FUJITSU SEMICONDUCTOR
DATA SHEET

DS04–22104–3E

ASSP

COAXIAL TRANSCEIVER INTERFACE FOR LAN

MBL8392B

COAXIAL TRANSCEIVER INTERFACE FOR LAN (10BASE5 AND 10BASE2)

The MBL8392B is a coaxial transceiver interface (CTI) for Ethernet and Thin Ethernet (Cheapernet) local area networks (LANs).

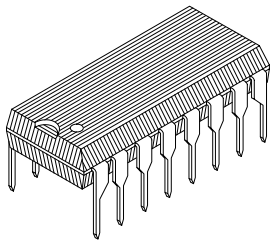
When used in combination with a LAN controller (MB86960A, MB86965A, MB86964), the MBL8392B can be used to configure Ethernet LANs in accordance with the IEEE 802.3 standard. It is connected between the coaxial cable and the data terminal equipment (DTE) and consists of a receiver, transmitter, collision detector, heartbeat generator, jabber timer, and open detector. The transmitter output is connected directly to a coaxial cable terminated at 50 Ω at both ends; the receiver output, collision detector output, and transmitter input are connected to the DTE through transformers. The CTI is isolated from the DTE by using IEEE 802.3-compatible pulse transformers mounted on a standard 16-pin DIP. The CTI power is isolated using a DC-to-DC converter.

If a data packet exceeds the legal length, the jabber timer stops the transmitter output. The collision detector monitors colliding packets on the coaxial cable and signals the DTE in the event of a collision.

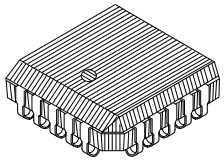
At the end of each transmission, the heartbeat generator generates a short pseudo-collision to ensure that the collision detector is functioning. The heartbeat function can be inactivated by applying the control voltage to the enable pin. This heartbeat-stop function is used for repeater applications.

The open detector detects the coaxial cable open state which is a transmission line to stop generation of a collision signal. By using this function, the AUI connector for the Thin Ethernet transceiver on the LAN board and the AUI connector for Ethernet can be connected in parallel to select automatically the line to which Ethernet or Thin Ethernet is connected.

DIP-16P-M05



LCC-20P-M02

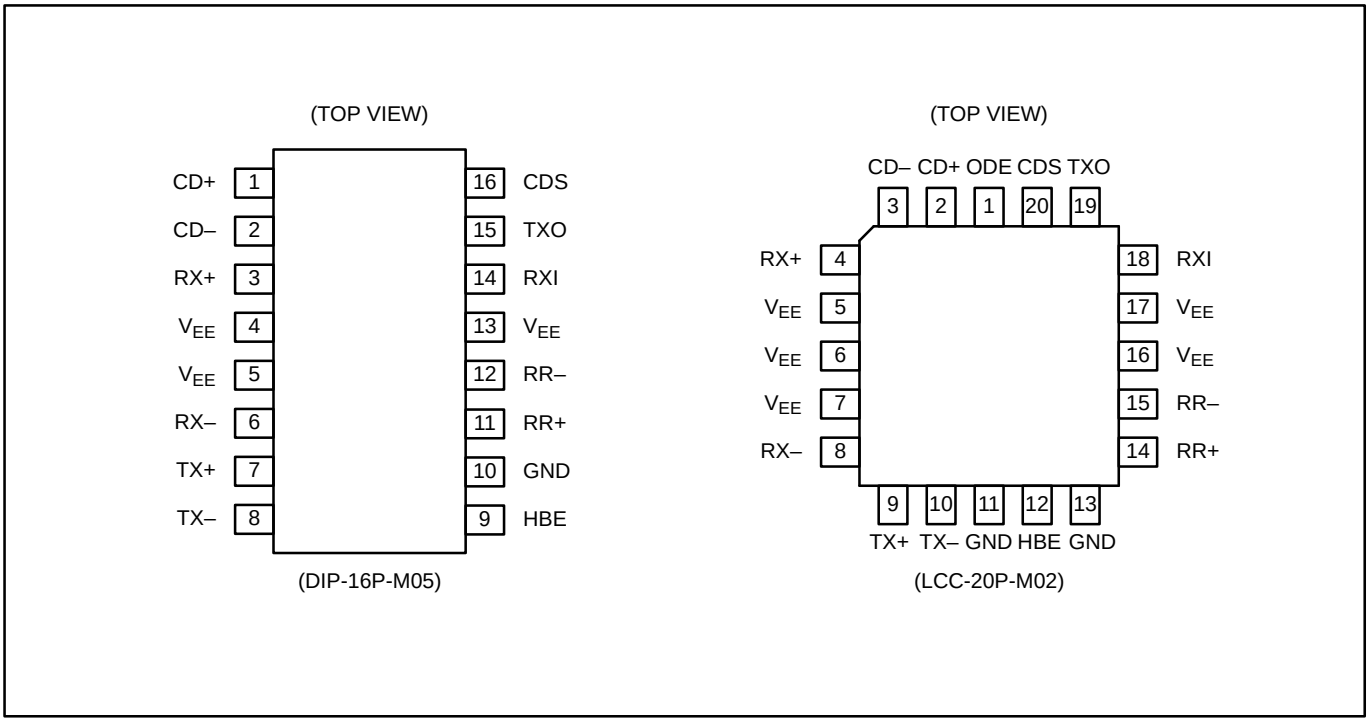


This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

FEATURES

- Compatible with Ethernet II, IEEE 802.3 10BASE5 and 10BASE2, and ISO 8802/3 interface specifications
- Integrates all transceiver electronics except transformers and power-supply DC-to-DC converter used for electrical isolation from external environment
- Low power consumption due to high-speed bipolar technology
- Only one external resistor (10 KΩ) required to set coaxial signaling current
- On-chip jabber timer function
- On-chip heartbeat function
- Open detector monitors coaxial cable connection state (20-pin PLCC only)
- On-chip reference voltage for accurate detection of a packet collision in receive mode
- Squelch circuit prevents malfunction due to noise in received signal
- Standard 16-pin DIP and 20-pin PLCC with special lead frames to reduce die operating temperature
- Power-on reset circuit prevents glitches in coaxial cable during power-up

