

Ethernet Coax Transceiver Interface

Features

- **Compliant with IEEE802.3 10BASE5 and 10BASE2**
- **Pin compatible with the popular 8392**
- **Internal squelch circuit to eliminate input noise**
- **Receive/transmit mode collision detect for extended distance**
- **Automatic AUI port isolation when coaxial connector is not present**

- **Low power BiCMOS design**
- **20-Pin PLCC (CY7B8492)**
- **16-Pin DIP or 28-Pin PLCC (CY7B8392)**

Functional Description

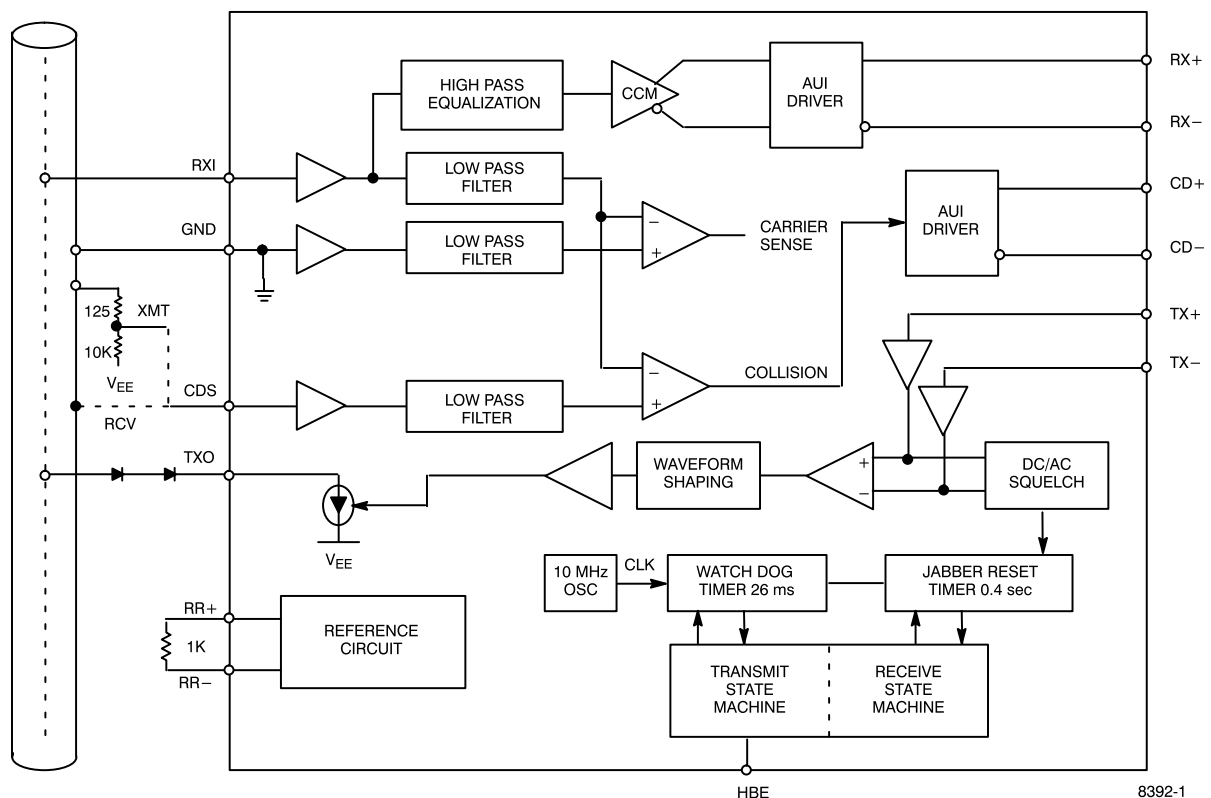
The CY7B8392 is a low power coaxial transceiver for Ethernet 10BASE5 and 10BASE2 applications. The device contains all the circuits required to perform transmit, receive, collision detection,

heartbeat generation, jabber timer and attachment unit interface (AUI) functions. In addition, the 7B8392 can also be used in a transmit collision detect mode.

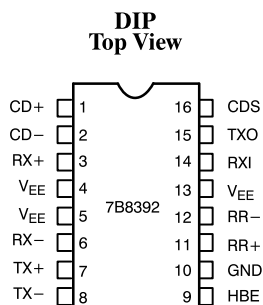
The transmitter output is connected directly to a double terminated 50Ω cable.

The CY7B8392 is fabricated with an advanced low power BiCMOS process. Typical standby current during idle is 25 mA.

