4-Channel 2:1 Mux/DeMux, Enable Low 1.8V/2.5V/3.3V, High-Bandwidth, Hot Plug

Description

The DIODES PI3CH3257 is a 4-channel, 2:1 Multiplexer/ De-multiplexer with tri-state outputs. The switch introduces no additional ground bounce noise or propagation delay.

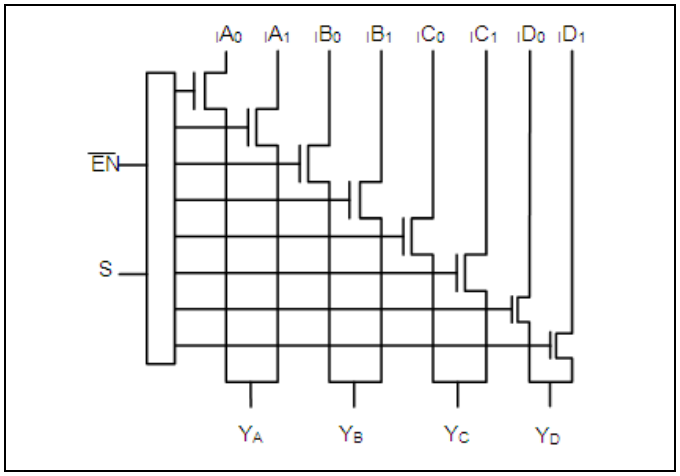
The PI3CH3257 device is very useful in switching signals that have high bandwidth (500 MHz).

Truth Table

$\overline{EX}$	S	YA	YB	YC	YD	Function
H	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Disable
L	L	IA0	IB0	IC0	ID0	S = 0
L	H	IA1	IB1	IC1	ID1	S = 1

Note: H=High Voltage Level; L=Low Voltage Level

Block Diagram

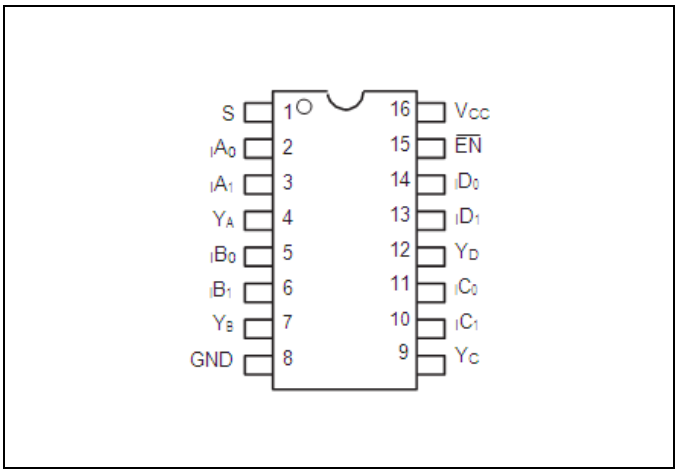


Features

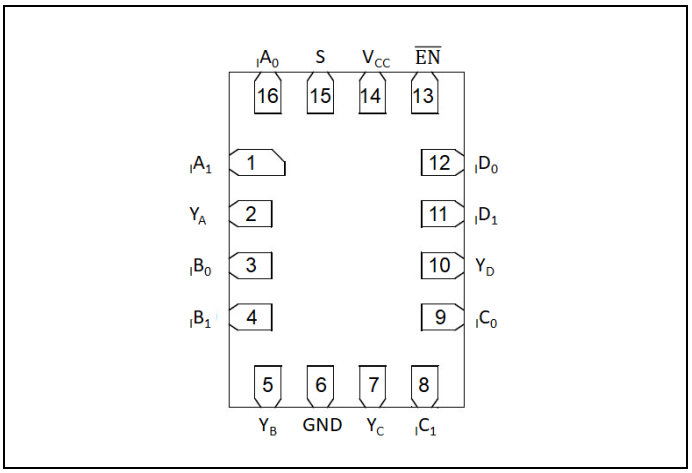
- Near-Zero Propagation Delay
- 4Ω Switches Connect Inputs to Outputs
- High Signal Passing Bandwidth (500MHz)
- Beyond Rail-to-Rail Switching
  - 0 to 5V Switching with 3.3V Power Supply
  - 0 to 3.3V Switching with 2.5V Power Supply
  - 0 to 2.5V Switching with 1.8V Power Supply
- 5V I/O Tolerant with Supply in OFF and ON State
- 1.8V, 2.5V and 3.3V Supply Voltage Operation
- Hot Insertion Capable
- Industrial Operating Temperature: –40°C to +85°C
- 8kV ESD Protection (Human Body Model)
- Latch-Up Performance: >200mA per JESD17
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative.
  https://www.diodes.com/quality/product-definitions
- Packaging (Pb-free & Green available):
  - 16-pin, 173-mil Wide Plastic, TSSOP (L)
  - 16-pin, 150-mil Wide Plastic, QSOP (Q)
  - 16-pin, 1.8x2.6mm, UQFN (ZTA)

