2.5V/3.3V, High-Bandwidth, Hot-Insertion, 2-Bit, 2-Port Bus Switch w/ Individual Enables

Features

- Near-Zero propagation delay
- 5Ω switches connect inputs to outputs
- High Bandwidth (>400 MHz)
- Rail-to-Rail, 3.3V or 2.5V Switching
- 5V I/O Tolerant
- 2.5V Supply Voltage Operation
- Permits Hot Insertion
- Packaging (Pb-free & Green):
  – 8-pin 173-mil wide plastic TSSOP
  – 8-pin 118-mil wide plastic MSOP

Applications

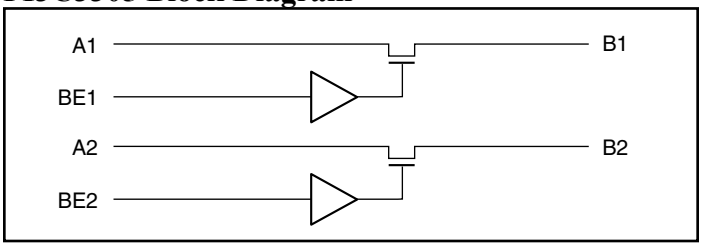
- High Bandwidth Data Switching
- Hot Docking

Description

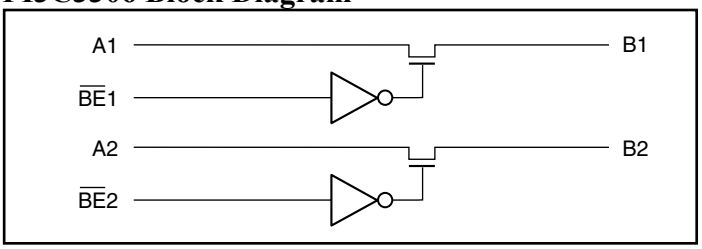
Pericom Semiconductor's PI3C3305 and PI3C3306 are 2.5 volt or 3.3 volt, 2-bit bus switches designed with fast individual enables. When enabled via the associated Bus Enable ($\overline{BE}$) pin, the "A" pin is directly connected to the "B" pin for that particular gate. The bus switch introduces no additional propagation delay or additional ground bounce noise.

The PI3C3306 device has active LOW enables, and the PI3C3305 has active HIGH enables. It is very useful in switching signals that have high bandwidth (>400 MHz).