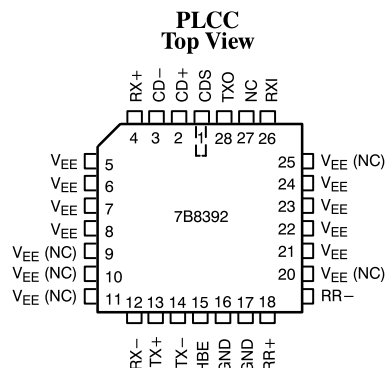
Logic Block Diagram



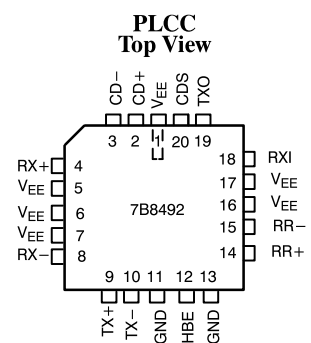
Pin Configurations



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Pin Description

Pin Number			Pin Name	Description
16-Pin DIP	28-Pin PLCC	20-Pin PLCC		
1	2	2	CD+	AUI Collision Output pins. Differential driver that transmit a 10-MHz signal during collision events, jabber and CD Heartbeat conditions. Also referred to as CI port.
2	3	3	CD-	
3	4	4	RX+	AUI Receive Output pins. Differential driver that outputs the signal receive from the line. Also referred to as DI port.
6	12	8	RX-	
7	13	9	TX+	AUI Transmit Input pins. Differential receiver that inputs the signal for transmission onto the cable.
8	14	10	TX-	
9	15	12	HBE	Heartbeat Enable Pin. When this pin is grounded, the heartbeat is enabled. When the pin is connected to V_{EE} , the heartbeat is disabled.
11	18	14	RR+	External Resistor. A 1K 1% resistor should be connected between these pins to establish proper internal operation current.
12	19	15	RR-	
14	26	18	RXI	Receive Input. This pin is connected directly to the coaxial cable.
15	28	19	TXO	Transmitter Output. This pin is connected directly (10BASE2 thin wire) or through a diode to the coaxial cable.
16	1	20	CDS	Collision Detect Sense. Ground sense connection for the collision detect circuit. This pin should be connected separately to the shield to prevent ground drops from altering the receive mode collision detect threshold.
10	16,17	11,13	GND	Positive Power Supply Pin.
4,5,13	5-11, 20-25	1,5-7,16,17	V_{EE}	Negative Power Supply Pin.

CY7B8392 Description

Transmitter

The CY7B8392 transfers Manchester-encoded data from the AUI port of the DTE (TX+ and TX-) to the coaxial cable. The output waveform is wave shaped to meet IEEE 802.3 specifications. For Ethernet compatible applications (10BASE5), an external isolation diode may be added to further reduce the coax load capacitance.

The AUI squelch circuit prevents signals with less than 15 ns pulse width or smaller than 175 mV average DC level from reaching the output driver. The squelch circuit also turns the transmitter off at the end of the packet if the average of the DC level of the signal stays greater than 175 mV for more than 190 ns.

Receiver

The CY7B8392 receiver transfers the serial data from the coaxial cable to the DTE via the balanced differential output (RX+ and RX-). The received signal is amplified and equalized by the on chip equalizer.

The device also contains an internal squelch function that discriminates noise from valid data. A 4-pole Bessel filter is used to extract the DC level of the received signal. If the DC level of the received signal is lower than an internally set squelch threshold, the CY7B8392 receive function will not be activated.

Collision Detection

The collision detection circuit monitors the signal level on the coax cable. This signal voltage level is compared against the collision voltage threshold V_{CD} . When the measured signal level is

more negative than V_{CD} , a collision condition is declared by the CY7B8392 by sending a 10-MHz signal over the CD+/CD- pair.

Long Cable Application

The IEEE 802.3 standard is designed for 500 meters of Ethernet cable and 185 meters of thin coax cable (RG58A/U). To extend the cable segment to 1000 meters and 300 meters of Ethernet cable and thin coaxial cable respectively, transmit collision detection mode is required. The disadvantage of the transmit collision detection mode is that it will detect collision only when the station is transmitting; it will not be able to detect collision of two far-end stations when it is not transmitting. Note that transmit mode collision detection is not allowed in repeater applications.

Implementation of transmit mode collision detection with CY7B8392 is simple. By connecting an external resistor divider to the CDS pin; R1 to 150 ohms and R2 to 10 Kohms, the device is now in transmit collision detection mode.