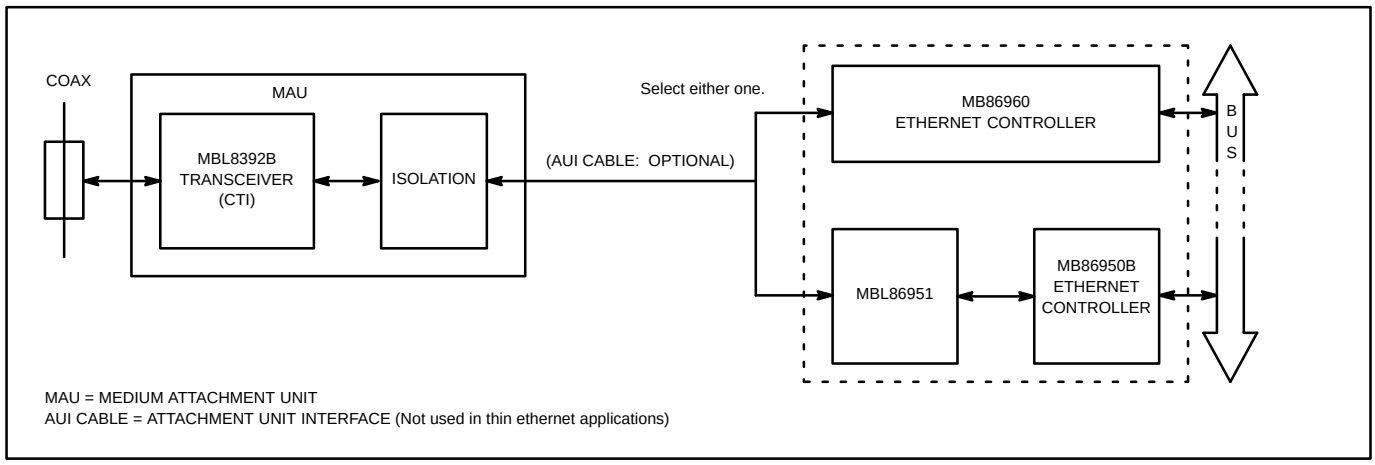
PIN ASSIGNMENT



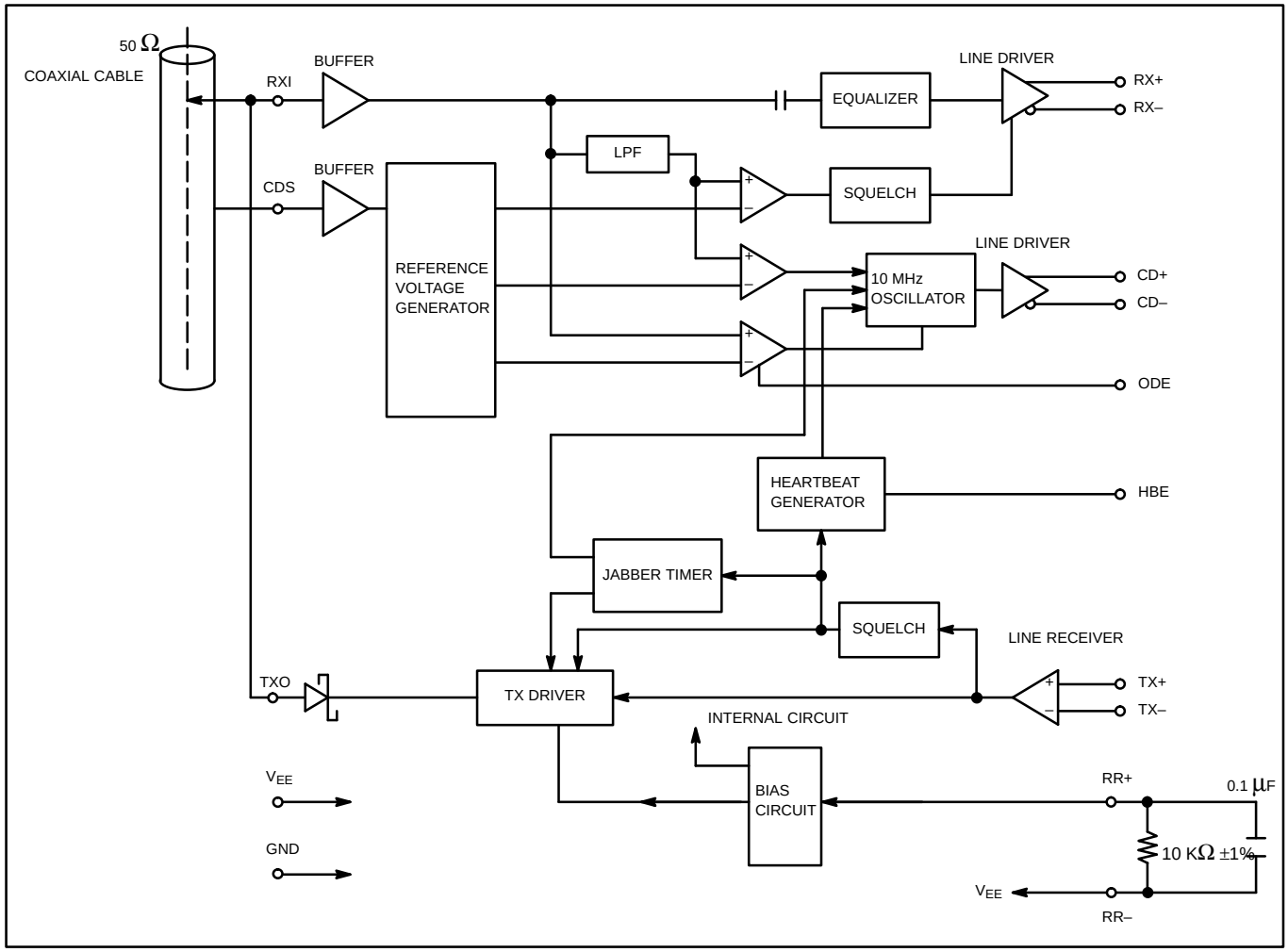
PIN DESCRIPTION

Pin No.		Symbol	I/O	Description
DIP	PLCC			
1 2	2 3	CD+ CD–	O	**COLLISION OUTPUTS:** These are balanced differential line driver outputs that send a 10 MHz oscillation signal to the DTE in the event of a packet collision, jabber interrupt, or heartbeat test.
3 6	4 8	RX+ RX–	O	**RECEIVER OUTPUTS:** These are balanced differential line driver outputs that send the received signal to the DTE.
7 8	9 10	TX+ TX–	I	**TRANSMITTER INPUTS:** These are balanced differential line receiver inputs that accept the transmission signal from the DTE and apply it to the coaxial cable at TXO.
9	12	HBE	I	**HEARTBEAT ENABLE:** The heartbeat function is disabled when this pin is connected to V_{EE}, and is enabled when this pin is connected to GND or left floating.
11 12	14 15	RR+ RR–	I	**EXTERNAL RESISTOR:** A 10 KΩ resistor connected between these pins sets the signaling current at TXO. RR– is connected internally to V_{EE}.
14	18	RXI	I	**RECEIVER INPUT:** This pin is connected directly to the coaxial cable. Received signals are equalized, amplified, and sent to the DTE through the RX$\pm$ pins.
15	19	TXO	O	**TRANSMITTER OUTPUT:** This pin is connected directly (Thin Ethernet) or through an external isolating diode (Ethernet) to the coaxial cable.
16	20	CDS	I	**COLLISION DETECT SENSE:** This is the ground sense connection for the collision detector. This pin should be connected directly to the coaxial cable shield to stop ground drops affecting the collision threshold voltage.
—	1	ODE	I	**OPEN DETECT ENABLE:** The open detection function is enabled when this pin is connected to GND, and is disabled when this pin is connected to V_{EE} or is floating.
10	11, 13	GND	—	**GROUND PINS:** Positive supply pins
4, 5, 13	5, 6, 7, 16, 17	V_{EE}	—	**NEGATIVE SUPPLY PINS:** These pins also serve as heat conductors transmitting heat from the die. They should be connected to a large area of metal on the PCB.

SYSTEM DIAGRAM



BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION

The MBL8392B contains five main functional blocks. These are:

1. Receiver Functions

The receiver receives data from the coaxial cable and sends it to the DTE. It consists of the following five circuits.

- Input buffer
  This buffer has a high input resistance and a low input capacitance to minimize load and coaxial-cable reflections.
- Equalizer
  This equalizer contains a high pass filter that compensates for the low pass filter effect of the coaxial cable and minimizes signal distortion for all signal frequencies.
- 4-pole Bessel low pass filter
  This filter extracts the average DC voltage level of received signals which will be the reference voltage for the receiver squelch circuit and collision detector.
- Squelch circuit
  This circuit stops noise on the coaxial cable falsely triggering the receiver in the absence of a true signal (idle state). At the beginning of the received packet, the receiver turns on when the DC level from the low pass filter is lower than the DC squelch threshold. This takes less than 500 ns (or 5 bits) for normal signal levels.
- Differential line driver
  This driver supplies ±900 mV (typical) differential signals to the DTE with 5 ns (typical) rise and fall times. In the idle state, the driver outputs (RX±) supply an offset voltage of less than 40 mV to minimize direct current in the pulse transformer and prevent the connected transformer from becoming saturated. The RX± outputs are emitter followers and require 500 Ω pull-down resistors to $V_{EE.}$ for Ethernet applications where they drive a 78 Ω differential transmission cable. For Thin Ethernet applications, where the AUI cable is not used, the pull-down resistors can be increased to 1.5 KΩ to reduce power consumption. Remove the resistance terminator that is provided for the second transformer, when the pull–down resistance is increased from 500Ω.

2. Transmitter Functions

The transmitter receives data from the DTE and sends it to the coaxial cable. It has differential inputs and an open-collector-current driver output. The differential-input common-mode bias circuit is built-in so no external bias is required. Controlled output rise and fall times of 25 ns (±5) minimize higher harmonics in the transmitted wave. To minimize signal jitter the difference between these rise and fall times is typically less than 1 ns. The transmitter drive current levels are set by an on-chip bandgap reference voltage and a 10 KΩ external resistor (1% accuracy). Diodes are arranged in series on-chip to reduce the transmitter load capacitance. The transmitter outputs satisfy the load capacitance specifications in the IEEE 802.3 standard. No extra external diode is required, for Thin Ethernet applications. An external diode should be added to reduce load capacitance for Ethernet applications.

The transmitter squelch circuit ensures that the transmitter can be enabled when the differential input signal level is 225 mV (typical) and the pulse width is more than 25 ns (typical). The transmitter is disabled at the end when the level is less than 225 mV (typical) and the width is more than 250 ns (typical).

3. Collision Functions

The collision function notifies the DTE of any packet collisions on the coaxial cable and tests the collision detector at the end of each transmission. The collision detector detects collisions between packets from any two stations on the network, irrespective of whether or not the DTE is producing the colliding packet. This collision detection function conforms to the IEEE 802.3 standard for both repeater and non-repeater nodes.