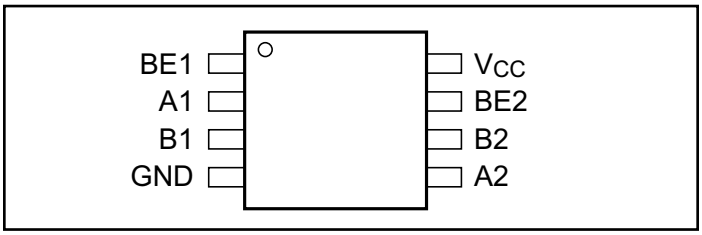
PI3C3305 Block Diagram



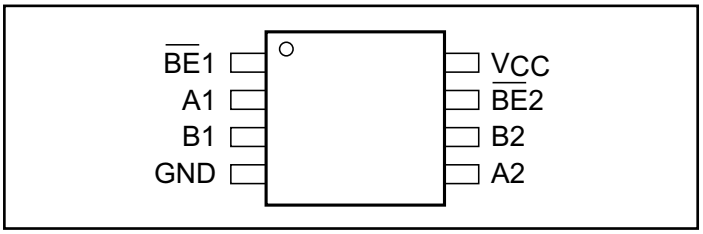
PI3C3306 Block Diagram



PI3C3305 Pin Configuration



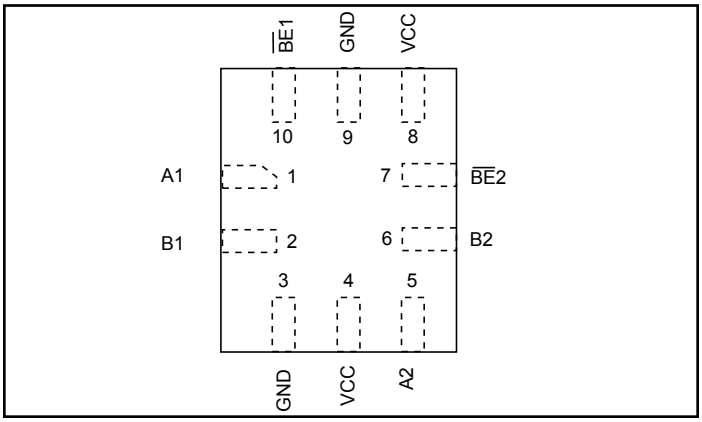
PI3C3306 8-Pin Configuration



Pin Description

Pin Name	Description
BEn	Switch Enable (PI3C3305)
$\overline{BE}$n	Switch Enable (PI3C3306)
A2-A1	Bus A
B2-B1	Bus B
V_{CC}	Power
GND	Ground

PI3C3306 10-Contact Configuration



Truth Table(1)

PI3C3306 $\overline{BE}n$	PI3C3305 BEn	An	Bn	V_{CC}	Function
X	X(2)	Hi-Z	Hi-Z	GND	Disconnect
H	L	Hi-Z	Hi-Z	V_{CC}	Disconnect
L	H	Bn	An	V_{CC}	Connect

Notes:
1. H = High Voltage Level; L = Low Voltage Level; Hi-Z = High Impedance; X = Don't Care
2. A pull-up resistor should be provided for power-up protection.

Maximum Ratings

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

Storage Temperature ..... –65°C to +150°C
Ambient Temperature with Power Applied ..... –40°C to +85°C
Supply Voltage to Ground Potential ..... –0.5V to +4.6V
DC Input Voltage ..... –0.5V to +5.5V
DC Output Current..... 120mA
Power Dissipation 0.5W

Note:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC Electrical Characteristics (Over Operating Range, T_A = –40°C to +85°C, V_{CC} = 3.3V ±10%)

Parameters	Description	Test Conditions(1)	Min.	Typ.(2)	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	2.0			V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level	–0.5		0.8	
I_{IH}	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC}			±1	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND			±1	
I_{OZH}	High Impedance Output Current	0 ≤ A, B ≤ V_{CC}			±1	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		–0.73	–1.2	V
R_{ON}	Switch On Resistance(3)	V_{CC} = Min., V_{IN} = 0.0V, I_{ON} = 48mA or 60mA		5	7	Ω
		V_{CC} = Min., V_{IN} = 2.4V, I_{ON} = 15mA		8	15	

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 3.3V, T_A = 25°C ambient and maximum loading.
3. Measured by the voltage drop between A and B pin at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two (A,B) pins.

Capacitance (T_A = 25°C, f = 1 MHz)

Parameters(1)	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	3.5	pF
C_{OFF}	A/B Capacitance, Switch Off		5.0	
C_{ON}	A/B Capacitance, Switch On		10.0	

Notes:
1. This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions[1]		Min.	Typ.[2]	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}		260	500	µA
ΔI_{CC}	Supply Current per Input HIGH	V_{CC} = Max.	V_{IN} = 3.0V[3]			750	

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V_{CC} = 3.3V, +25°C ambient.
3. Per driven input (control input only); A and B pins do not contribute to ΔI_{CC}.

Switching Characteristics over 3.3V Operating Range

Parameters	Description	Test Conditions[1]	3305/3306 Com		Units
			Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay[2, 3] A to B, B to A	C_L = 50pF R_L = 500Ω		0.25	ns
t_{PZH} t_{PZL}	Bus Enable Time	C_L = 50pF R_L = 500Ω R = 500Ω	1.5	6.5	
t_{PHZ} t_{PLZ}	Bus Disable Time		1.5	5.5	