The CY7B8392 utilizes a combination receive and transmit mode collision detection. When the device is idle it enters into receive collision detection mode, and when it is transmitting it is in the transmit collision detection mode.

Heartbeat Test Function

The Heartbeat Test Function is enabled when the HBE pin is tied to ground. When enabled, a 10-MHz collision signal is transmitted to the MAC over the CD+/CD- pair after the transmission of a packet for $10 \pm 5BT^{[1]}$. The Heartbeat function should be disabled by tying the HBE pin to V_{EE} for repeater applications.

Note:

1. BT = Bit Time = 100 ns.

Jabber Function

The on-chip watchdog timer prevents the DTE from locking up a network by transmitting continuously. When the transmission exceeds the jabber time limit, the Jabber function disables the transmitter and sends a 10-MHz signal over the CD± pair. Once the transmitter is in the jabber state, it must remain in the idle state for 500 ms before it will exit the jabber state.

Auto AUI Selection Function

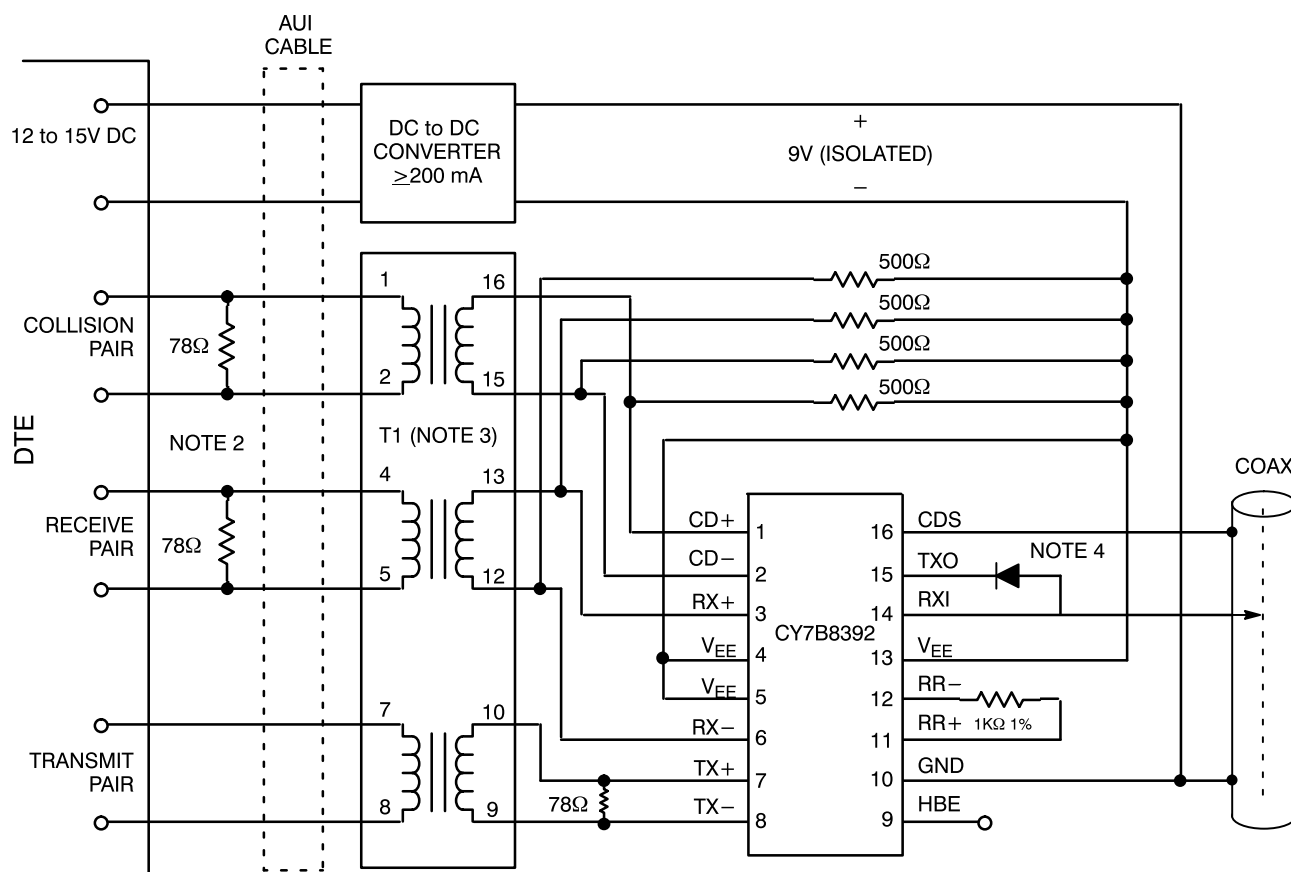
Initially, during power-up the CI and DI ports of the AUI are high impedance. If the RXI port is not connected to a coaxial seg-

ment, the AUI port will remain in high impedance. The AUI port will only be activated when RXI is connected to a coaxial segment.

