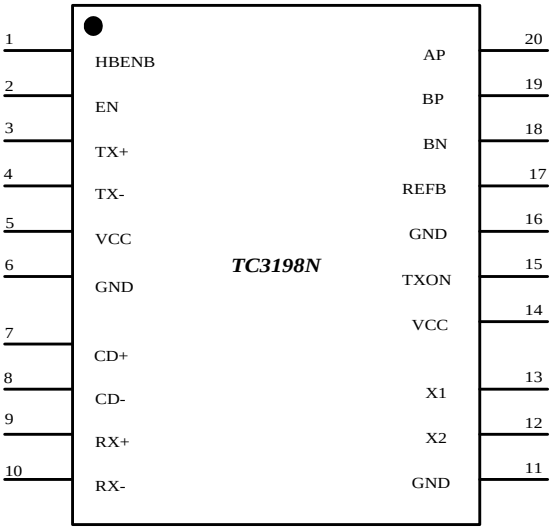
3.6 DIFFERENTIAL LINE DRIVER/RECEIVER

The Differential Line Drivers and Receivers are used in the separate mode to transmit ECL level signal to the transceiver cable and receive ECL level signal from the transceiver cable for the ETHERNET applications.

3.7 COAXIAL CABLE SIGNAL CONVERTER AND ISOLATOR (TC3098HN)

The converter and isolator block provides necessary signal conversion and power isolation. An ECL-like signal on the coaxial cable is converted into a CMOS compatible signal for internal processing purpose. Power isolation is also done within this block to avoid an ground current or damage due to potential difference.

TC3198N Connection Diagrams (20 SOP)



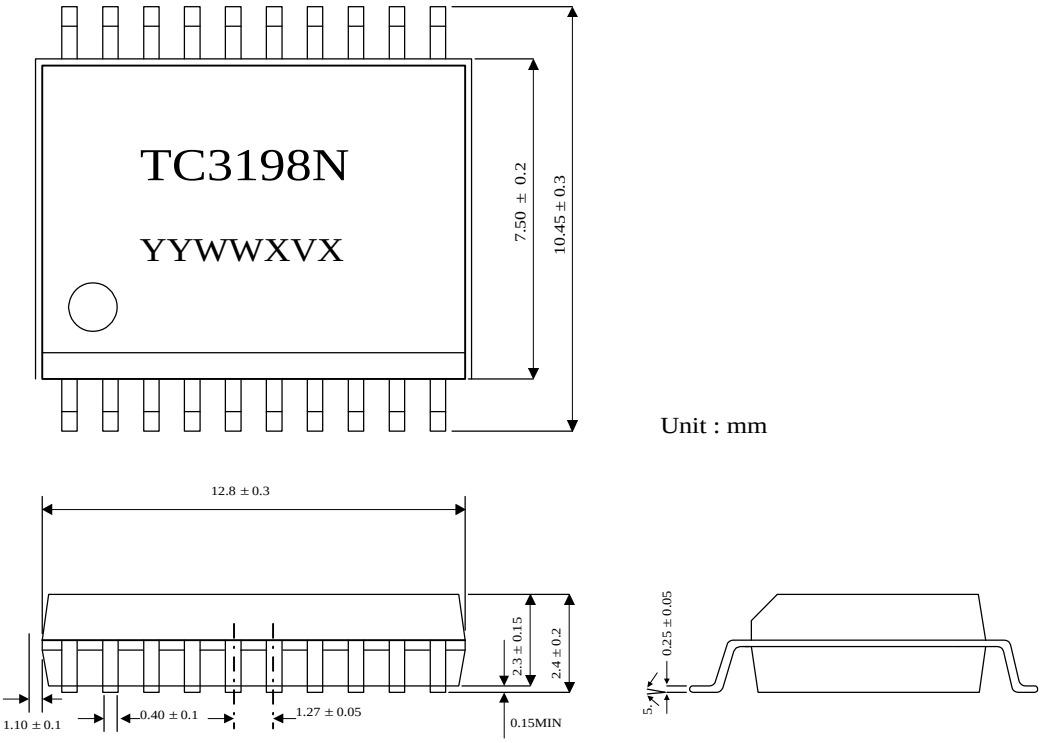
4. Pin Description (20 SOP)

Pin No.	Pin Name	I/O	Description
1	HBENB	I	Heartbeat (SQE) signal low enable, internal pull high.
2	EN	I	High to enable 3192N transceiver, low to disable, internal pull high.
3,4	TX+/-	I	Differentially drived receive signal from AUI cable.
5,14	VCC		Power, 5V.
6,11,16	GND		Ground.
7,8	CD+/-	O	Differentially drived collision to AUI cable.
9,10	RX+/-	O	Differentially drived transmit to AUI cable.
12	X2	O	Crystal feedback output, this output is used in the crystal connection.
13	X1	I	Crystal or external clock source input (20MHz).
15	TXON	O	Transmit digital output to TC3098HN.
17	REFB	O	DC voltage Bias for detecting collision.
19,18	BP/BN	I	Collision detect buffer input.
20	AP	I	Receive buffer input, (Care must be taken to minimize parasitic capacitance on this path).