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Configuration



TSSOP/QSOP Top View



UQFN 1.8x2.6 Top View

Pin Description

TSSOP/QSOP Pin#	UQFN Pin#	Pin Name	Description
1	15	S	Select Inputs
2, 3, 5, 6, 11, 10, 14, 13	16, 1, 3, 4, 9, 8, 12, 11	$_IA_0$, $_IA_1$, $_IB_0$, $_IB_1$, $_IC_0$, $_IC_1$, $_ID_0$, $_ID_1$	Data Inputs
4, 7, 9, 12	2, 5, 7, 10	Y_A, Y_B, Y_C, Y_D	Data Outputs
8	6	GND	Ground
15	13	$\overline{EN}$	Enable
16	14	V_{CC}	Power
—	Center Pad	GND	—

Maximum Ratings

Storage Temperature	-65°C to +150°C
Supply Voltage to Ground Potential	-0.5V to +4.6V
DC Input Voltage	-0.5V to +6.0V
DC Output Current	64mA
Power Dissipation	0.35W
Junction Temperature (Tj)	125°C
ESD (All Pins)	8KV (HBM) and 1KV (CDM)

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

3.3V Supply (Over Operating Range, T_A = -40°C ~ +85°C, V_{CC} = 3.3V ± 10%, unless otherwise noted)

Symbol	Description	Test Conditions(1)	Min	Typ(2)	Max	Unit
V_{IH}	Control Input HIGH Voltage	Guaranteed Logic HIGH Level	2.0	—	—	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.5	—	0.8	V
V_{IK}	Clamp Diode Voltage	V_{CC} = Max., I_{IN} = -18mA	—	-1.3	-1.8	V
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	µA
I_{OZH}	High-Impedance Current(3)	0 ≤ Y, In ≤ V_{CC}	—	—	±1	µA
I_{OFF}	Power-Off Leakage Current	V_{CC} = 0V, V_{IN} = 0V to 5.5V	—	—	1	µA
R_{ON}	Switch On-Resistance(4)	V_{CC} = 3V, V_{IN} = 0.0V I_{ON} = 30mA	—	3.5	6	Ω
		V_{CC} = 3V, V_{IN} = 2.4V I_{ON} = -15mA	—	4	8	

Notes:
1. For maximum or minimum conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 3.3V, TA = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. Measured by the voltage drop between Y and In pin at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (Y, In) pins.

2.5V Supply (Over Operating Range, T_A = -40°C ~ +85°C, V_{CC} = 2.5V ± 10%, unless otherwise noted)

Symbol	Description	Test Conditions(1)	Min	Typ(2)	Max	Unit
V_{IH}	Control Input HIGH Voltage	Guaranteed Logic HIGH Level	1.7	—	V_{CC}+0.3	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.3	—	0.7	V
V_{IK}	Clamp Diode Voltage	V_{CC} = Max., I_{IN} = -18mA	—	-1.3	-1.8	V
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	µA
I_{OZH}	High-Impedance Current(3)	0 ≤ Y, In ≤ V_{CC}	—	—	±1	µA
I_{OFF}	Power-Off Leakage Current	V_{CC} = 0V, V_{IN} = 0V to 5.5V	—	—	1	µA
R_{ON}	Switch On-Resistance(4)	V_{CC} = 2.3V, V_{IN} = 0.0V I_{ON} = 30mA	—	4	8	Ω
		V_{CC} = 2.3V, V_{IN} = 1.7V I_{ON} = -15mA	—	4	9	

Notes:
1. For maximum or minimum conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 2.5V, TA = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. Measured by the voltage drop between Y and In pin at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (Y, In) pins.