When the connector is removed from the CY7B8392 (after power-up), a 10-MHz signal is transmitted over the CI circuit for 800 ms with the DI port disabled. After the transmission of the 10-MHz signal, the CI port is disabled.

This function allows multiple MAUs to be connected to a single AUI port without having to turn off the coaxial transceiver manually.

Connection Diagram for Standard CY7B8392 Applications



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Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature -65°C to $+150^{\circ}\text{C}$

Ambient Temperature with

Power Applied -0°C to $+70^{\circ}\text{C}$

Supply Voltage -12V

Input Voltage GND+0.3V to $V_{EE}-0.3V$

Operating Range

Range	Ambient Temperature	V _{EE}
Commercial	0°C to +70°C	−9V ± 5%

Notes:

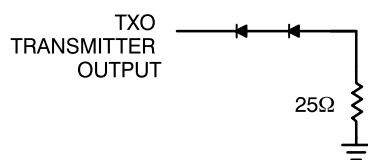
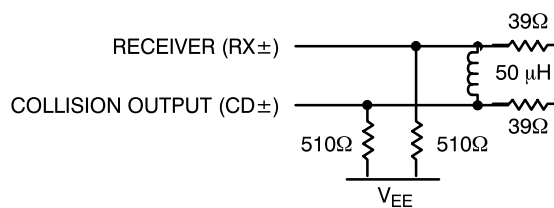
2. 78Ω resistors not required if AUI cable not present.
3. T1 is a 1:1 pulse transformer, with an inductance of 30 to 100 μH.
4. IN916 or equivalent for Ethernet, not required for Thin Ethernet.

Electrical Characteristics Over the Operating Range^[5]

Parameter	Description	Min.	Typ.	Max.	Unit
V_{EE}	Supply Voltage	-8.55	-9.0	-9.45	V
I_{EE1}	(V_{EE} to GND) Non-transmitting		-25	-35	mA
I_{EE2}	(V_{EE} to GND) Transmitting		-70	-80	mA
I_{RXI}	Input Bias Current (RXI pin)	-2		25	μ A
I_{TDC}	Transmitter Output DC Current	37	41	45	mA
I_{TAC}	Transmitter AC Current	± 28			mA
V_{CD}	Collision Threshold	-1.45	-1.53	-1.62	V
V_{CS}	Carrier Sense Threshold	-0.38	-0.45	-0.52	V
RX, C, D	Differential Output Voltage	± 500		± 1500	mV
V_{OC}	Common Mode Voltage ^[6]	-1		-3	V
V_{TS}	Transmitter Squelch Threshold ^[7]	-175	-225	-300	mV
R_{RXI}	Shunt Resistance—Non-transmitting	100			K Ω
T_{TXO}	Shunt Resistance—Transmitting	10			K Ω

Capacitance

Parameter	Description	Test Conditions	Typ.	Unit
C_X	Input Capacitance		1.5	pF

AC Test Loads and Waveforms

(a)

(b)

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Notes:

- Testing is done under test load as defined in AC Test Loads and Waveforms.
- During idle, V_{OC} is pulled down to V_{EE} to minimize the power dissipation across the load resistors connected to $RX\pm$ and $CD\pm$.
- For a minimum pulse width of >40 ns.