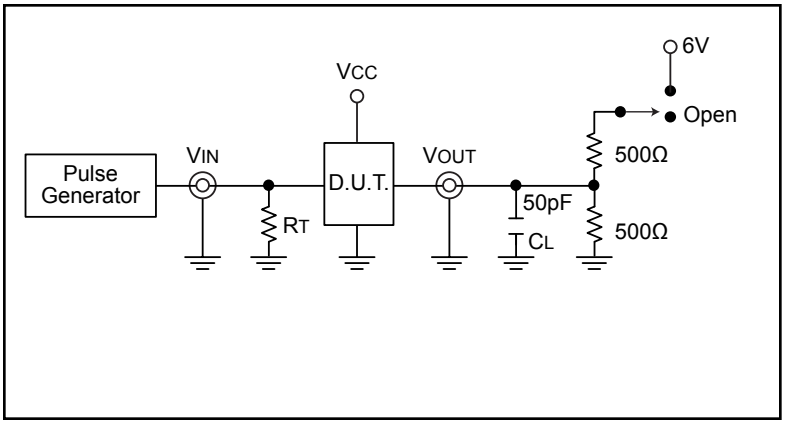
Notes:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. The bus switch contributes no propagational delay other than the RC delay of the On-Resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for 50pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational delay of the bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.

Switching Characteristics over 2.5V Operating Range

Parameters	Description	Test Conditions[1]	3305/3306 Com		Units
			Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay[2, 3] A to B, B to A	C_L = 50pF R_L = 500Ω		0.25	ns
t_{PZH} t_{PZL}	Bus Enable Time	C_L = 50pF R_L = 500Ω R = 500Ω	1.5	9.8	
t_{PHZ} t_{PLZ}	Bus Disable Time		1.5	8.3	

Notes:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. The bus switch contributes no propagational delay other than the RC delay of the On-Resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for 50pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational delay of the bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.

Test Circuits



Switch Position

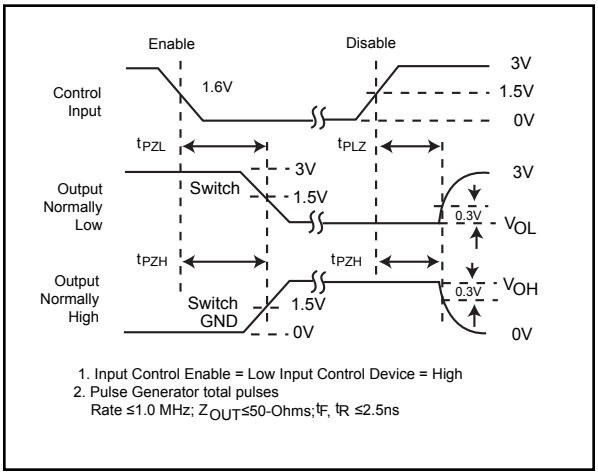
Test	Switch
Disable LOW	6V
Enable LOW	6V
Disable HIGH	GND
Enable HIGH	GND
tPD	Open

Definitions:

C_L = Load capacitance (includes jig and probe capacitance)

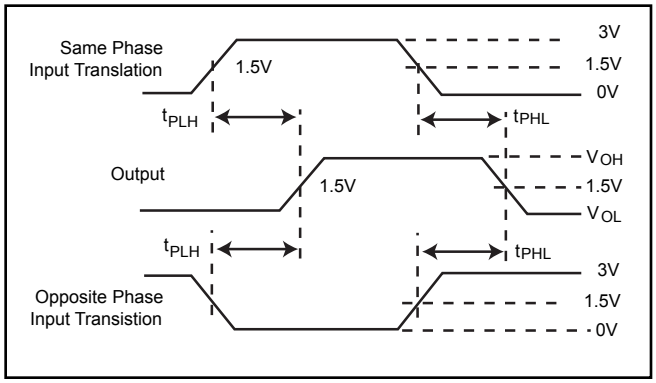
R_T = Termination resistance (should be equal to Z_{OUT} of the pulse generator)