The collision detector consists of a 4-pole Bessel low pass filter, a comparator, a reference voltage generator that sets the collision threshold, a heartbeat generator, 10 MHz oscillator, and a differential line driver.

The collision comparator monitors the DC level at the output of the low pass filter and enables the line driver if the level falls below the collision threshold. A collision is signaled to the DTE by a 10 MHz oscillation signal at the CD± outputs within 900 ns after the collision.

The collision signal starts with a Low pulse and ends with a continuous idle state of longer than 400 ns.

A collision is detected at a level of less than –1.52 V (typical). However, when the open detection function is active in the standard 20-pin PLCC, a collision is detected over a range of –1.52 V to – 5 V (typical).

The heartbeat generator generates a pseudo-collision (heartbeat) through the differential driver outputs (CD±) at the end of each transmission to ensure that the collision detector is functioning properly. The heartbeat is generated about 800 ns after the end of the transmission so that a burst is generated continuously for about 800 ns. The heartbeat function can be disabled externally by connecting the HBE input pin to V_{EE}. so the CTI can be used in repeater applications. The collision outputs (CD±), like recieve outputs, also require pull-down resistors (500 Ω) to V_{EE} and supply an offset voltage of less than 40 mV in the idle state to prevent saturation by the pulse transformers.

4. Jabber Functions

The jabber function disables the transmitter when a data packet is longer than the length specified in the IEEE 802.3 standard. The jabber timer monitors the data packet length and signals the collision outputs to disable transmission when a data packet is longer than 30 ms (typical). The jabber circuit continues to generate a burst for 400 ms (unjab time) after the end of data transmission and the transmitter becomes enabled after the unjab time.

5. Open Detect Functions

The PLCC20 package has Ethernet and Thin Ethernet on one PCB. The coaxial cable open detect function minimizes line switching under control of one DTE. At disconnection from the coaxial cable, one CTI enters the idle state and the other is unaffected. (The open detector is activated when the RXI input voltage falls below about –5 V. The RXI input voltage automatically falls below –5 V when the coaxial cable is disconnected from the CTI.) During power-up, when the coaxial cable is disconnected from the CTI the open detector generates a burst to the collision outputs for 30 ms (typical); when the coaxial cable is connected, the open detector generates a burst to the collision outputs for about 400 ms. Immediately after the coaxial cable is connected, the detector notifies the DTE that communication is disabled. During random transfer, when TXO output is open a burst for 30 ms is shorten. When TXO output is connected while repeating transfer in a short cycle, a burst for 400 ms is generated continuously. In this case, stopping transfer causes stopping burst generation. The open detect function is enabled when the ODE pin is connected to GND, and is disabled when the ODE pin is connected to OPEN or V_{EE}. This function is available only in the standard 20-pin PLCC.

Ethernet and Thin Ethernet media cannot be used simultaneously.

DETECTION OF COAXIAL CABLE FAULTS

The MBL8392B has no internal loopback path from the transmitter inputs (TX±) to the receiver outputs (RX±).

However, the transmit data is output as the received signal to the receiver outputs when the DTE is transmitting. If a short-circuit fault occurs between the CTI and cable connector, no transmit data is output to the receiver outputs. Therefore, the DTE can detect this fault in a similar to loopback. If the open detect function is inactive due to an open fault, a continuous collision signal is sent to the DTE so it can detect the open fault. If the open detect function is active, as with a short-circuit fault, no transmit data is output to the receiver outputs. Therefore, the DTE can detect a line fault.

If a short-circuit or open fault occurs in the coaxial cable, mismatched impedance reflections can be monitored to determine the distance of the fault from the CTI.

However, other methods are required to analyze cable faults

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit
Supply Voltage*1	V_{EE}	–12	V
Input Voltage*1	V_{IN}	0 to V_{EE}	V
Storage Temperature	T_{STG}	–55 to +125	°C
Junction Temperature*2	T_J	+125	°C
Thermal Resistance of Package	θ_{JA} (PLCC20)	+70	°C/W
	θ_{JA} (DIP16)	+65	°C/W

*1 Values when Vcc = 0 V

*2 The junction temperature is calculated from the following expression:

$T_J = T_a + \theta_{JA} \{[-V_{EE} \times I_{EE} + (-V_{EE} - 1.8) \times 0.045 \times n] + 4 \times 2.4 \times (-V_{EE} - 2.4)/R\}$

T_a = Ambient temperature (°C)

θ_{JA} = Thermal resistance of package (°C/W)

V_{EE} = Supply voltage (V)

I_{EE} = Supply current (A) (Receiving)

n = Percentage transmitter duty cycle

R = Pull-down resistors connected to RX and CD pins (Ω)

Note: Permanent device damage may occur if the above Absolute Maximum Ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

The package is designed to have low thermal resistance by connecting pins 4, 5, 12, and 13 of the 16-pin DIP, and pins 5, 6, 7, 15, 16, and 17 of the 20-pin PLCC to the die. These pins serve as heat conductors and should be connected to a large area of metal on the PCB.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Rating	Unit
Supply Voltage*	V_{EE}	–9.0 ±5%	V
Input Voltage (CDS Pin)*	V_{IN1}	+0.5 to –0.5	V
Input Voltage (RXI, HBE, ODE Pins)*	V_{IN2}	0 to V_{EE}	V
Input Voltage (TX± Pin)*	V_{IN3}	–3.5 to –7.0	V
Operating Temperature	T_{OP}	0 to 70	°C

*Values when Vcc = 0 V

ELECTRICAL CHARACTERISTICS

1. DC CHARACTERISTICS

(V_{EE} = –9 V ±5%, Ta = 0° to +70°C)

Parameter	Symbol	Conditions	Standard Value			Unit
			Min.	Typical	Max.	
Power-on Reset Voltage	V_{POR}	—	—	–6.4	—	V
Supply Current (Receiving)	I_{EE}	RX± and CD± pins open	—	–57	–70	mA
Supply Current (Transmitting)		RX± and CD± pins open	—	–102	–115	mA
Receiver Input Current	I_{RXI}	V_{RXI} = 0V	–2	—	+25	µA
Cable Sense Input Current	I_{CDS}	V_{CDS} = 0V	—	+2	+6	µA
HBE High level Input Voltage	V_{IH}	—	V_{CC} – 0.4	—	—	V
HBE Low level Input Voltage	V_{IL}	—	—	—	V_{EE} + 0.4	V
HBE High level Input Current	I_{IH}	V_{HBE} = 0V	—	30	500	µA
HBE Low level Input Current	I_{IL}	V_{HBE} = V_{EE}	—	–110	–1000	µA
Transmitter Output DC current Level*1	I_{TDC}	—	–37	—	–45	mA
Transmitter Output AC current Level*1	I_{TAC}	—	±28	—	±I_{TDC}	mA
Transmit Current	I_{TX10}	V_{TXO} = –10V	–250	—	+250	µA
Transmitter Output Voltage Compliance*2	V_{TCOM}	—	—	—	–3.7	V
Collision Threshold*3	V_{CD}	Measured by applying DC voltage	–1450	–1520	–1580	mV
Differential Output Voltage (Operation)*4 (RX+, CD+)	V_{OD}	—	±600	—	±1200	mV
Differential Output Voltage Balance*5 (RX±, CD±)	V_{OB}	—	—	—	±40	mV
Differential Common Output Voltage (RX±, CD±)	V_{OC}	—	–2.0	–2.5	–3.0	V
Receiver Input Squelch Voltage	V_{RS}	Average DC voltage of V_{RXI}	—	–550	—	mV
Transmitter Input Squelch Input	V_{TS}	(V_{TX}+ – V_{TX}–) peak	–160	–225	–300	mV
Receiver Input Resistance	R_{RXI}	—	100	—	—	KΩ
Receiver Input Capacitance	C_{RXI}	—	—	—	2	pF
Transmitter Output Resistance	R_{TXO}	—	—	100	—	KΩ

*1 I_{TDC} and I_{TAC} are measured as (V_{MAX} + V_{MIN})/(2x25) and (V_{MAX} – V_{MIN})/(2x25), where V_{MAX} and V_{MIN} are the maximum and minimum voltages, respectively, at TXO with a 25 Ω load between TXO and GND.

*2 The TXO pin may keep electrical current at less than the minimum value of I_{TDC} when the idle (no signal) voltage is –3.7 V.

*3 The Collision threshold for an AC signal is within 10% of V_{CD}.

*4 Measured on secondary side of pulse transformer as shown in Connection Diagram-1. The transformer has a 1:1 turn ratio with an inductance between 30 and 100 µH at 5 MHz.