1.8V Supply (Over Operating Range, T_A = -40°C ~ +85°C, V_{CC} = 1.8V ±10%, unless otherwise noted)

Symbol	Description	Test Conditions[1]	Min	Typ[2]	Max	Unit
V_{IH}	Control Input HIGH Voltage	Guaranteed Logic HIGH Level	1.2	—	V_{CC}+0.3	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.3	—	0.6	V
V_{IK}	Clamp Diode Voltage	V_{CC} = Max., I_{IN} = -18mA	—	-1.3	-1.8	V
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	µA
I_{OZH}	High-Impedance Current[3]	0 ≤ Y, In ≤ V_{CC}	—	—	±1	µA
I_{OFF}	Power-Off Leakage Current	V_{CC} = 0V, V_{IN} = 0V to 5.5V	—	—	1	µA
R_{ON}	Switch On-Resistance[4]	V_{CC} = 1.65V, V_{IN} = 0.0V I_{ON} = 30mA	—	6	10	Ω
		V_{CC} = 1.65, V_{IN} = 1.05V I_{ON} = -15mA	—	10	15	

Notes:
1. For maximum or minimum conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 1.8V, TA = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. Measured by the voltage drop between Y and In pin at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (Y, In) pins.

Capacitance

T_A = 25°C, f = 1MHz

Symbol[1]	Description	Test Conditions	Typ.	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	1.6	3.5	pF
$C_{OFF(IN)}$	In Capacitance, Switch Off		3.2	5	
$C_{OFF(Y)}$	Y Capacitance, Switch Off		4.9	7	
C_{ON}	Y/In Capacitance, Switch On		8.4	13	

Note:
1. These parameters are determined by device characterization but are not production tested

Power Supply Characteristics

Symbol	Description	Test Conditions[1]	Min	Typ	Max	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC} = 3.6V, V_{IN} = GND or V_{CC}	—	0.1	0.5	mA

Note:
1. For maximum or minimum conditions, use appropriate value specified under Electrical Characteristics for the applicable device.

Dynamic Electrical Characteristics

Over Operating Range, T_A = -40°C ~ +85°C, V_{CC} = 3.3V ± 10%

Symbol	Description	Test Conditions	Min	Typ	Max	Unit
X_{TALK}	Crosstalk	See Test Diagram	—	-60	—	dB
O_{IRR}	Off-Isolation	See Test Diagram	—	-60	—	
BW	-3dB Bandwidth	See Test Diagram	—	500	—	MHz

Switch Characteristics

Over 3.3V Operating Range

Symbol	Description	Test Conditions(1)	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	Propagation Delay(2, 3) Y to In, In to Y	See Test Diagram	—	—	0.3	ns
t_{PZH}, t_{PZL}	Enable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	5.5	
t_{PHZ}, t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	6	

Note:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on propagation delays.
3. The switch contributes no propagation 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 0.30ns for 10pF load. Because this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay of the 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.

Over 2.5V Operating Range

Symbol	Description	Test Conditions(1)	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	Propagation Delay(2, 3) Y to In, In to Y	See Test Diagram	—	—	0.3	ns
t_{PZH}, t_{PZL}	Enable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	6.5	
t_{PHZ}, t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	6	

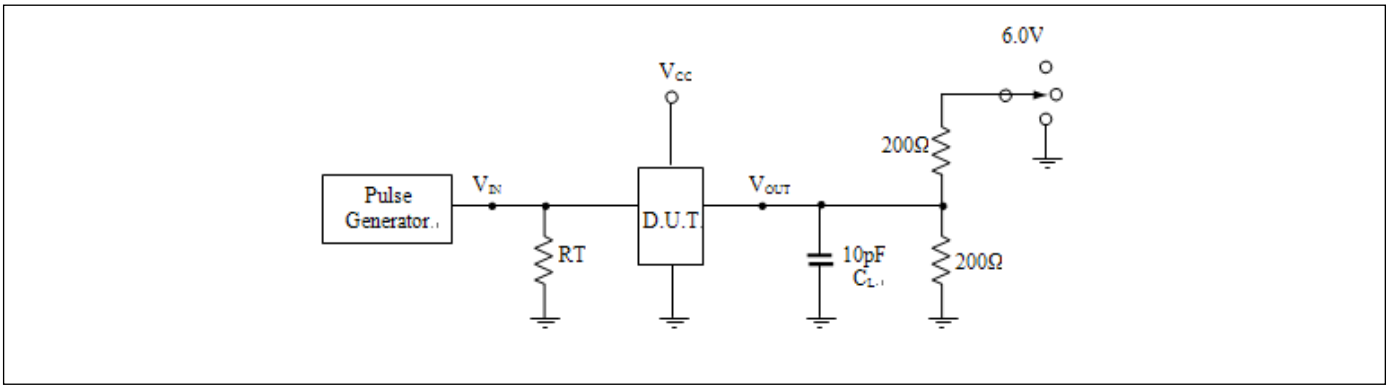
Note:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on propagation delays.
3. The switch contributes no propagation delay other than the RC delay of the on-resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.30ns for 10pF load. Because this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay of the 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.