Switching Characteristics Over the Operating Range

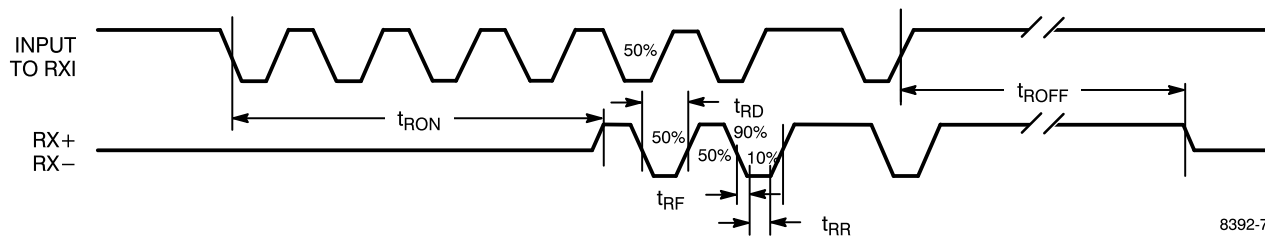
Parameter	Description	Min.	Typ.	Max.	Unit
t_{RON}	Receiver Start-Up Delay		2.5	5	bits
t_{RD}	Receiver Propagation Delay		25	50	ns
t_{RR}	Differential Output Rise Time ($RX\pm$, $CD\pm$)		4	7	ns
t_{RF}	Differential Output Fall Time ($RX\pm$, $CD\pm$)		4	7	ns
t_{RJ}	Receiver and Cable Total Jitter		± 2		ns
t_{TST}	Transmitter Start-Up Delay		1	2	bits
t_{TD}	Transmitter Propagation Delay		25	50	ns
t_{TR}	Transmitter Output Rise Time (TXO)	20	25	30	ns
t_{TF}	Transmitter Fall Time (TXO)	20	25	30	ns
t_{TM}	t_{TR} and t_{TF} Mismatch		± 0.5	± 3	ns
t_{TS}	Transmit Skew (TXO)		± 0.5	± 2	ns
t_{TON}	Transmit Turn-On Pulse Width at V_{TS} ($TX\pm$) ^[8]	10	20	40	ns
t_{TOFF}	Transmit Turn-Off Delay	130	200	300	ns
t_{CON}	Collision Turn-On Delay		7	13	bits
t_{COFF}	Collision Turn-Off Delay			20	bits
f_{CD}	Collision Frequency	8.5	10	12.5	MHz
t_{CD}	Collision Pulse Width	40	50	69	ns
t_{HON}	CD Heartbeat Delay	0.6	1.1	1.6	μs
t_{HW}	CD Heartbeat Duration	0.5	1.0	1.5	μs
t_{JA}	Jabber Activation Delay	20	26	32	ms
t_{JR}	Jabber Reset Time Out	300	420	550	ms

Note:

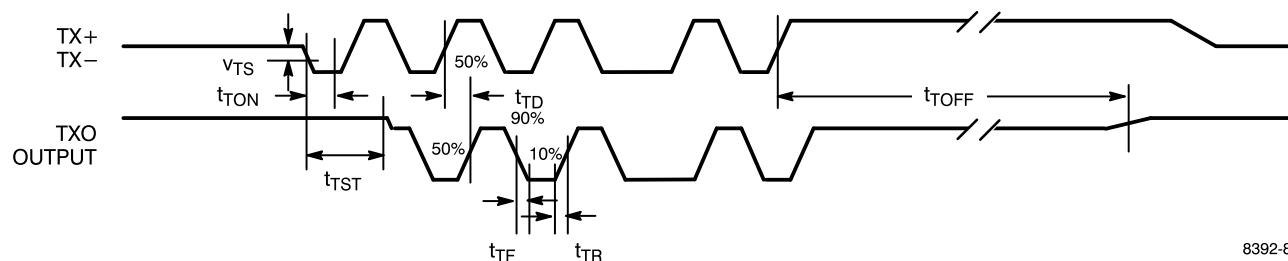
8. For a minimum pulse amplitude of >300 mV.