*5 Differential voltage between RX± pins or CD± pins with transformer removed

Notes:

1. No external diode is connected to the TXO pin. All typical values are for V_{EE} = –9 V and Ta = +25°C.
2. Currents flowing into device pins are positive. All voltages are referenced to ground unless otherwise specified.

2. AC CHARACTERISTICS

(1) Transmitter Timing

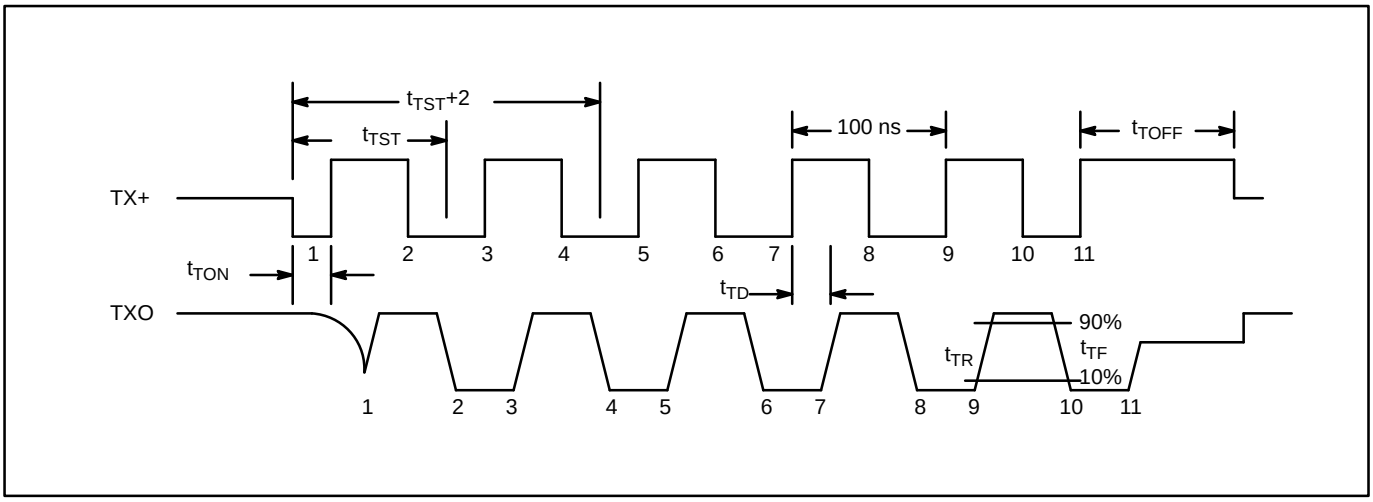
(V_{EE} = –9 V ±5%, Ta = 0° to +70°C)

Parameter	Symbol	Conditions	Limits Value			Unit
			Min.	Typical	Max.	
Start-up Delay Time TX± to TXO	t_{TST}	V_{TX}± = 1 V_{peak}	—	1	2	bits
First Validly Timed Bit		—	—	—	t_{TST} + 2	bits
Delay Time TX± to TXO	t_{TD}	V_{TX}± = 1 V_{peak}	—	40	50	ns
Transmitter Output Rise Time	t_{TR}	10% –90%	20	25	30	ns
Transmitter Output Fall Time	t_{TF}	10% –90%	20	25	30	ns
t_{TR} – t_{TF} Difference	t_{TM*1}	—	—	±1	—	ns
Transmitter Skew	t_{TS*2}	—	—	±1	—	ns
Transmitter Turn-on Pulse Width	t_{TON}	V_{TX}± = 1 V_{peak}	40	—	—	ns
Transmitter Turn-off Pulse Width	t_{TOFF}	V_{TX}± = 1 V_{peak}	160	250	340	ns

*1 Difference between rise and fall times (calculated value)

*2 Difference in delay time between rising and falling edges (calculated value)

Note: No external diode is connected to the TXO pin. All typical values are for V_{EE} = –9 V and Ta = +25°C.



(2) Receiver Timing

(V_{EE} = –9 V ±5%, Ta = 0° to +70°C)

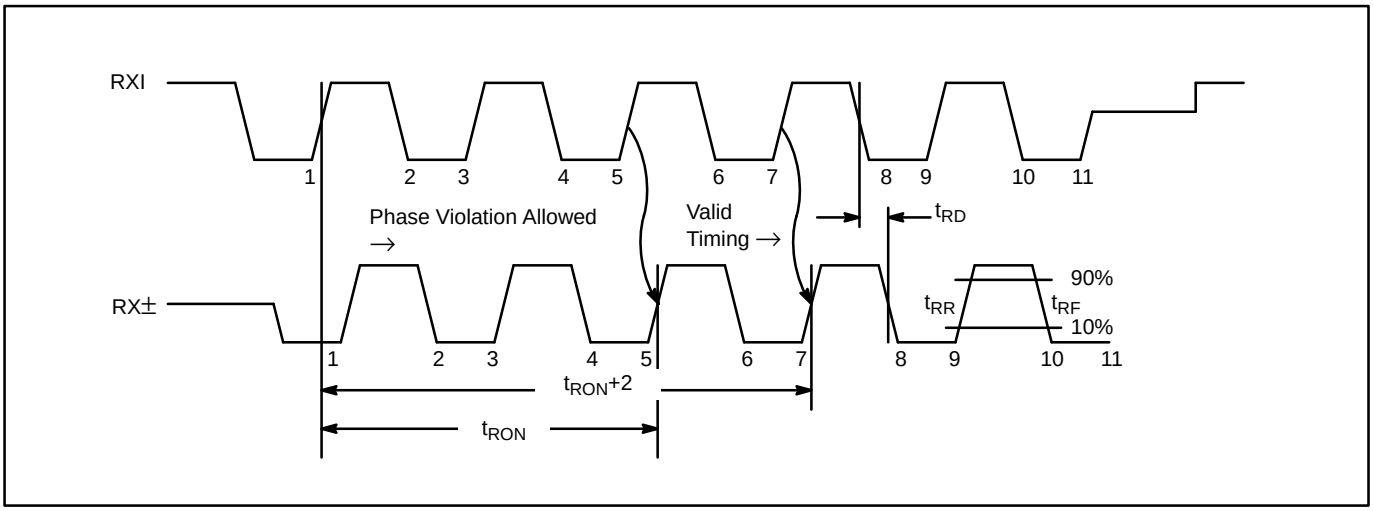
Parameter	Symbol	Conditions	Limits Value			Unit
			Min.	Typical	Max.	
Start-up Delay Time RXI to RX±	t_{RON}	V_{RXI} = –2 V_{peak}	—	—	5	bits
First Validly Timed Bit		—	—	—	t_{RON} + 2	bits
Delay Time RXI to RX±	t_{RD}	V_{RXI} = –2 V_{peak}	—	35	50	ns
Differential Output Settling Time to VOB → 40 mV (RX±, CD±)*1	t_{OS}	—	200	500	—	ns
Receiver Output High to Idle Time*1	t_{RHI}	Measured to +210 mV	200	—	850	ns
Differential Output Rise Time (RX±, CD±)*1	t_{RR}	—	—	5	—	ns
Differential Output Fall Time (RX±, CD±)*1	t_{RF}	—	—	5	—	ns
Differential Output Rise and Fall Matching t_{RR} – t_{RF} Difference*2	t_{RM}	t_{RR} – t_{RF}	—	±1	—	ns

*1 Measured on secondary side of pulse transformer as shown in Connection Diagram-1. The transformer has a 1:1 turn ratio with an inductance between 30 and 100 µH at 5 MHz.

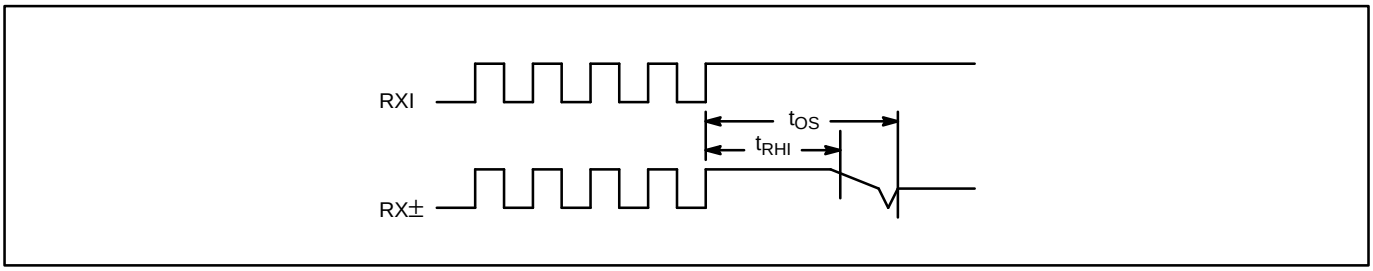
*2 Difference between rise and fall times (calculated value)

Note: All typical values are for V_{EE} = –9 V and Ta = +25°C.