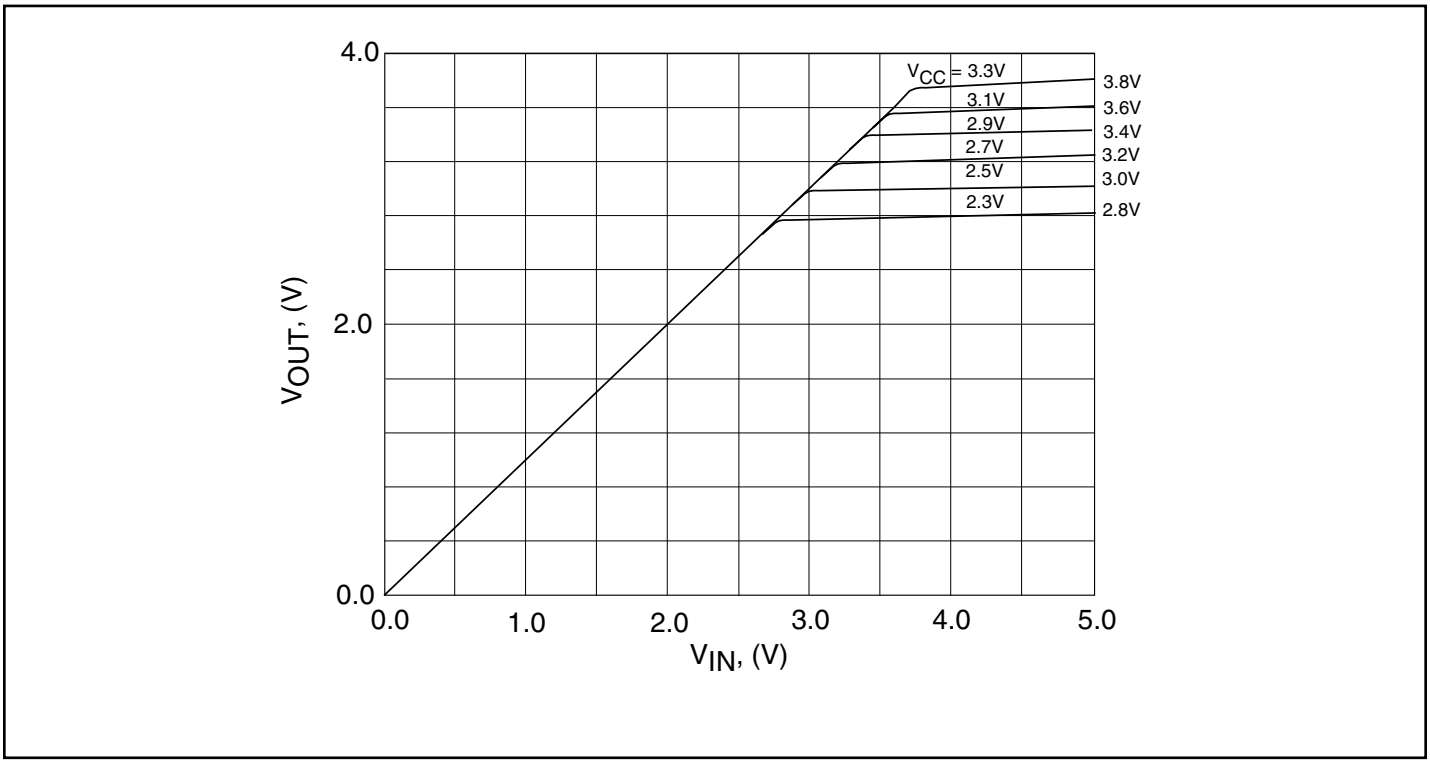
Enable and Disable Timing



1. Input Control Enable = Low Input Control Device = High
2. Pulse Generator total pulses
   Rate ≤1.0 MHz; Z_{OUT}≤50-Ohms;t_F, t_R ≤2.5ns