5. Absolute Maximum Ratings

Power Supply Voltage	-0.5V	to	7V
Input Voltage	0V	to	7V
Storage Temperature	-40℃	to	125℃
Operating Temperature	0℃	to	70℃

6. Physical Dimensions (20 SOP)



7. D.C. Characteristics

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Pin	Symbol	Parameters	Conditions	Min	Typ	Max	Unit
	V_{IL}	Input Low Voltage		V_{SS}		0.8	V
HBEN	V_{IH}	Input High Voltage		2.0		V_{CC}	V
EN	I_{IL}	Input Low Current	V_{IN} = GND	--		200	µA
	I_{IH}	Input High Current	V_{IN} = V_{CC}	--		20	µA
TXON	V_{OL}	Output Low Voltage	I_{OL} = 8.0mA	--		0.4	V
	V_{OH}	Output High Voltage	I_{OH} = 4.0mA	2.4		--	V
TX+/-	V_{DS}	Diff, Squelch Threshold		-175		-300	mV

(1 of 2)

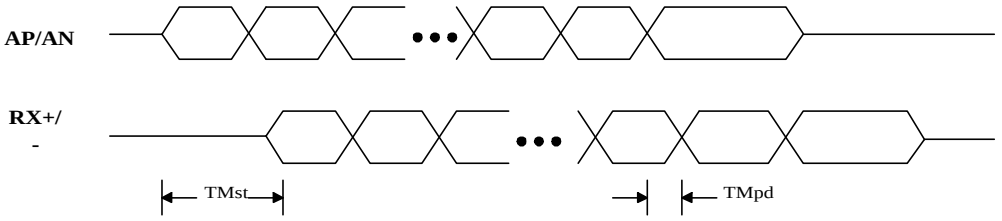
Pin	Symbol	Parameters	Conditions	Min	Typ	Max	Unit
CD+/- RX+/-	V_{OD}	Diff, Output Voltage	78Ω Termination	±550		±1200	mV
AP	V_{AP}	Input DC Bias	V_{CC} = 5V		2.95		V
BP	V_{BP}	Input DC Bias	V_{CC} = 5V		2.94		V
BN	V_{BN}	Input DC Bias	V_{CC} = 5V		2.44		V
REFB	I_{IN}	Input Leakage	V_{IN}=GND or V_{CC}	-20		+20	µA
X1	I_{IN}	Input Leakage	V_{IN}=GND or V_{CC}	-30		+30	µA
X2	V_{OL}	Output Low Voltage	X1 =V_{CC} I_{OL} = 2mA			0.4	V
	V_{OH}	Output High Voltage	X1 = GND I_{OH} = 1mA	2.4			V
	I_{CC}	Supply Current Transmitting	V_{CC} = 5V			50	mA
	V_{BP}-V_{BN}	Collision Threshold Voltage	V_{CC} = 5V	450		550	mV

8. Timing Characteristics

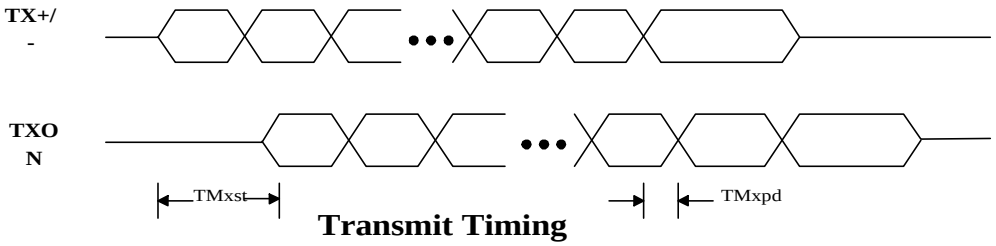
TABLE 1. TIMING FOR MAU APPLICATIONS

Symbol	Parameter	Min.	Typ.	Max.	Units
TMst	Receive start delay		450		ns
TMpd	Receive propagation delay		25	50	ns
TMxst	Transmit output start delay		175		ns
TMxpd	Transmit output propagation delay		25	50	ns
TMcon	Collision turn on delay time		50		ns
TMcoff	Collision turn off delay time		350		ns

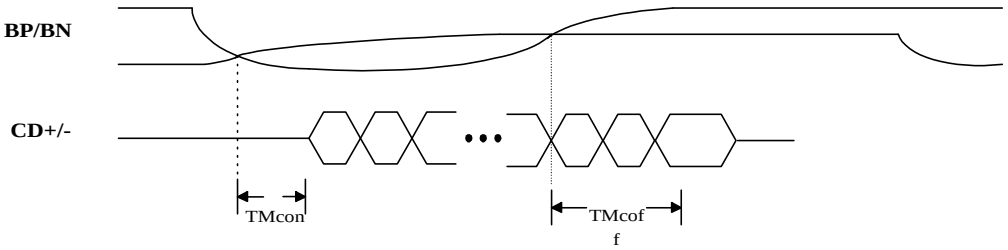
TIMING FOR MAU APPLICATION



Receive Timing



Transmit Timing



Collision Timing

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