Receiver Start-of-Packet Timing



Receiver End-of-Packet Timing



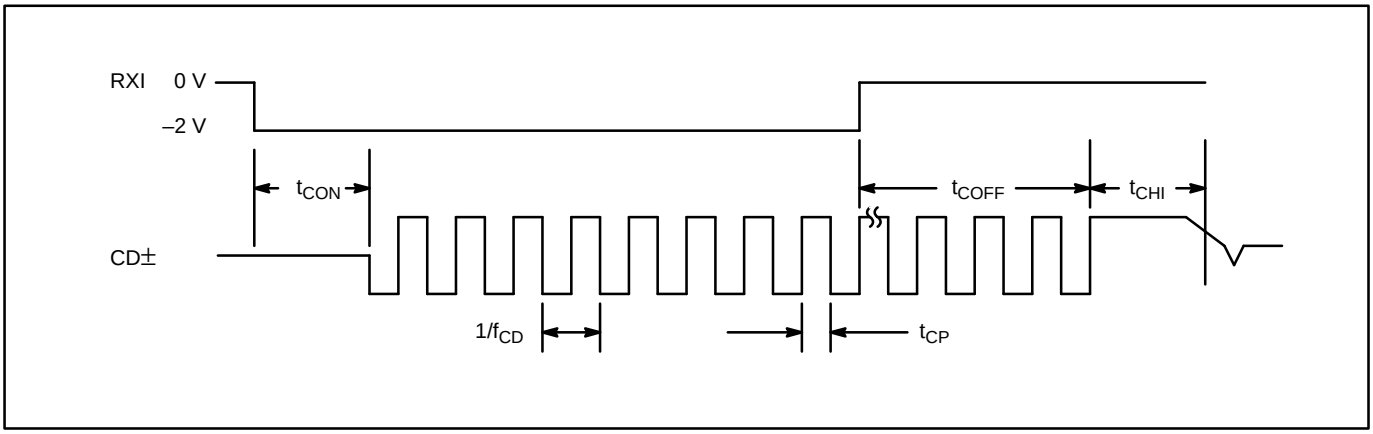
(3) Collision Timing

(V_{EE} = –9 V ±5%, Ta = 0° to +70°C)

Parameter	Symbol	Conditions	Limits Value			Unit
			Min.	Typical	Max.	
Collision Turn-on Delay	t_{CON}	0 V to – 2 V step at RXI	—	7	9	bits
Collision Turn-off Delay	t_{COFF}	–2 V to 0 V step at RXI	—	4	20	bits
Collision Output High-to-Idle Time	t_{CHI}	Measured to +210 mV	200	—	850	ns
Collision Frequency	f_{CD}	—	8.0	10	12.5	MHz
Collision Output Pulse Width	t_{CP}	—	40	—	60	%

* Measured on secondary side of pulse transformer as shown in Connection Diagram-1. The transformer has a 1:1 turn ratio with an inductance between 30 and 100 µH at 5 MHz.

Note: All typical values are for V_{EE} = –9 V and Ta = +25°C.

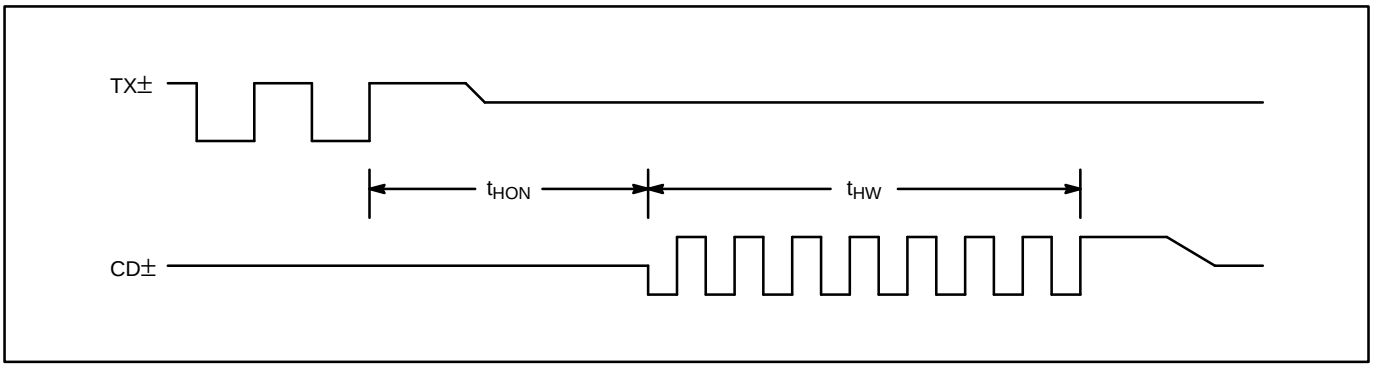


(4) Heartbeat Timing

(V_{EE} = –9 V ±5%, Ta = 0° to +70°C)

Parameter	Symbol	Conditions	Limits Value			Unit
			Min.	Typical	Max.	
Heartbeat Turn-on Delay	t_{HON}	TX± to CD±	0.6	—	1.6	µs
Heartbeat Test Duration	t_{HW}	CD±	0.5	—	1.5	µs

Note: All typical values are for V_{EE} = –9 V and Ta = +25°C.

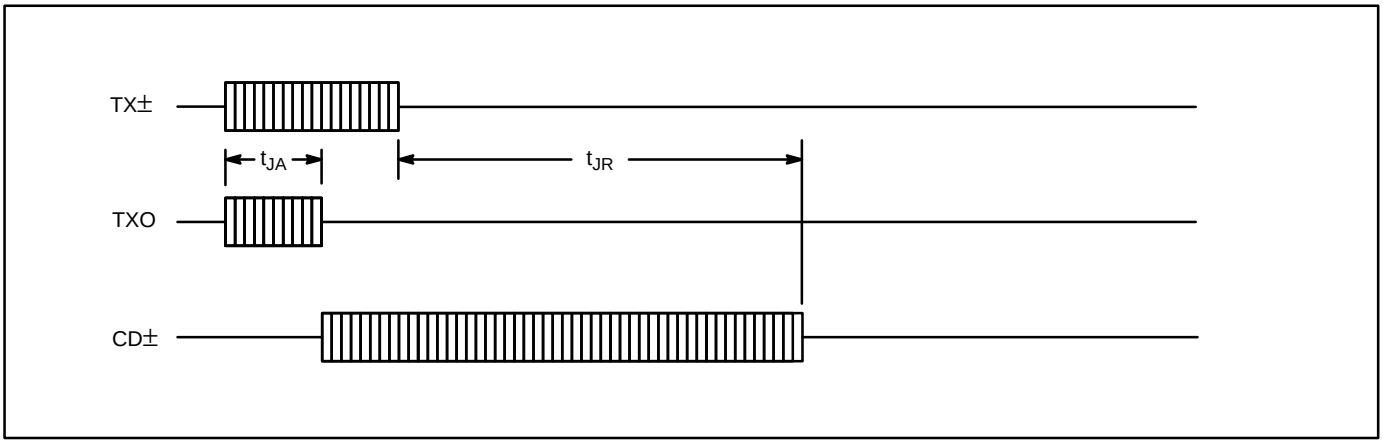


(5) Jabber Timing

(V_{EE} = –9 V ±5%, Ta = 0° to +70°C)