Switching Waveforms

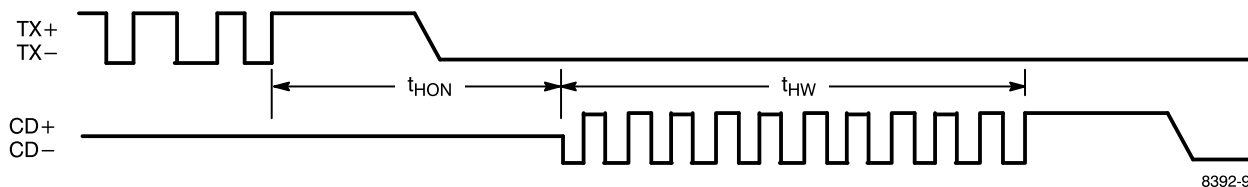
Receiver Timing



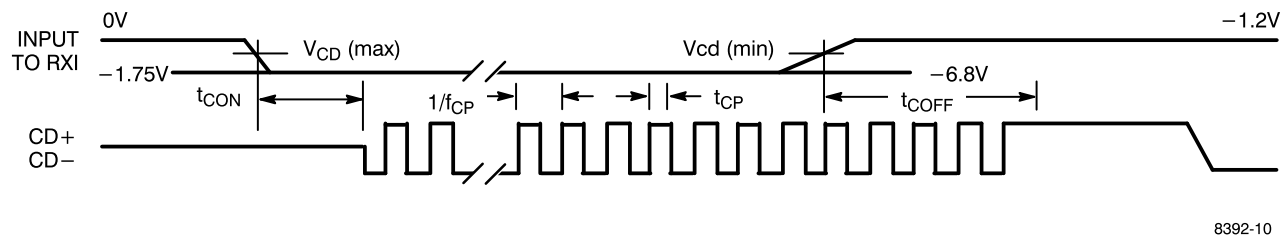
Transmit Timing



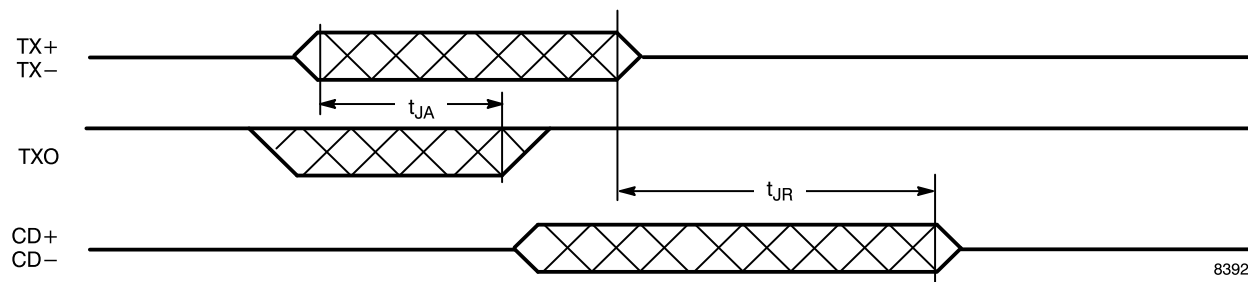
Heartbeat Timing



Collision Timing



Jabber Timing





PRELIMINARY

CY7B8392
CY7B8492

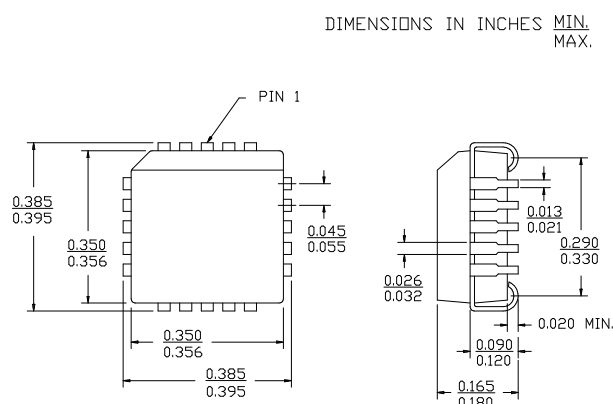
Ordering Information^[9]

Ordering Code	Package Name	Package Type	Operating Range
CY7B8392-JC	J64	28-Lead Plastic Leaded Chip Carrier	Commercial
CY7B8392-PC	P1	16-Lead (300-Mil) Molded DIP	
CY7B8492-JC	J61	20-Lead Plastic Leaded Chip Carrier	

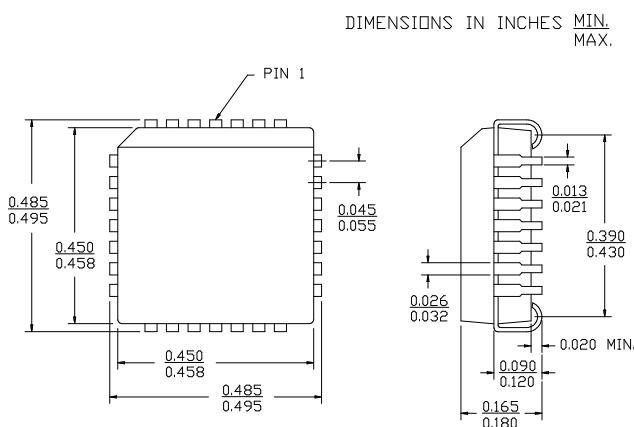
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Package Diagrams

20-Lead Plastic Leaded Chip Carrier J61



28-Lead Plastic Leaded Chip Carrier J64



16-Lead (300-Mil) Molded DIP P1