Over 1.8V Operating Range

Symbol	Description	Test Conditions(1)	Min	Typ	Max	Unit
t_{PLH}, t_{PHL}	Propagation Delay(2, 3) Y to In, In to Y	See Test Diagram	—	—	0.3	ns
t_{PZH}, t_{PZL}	Enable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	20	
t_{PHZ}, t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	12	

Notes:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on propagation delays.
3. The switch contributes no propagation 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 0.30ns for 10pF load. Because this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay of the 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 Circuit for Electrical Characteristics

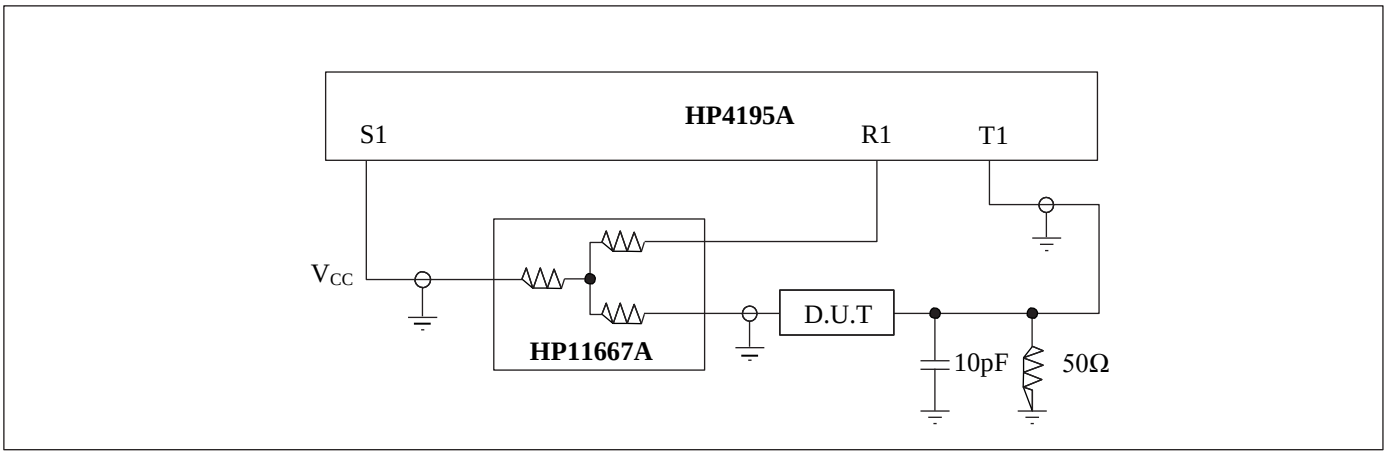


Notes:
1. C_L = Load capacitance: includes jig and probe capacitance.
2. RT = Termination resistance: should be equal to ZOUT of the pulse generator.
3. All input impulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50Ω, t_R ≤ 2.5ns, t_F ≤ 2.5ns.
4. The outputs are measured one at a time with one transition per measurement.