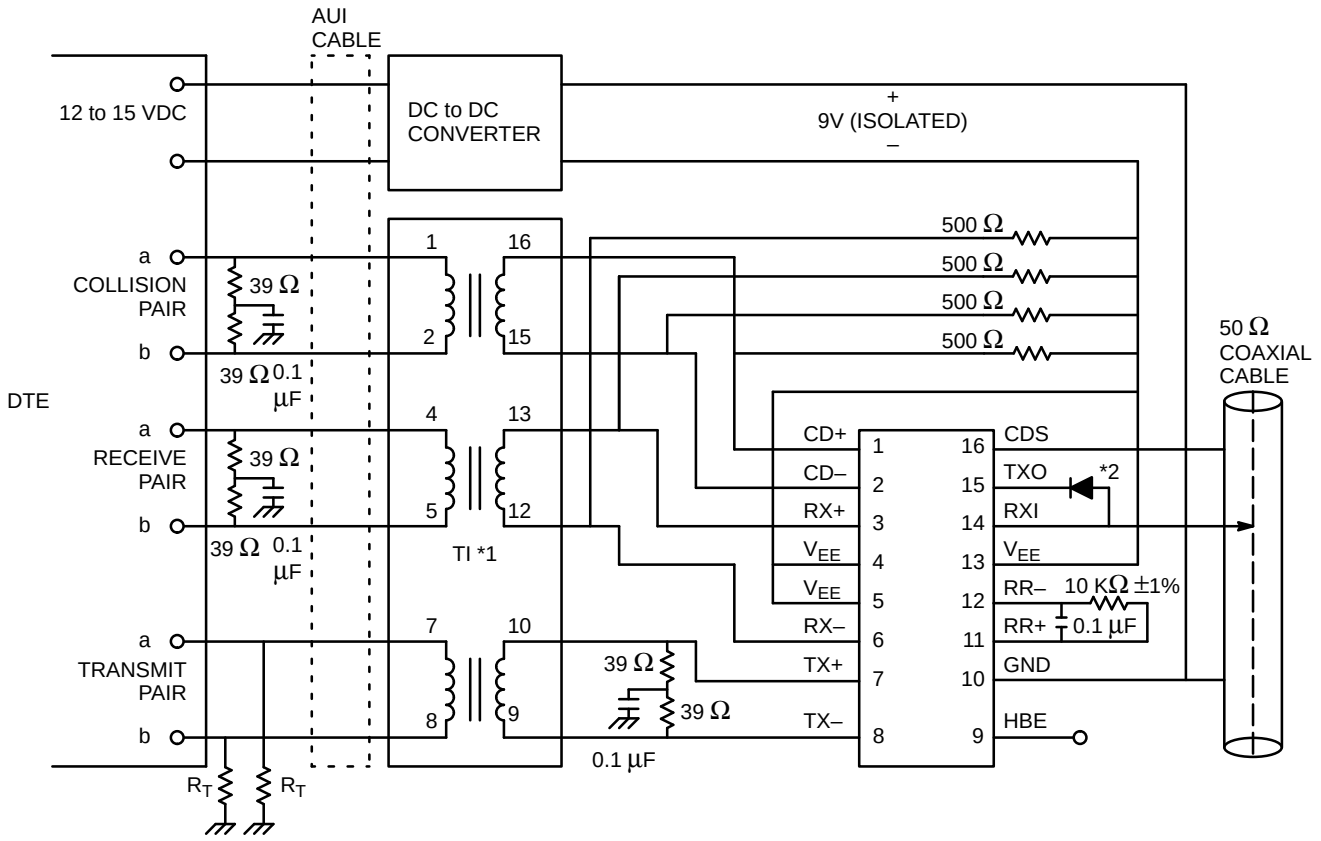
Parameter	Symbol	Conditions	Limits Value			Unit
			Min.	Typical	Max.	
Jabber Activation Time	t_{JA}	TX± to CD±	20	30	60	ms
Jabber Reset Time	t_{JR}	TX± to CD±	250	400	750	ms

Note: All typical values are for V_{EE} = –9 V and Ta = +25°C.



APPLICATION CIRCUIT

Connection Diagram-1 10Base5 16-pin DIP Package (Without Open Detect Function)



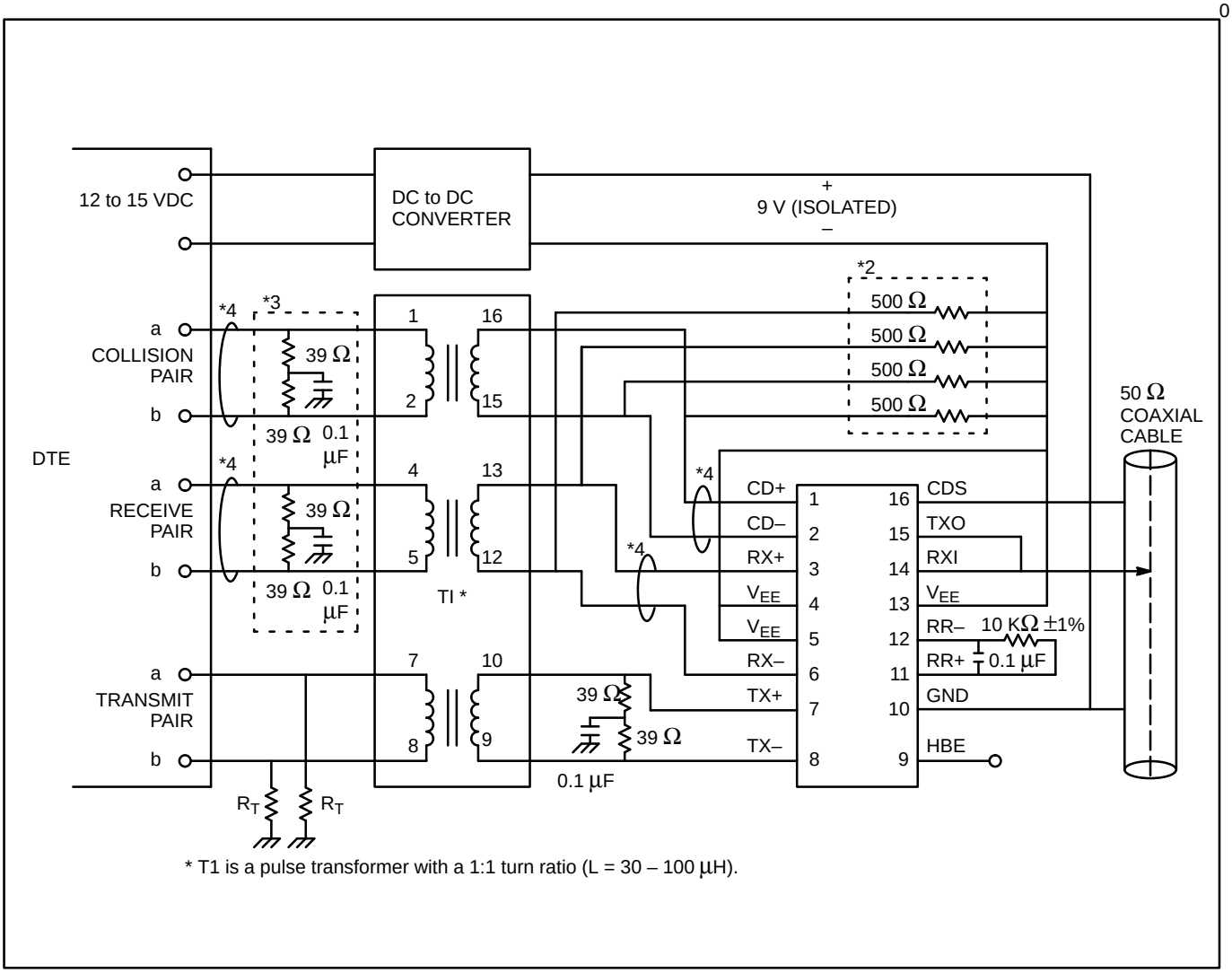
*1 T1 is a pulse transformer with a 1:1 turn ratio (L = 30 – 100 μH).

*2 1N916 or equivalent for Ethernet–not required for Thin Ethernet

Notes:

1. Open or connect the ODE pin to V_{EE} when configuring the above circuit for the PLCC20 package.
2. RT (Resistance Terminator) in the above figure indicates pull-down resistors for the encoder/decoder transmit output. (See the data sheet for the encoder/decoder used for the resistance values.)
3. The two 39-Ω resistors in series between the collision and receive pairs are a resistance terminator for the transmission line. This resistor installation is not required when a resistance terminator is provided for the encoder/decoder. (See the data sheet for the encoder/decoder used.)
4. When connecting the MBL8392B to Fujitsu encoder/decoders or controllers with encoder/decoders, refer to the table on page 17.