Propagation Delay





Output Voltage vs. Input Voltage over Various Supply Voltages

Application Information

Logic Inputs

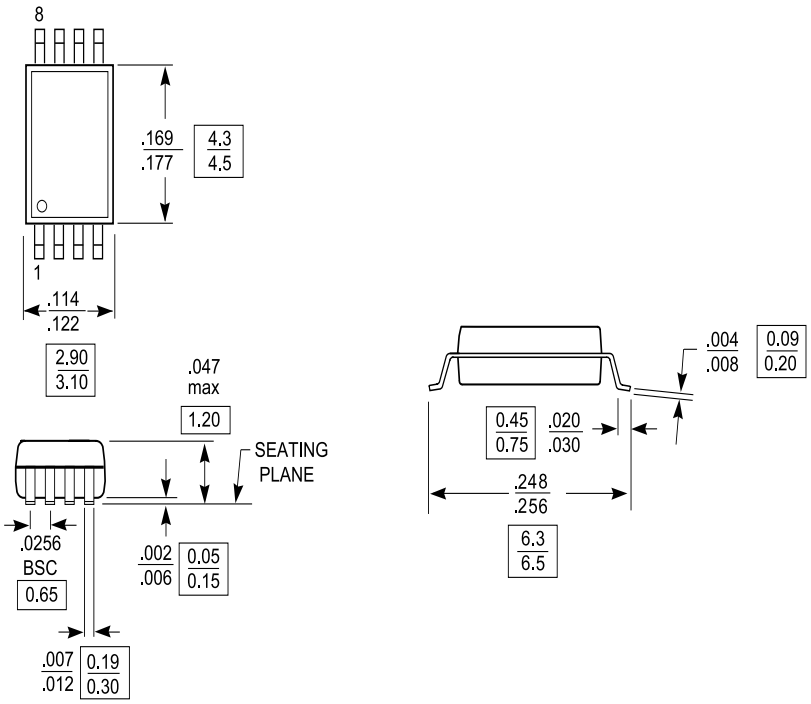
The logic control inpus can be driven up to +3.6V regardless of the supply voltage. For example, given a +3.3V supply, IN may be driven LOW to 0V and HIGH to 3.6V. Driving IN Rail-toRail® minimizes power consumption.

Power-Supply Sequencing

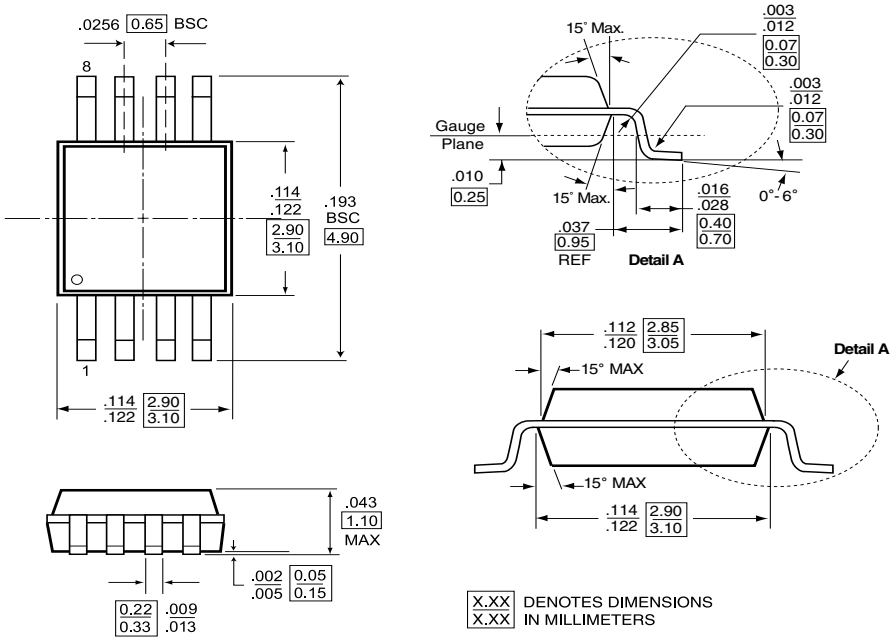
Proper power-supply sequencing is advised for all CMOS devices. It is recommended to always apply V_{CC} before applying signals to the input/output or control pins.

Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd.