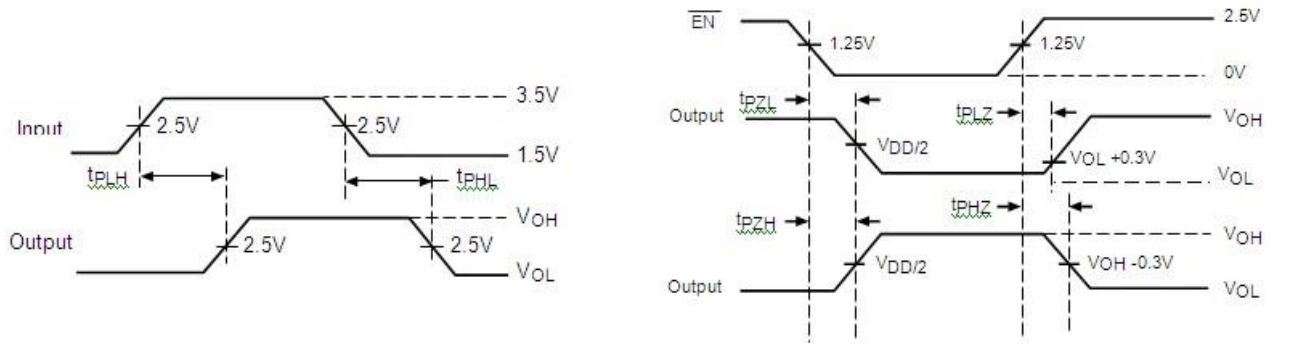
Switch Positions

Test	Switch
tPLZ, tPZL	6.0V
tPHZ, tPZH	GND
Prop Delay	Open

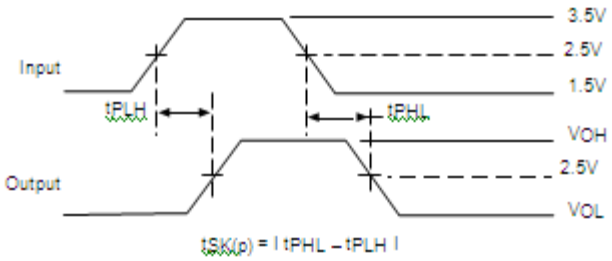
Test Circuit for Dynamic Electrical Characteristics



Switching Waveforms



Voltage Waveforms Enable and Disable Times



Pulse Skew - $t_{SK(p)}$

Applications Information

Logic Inputs

The logic control inputs can be driven up to 3.6V regardless of the supply voltage. For example given a +3.3V supply, $\overline{EN}$ may be driven LOW to 0V and HIGH to 3.6V. Driving $\overline{EN}$ Rail-to-Rail® minimizes power consumption.

Hot Insertion

For Datacom and Telecom applications that have ten or more volts passing through the backplane, a high voltage from the power supply can be seen at the device input pins during hot insertion. The PI3CH360 devices have maximum limits of 6V and 120mA for 20ns. If the power is higher, applied for a longer time, or repeatedly reaches the maximum limits, the devices can be damaged.

Part Marking

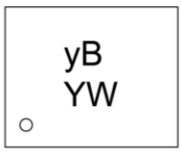
L Package

YY: Date Code (Year)
WW: Date Code (Workweek)
1st X: Assembly Site Code
2nd X: Wafer Fab Site Code
Bar above Fab Code means Cu wire

Q Package

Y: Date Code (Year)
W: Date Code (Workweek)
1st X: Assembly Site Code
2nd X: Wafer Fab Site Code
Bar above Fab Code means Cu wire