Connection Diagram-2 10Base2 16-pin DIP Package (Without Open Detect Function)



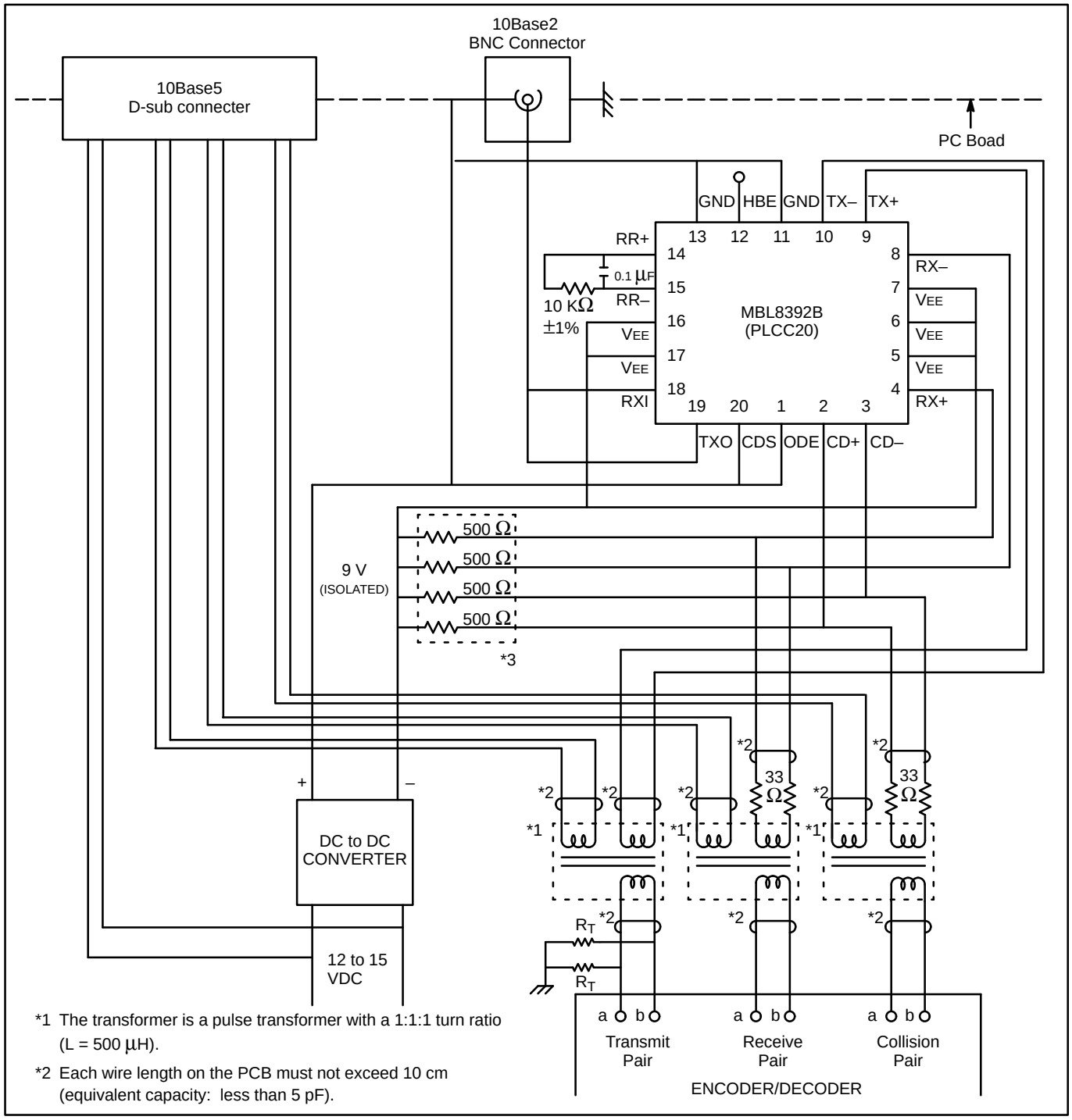
* T1 is a pulse transformer with a 1:1 turn ratio (L = 30 – 100 µH).

Notes:

1. Remove the resistance terminator enclosed by the dotted line (*3) in the above figure to increase the pull-down resistance enclosed by the dotted line (*2) to lower the power consumption. The pull–down resistance can be increased up to 1.5 KΩ. In this case, shorten the wire at the collision and receive pairs (*4) to less than 10 cm.
2. Open or connect the ODE pin to V_{EE} when configuring the above circuit for the PLCC20 package.
3. RT (Resistance Terminator) in the above figure indicates pull-down resistors for the encoder/decoder transmit output. (See the data sheet for the encoder/decoder used for the resistance values.)
4. The two 39-Ω resistors in series between the collision and receive pairs are a resistance terminator for the transmission line. However, if a resistance terminator is provided for the encoder/decoder, this resistor installation is not required.

   (See the data sheet for the encoder/decoder used.) In this case, the pull-down resistance (*2) cannot be increased.
5. When connecting the MBL8392B to Fujitsu encoder/decoders or controllers with encoder/decoders, refer to the table on page 17.

Connection Diagram-3 10BASE5 and 10BASE2 Integrated (1) (With Open Detect Function)



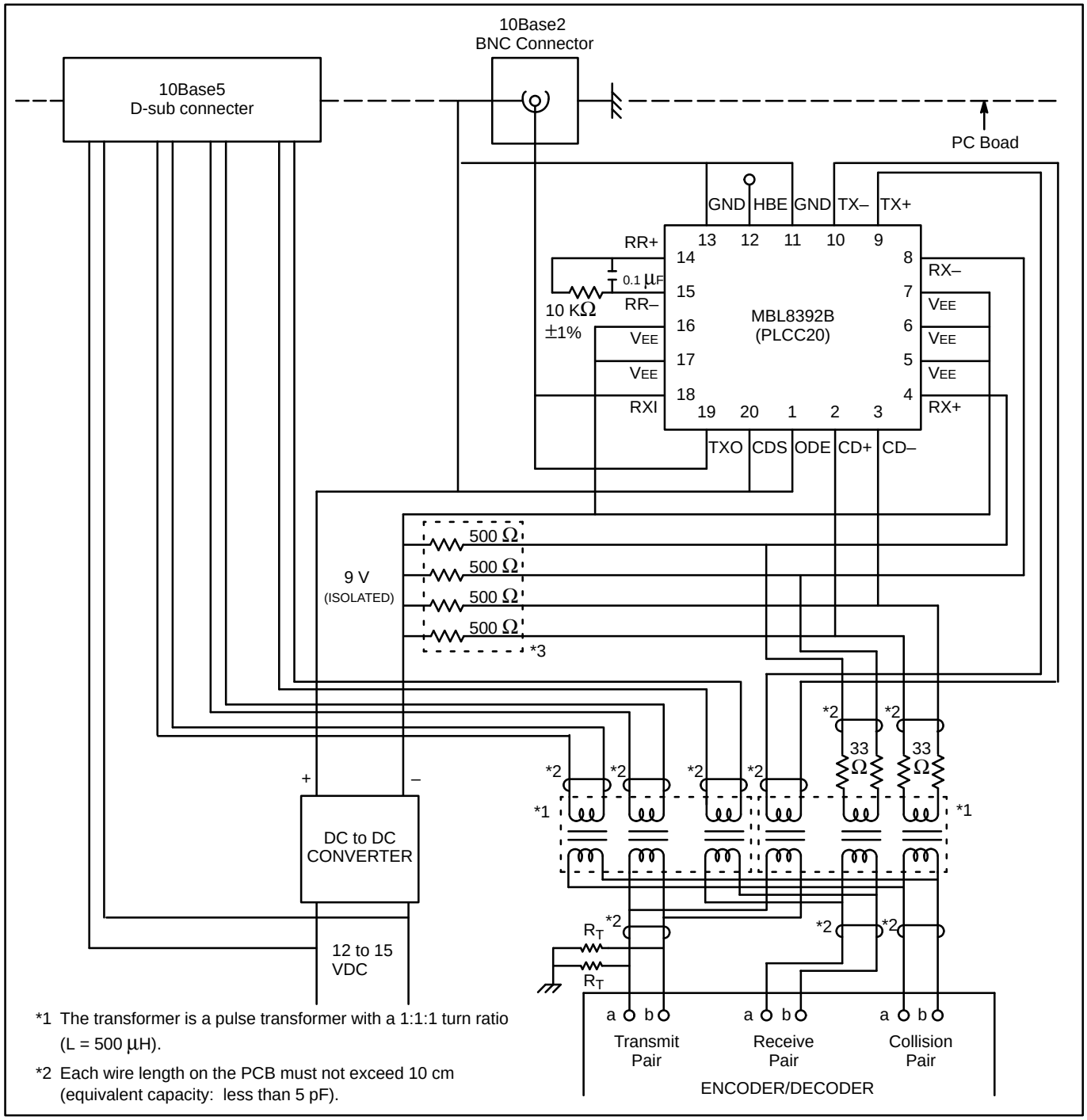
*1 The transformer is a pulse transformer with a 1:1:1 turn ratio (L = 500 µH).

*2 Each wire length on the PCB must not exceed 10 cm (equivalent capacity: less than 5 pF).

Notes:

1. The pull-down resistance enclosed by the dotted line (*3) in the above figure can be increased up to 1500 Ω to lower power consumption.
2. RT (Resistance Terminator) in the above figure indicates pull-down resistors for the encoder/decoder transmit output. (See the data sheet for the encoder/decoder used for the resistance values.)
3. If a resistance terminator is provided for the encoder/decoder, 10Base 5/2 cannot be used simultaneously.
4. When connecting the MBL8392B to Fujitsu encoder/decoders or controllers with encoder/decoders, refer to the table on page 17.