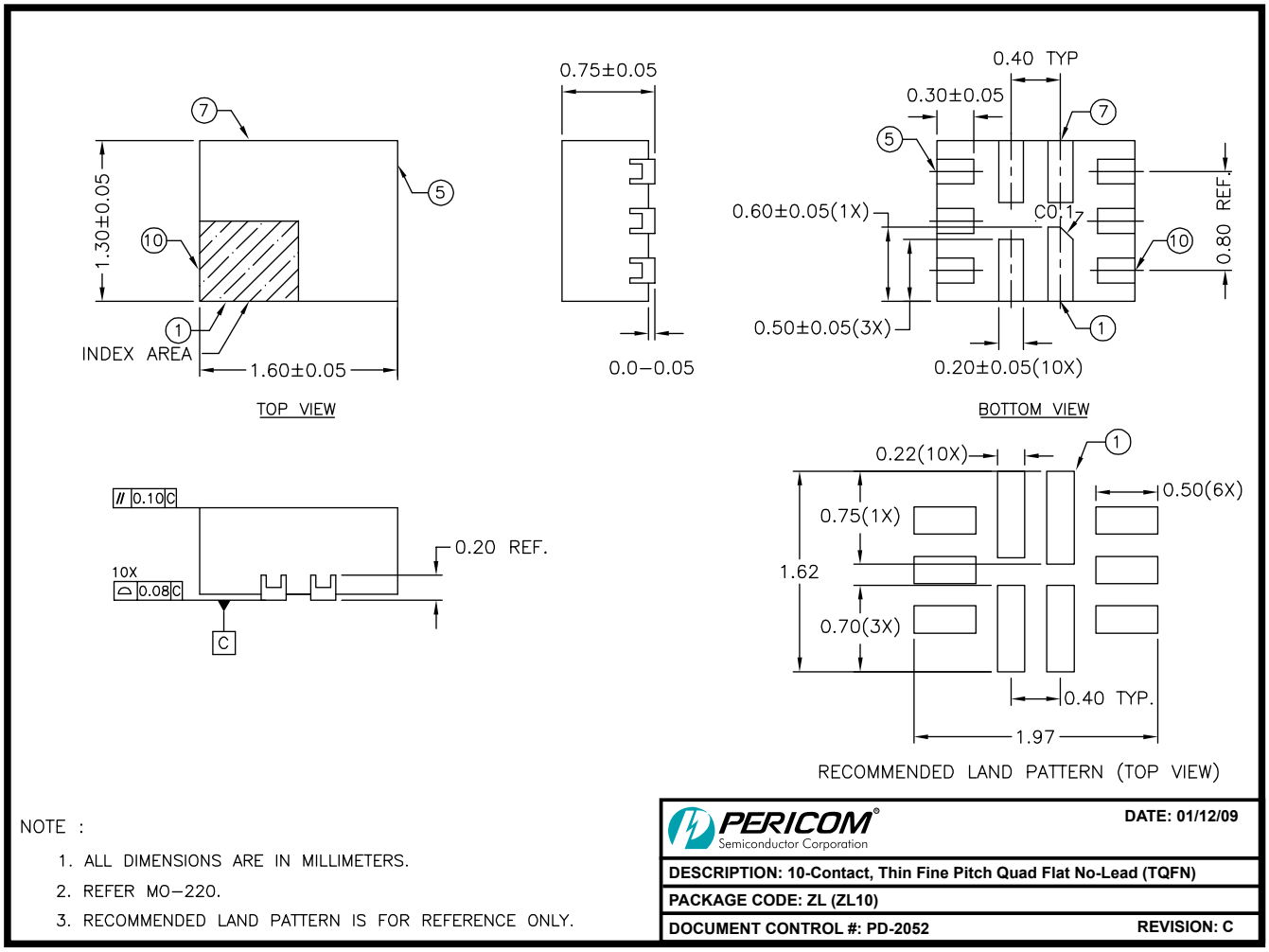
Packaging Mechanical: 8-Pin TSSOP (L)



Packaging Mechanical: 8-Pin MSOP (U)



Packaging Mechanical: 8-Pin MSOP (ZL)



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Ordering Information

Ordering Code	Package Code	Description
PI3C3305LE	L	Pb-free & Green, 8-pin 173-mil wide plastic TSSOP
PI3C3305UEX	U	Pb-free & Green, 8-pin 118-mil wide plastic MSOP Tape/Reel
PI3C3306LE	L	Pb-free & Green, 8-pin 173-mil wide plastic TSSOP
PI3C3306UEX	U	Pb-free & Green, 8-pin 118-mil wide plastic MSOP Tape/Reel

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- Adding an X suffix = Tape/Reel