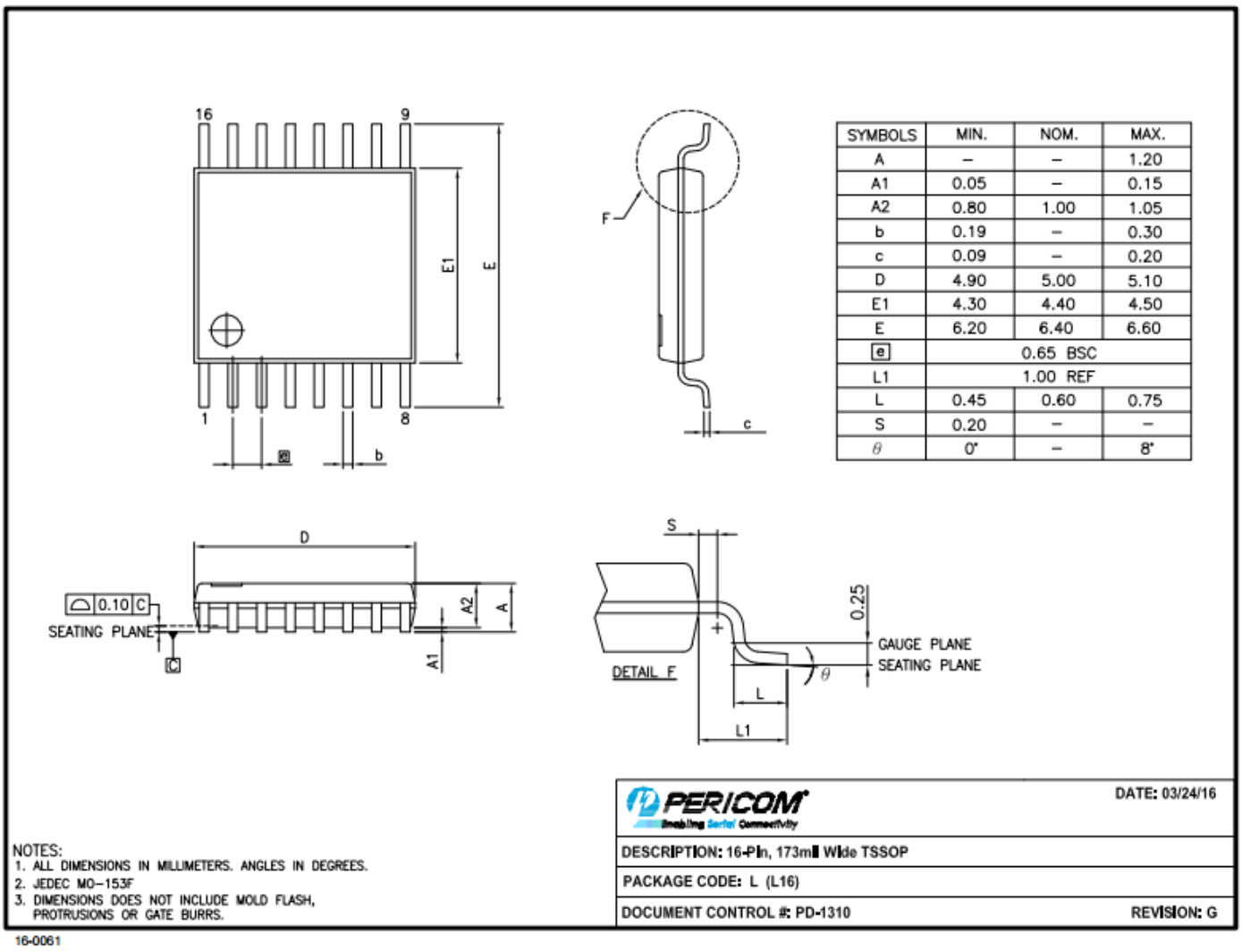
ZTA Package



yB = PI3CH3257ZTAE
Y: Date Code (Year)
W: Date Code (Workweek)

Mechanical Information

16-TSSOP (L)



SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.20
A1	0.05	–	0.15
A2	0.80	1.00	1.05
b	0.19	–	0.30
c	0.09	–	0.20
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65 BSC		
L1	1.00 REF		
L	0.45	0.60	0.75
S	0.20	–	–
θ	0°	–	8°

NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC MO-153F
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