Connection Diagram-4 10BASE5 and 10BASE2 Integrated (2) (With Open Detect Function)



*1 The transformer is a pulse transformer with a 1:1:1 turn ratio (L = 500 µH).

*2 Each wire length on the PCB must not exceed 10 cm (equivalent capacity: less than 5 pF).

Notes:

1. The pull-down resistance enclosed by the dotted line (*3) in the above figure can be increased up to 1500 Ω to lower power consumption.
2. RT (Resistance Terminator) in the above figure indicates pull-down resistors for the encoder/decoder transmit output. (See the data sheet for the encoder/decoder used for the resistance values.)
3. If a resistance terminator is provided for the encoder/decoder, 10Base 5/2 cannot be used simultaneously.
4. When connecting the MBL8392B to Fujitsu encoder/decoders or controllers with encoder/decoders, refer to the table on page 17.

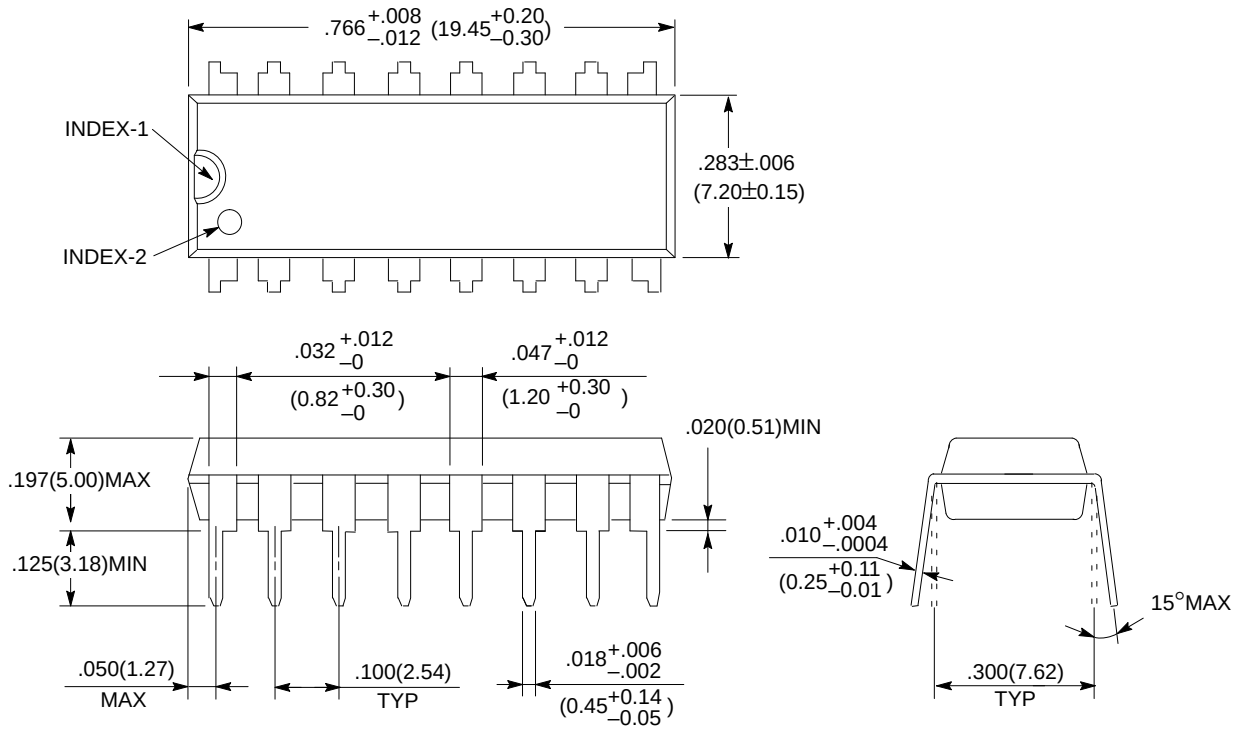
When connecting the MBL8392B to Fujitsu encoder/decoders or controllers with encoder/decoders, connect the collision, receive, and transmit pairs shown on pages 13 to 16 to the following pins of each IC circuit.

	Pin name	MB86965A (MB86964)	MB86961	MB86960A
Receive pair	a	DIP	DIP	RXDATA+
	b	DIN	DIN	RXDATA–
Collision pair	a	CIP	CIP	COL+
	b	CIN	CIN	COL–
Transmit pair	a	DOP	DOP	TXDATA+
	b	DON	DON	TXDATA–
	R_{T*}	None	None	270 (Ω)

* RT means resistance terminator.

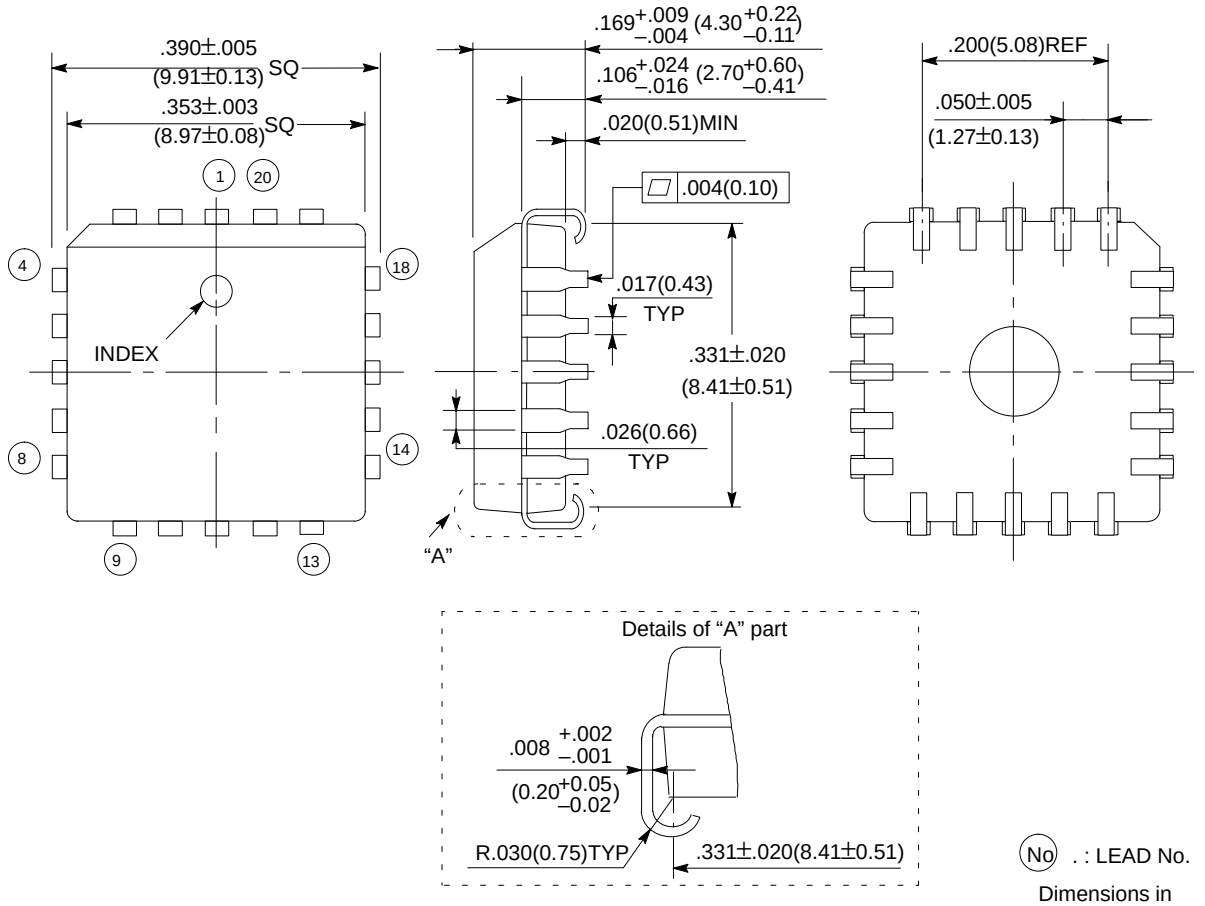
PACKAGE DIMENSIONS

16-LEAD PLASTIC DUAL IN-LINE PACKAGE
(CASE No.: DIP-16P-M05)



Dimensions in
inches (millimeters)

20-LEAD PLASTIC LEADED CHIP CARRIER
(CASE No.: LCC-20P-M02)



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