PERICOM Semiconductor — DATE: 03/24/16

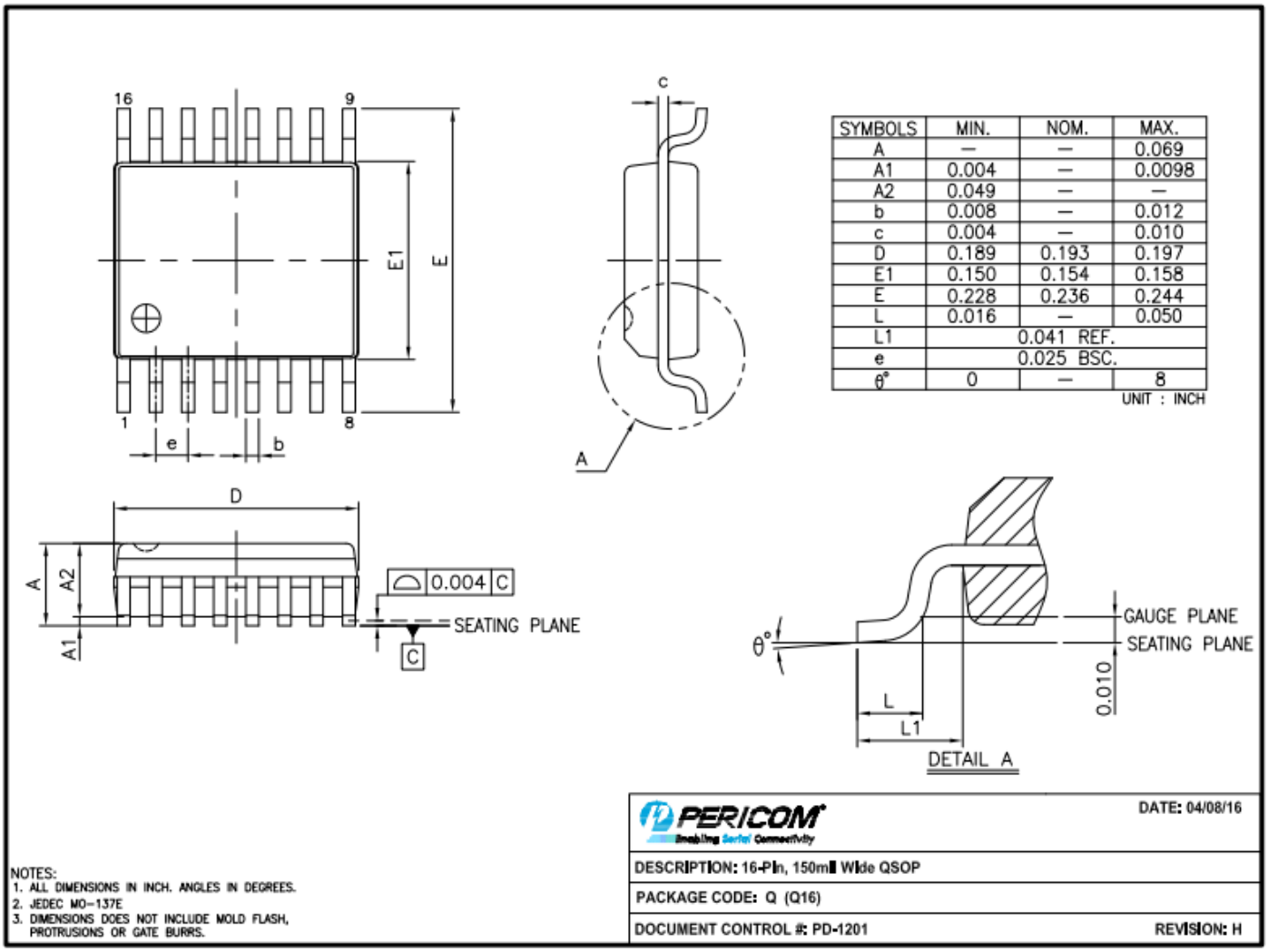
DESCRIPTION: 16-Pin, 173mil Wide TSSOP

PACKAGE CODE: L (L16)

DOCUMENT CONTROL #: PD-1310 — REVISION: G

16-0061

16- QSOP (Q)



SYMBOLS	MIN.	NOM.	MAX.
A	—	—	0.069
A1	0.004	—	0.0098
A2	0.049	—	—
b	0.008	—	0.012
c	0.004	—	0.010
D	0.189	0.193	0.197
E1	0.150	0.154	0.158
E	0.228	0.236	0.244
L	0.016	—	0.050
L1		0.041 REF.	
e		0.025 BSC.	
θ°	0	—	8

UNIT : INCH

NOTES:
1. ALL DIMENSIONS IN INCH. ANGLES IN DEGREES.
2. JEDEC MO-137E
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

16-0056

PERICOM Semiconductor

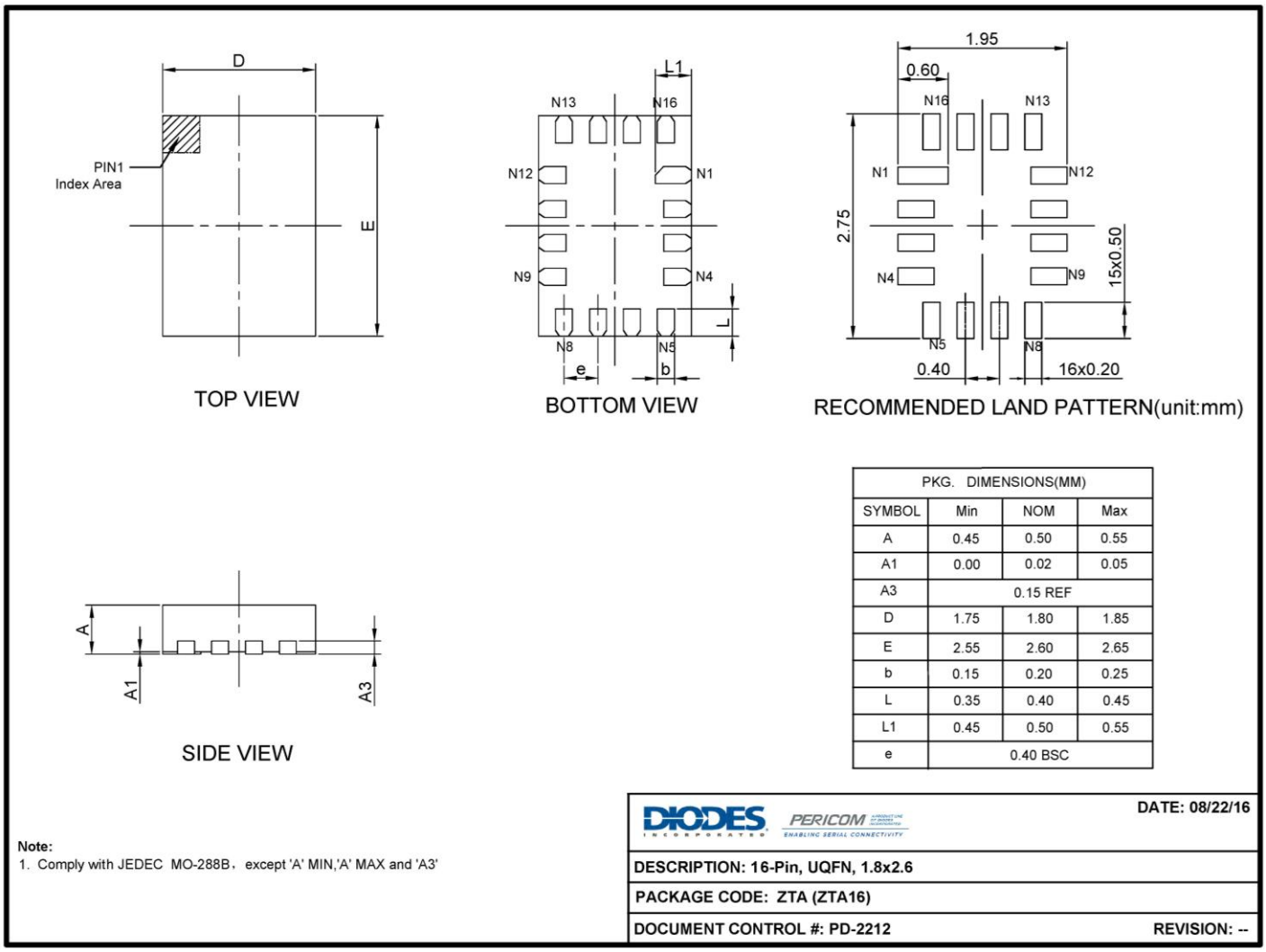
DATE: 04/08/16

DESCRIPTION: 16-Pin, 150mil Wide QSOP

PACKAGE CODE: Q (Q16)

DOCUMENT CONTROL #: PD-1201 REVISION: H

16-UQFN (ZTA)



PKG. DIMENSIONS(MM)			
SYMBOL	Min	NOM	Max
A	0.45	0.50	0.55
A1	0.00	0.02	0.05
A3		0.15 REF	
D	1.75	1.80	1.85
E	2.55	2.60	2.65
b	0.15	0.20	0.25
L	0.35	0.40	0.45
L1	0.45	0.50	0.55
e		0.40 BSC	

Note:
1. Comply with JEDEC MO-288B, except 'A' MIN,'A' MAX and 'A3'

DATE: 08/22/16

DESCRIPTION: 16-Pin, UQFN, 1.8x2.6

PACKAGE CODE: ZTA (ZTA16)

DOCUMENT CONTROL #: PD-2212 REVISION: --

16-0164

For latest package information:
Please see http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/.

Ordering Information

Part Numbers	Package Code	Package Description	Pin 1 Orientation
PI3CH3257LEX	L	16-Pin, 173mil Wide (TSSOP)	Top Right Corner
PI3CH3257QEX	Q	16-Pin, 150mil Wide (QSOP)	Top Right Corner
PI3CH3257ZTAEX	ZTA	16-pin, 1.8x2.6mm (UQFN)	Top Right Corner
PI3CH3257ZTAEX-13R	ZTA	16-pin, 1.8x2.6mm (UQFN), 12mm width carrier tape	Top Left Corner

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. E = Pb-free and Green
5. X suffix = Tape/Reel
6. For packaging details, go to our website at: https://www.diodes.com/assets/MediaList-Attachments/Diodes-Package-Information.pdf

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