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

Features

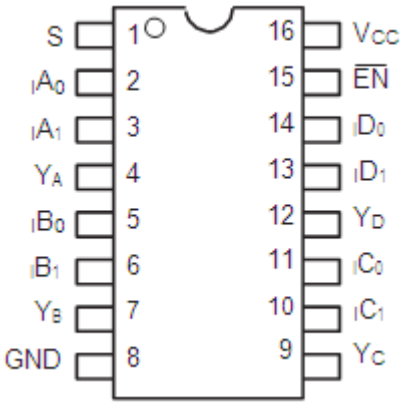
- Near-Zero Propagation Delay
- 5Ω Switches Connect Inputs to Outputs
- High Signal Passing Bandwidth (500MHz)
- Beyond Rail-to-Rail Switching
  - -0 to 5V Switching with 3.3V Power Supply
  - -0 to 3.3V Switching with 2.5V Power Supply
- 5V I/O Tolerant with Supply in OFF and ON State
- 1.8V, 2.5V, 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)
- Packaging (Pb-free & Green available):
  - -16-pin 173-mil Wide Plastic TSSOP (L)
  - -16-pin 150-mil Wide Plastic QSOP (Q)
  - -16-pin UQFN3x3-16(ZHD)

Description

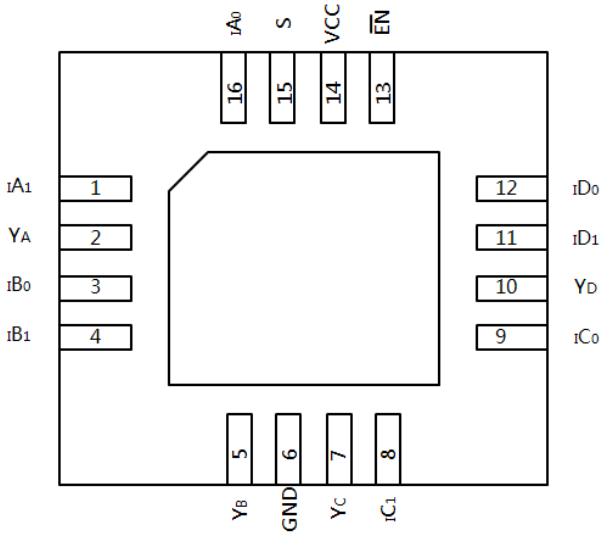
The PI3CH480 is a 4-channel, 2:1 Multiplexer/De-multiplexer with tri-state outputs. The switch introduces no additional ground bounce noise or propagation delay.

The PI3CH480 device is very useful in switching signals that have high bandwidth (500 MHz).

Pin Configuration

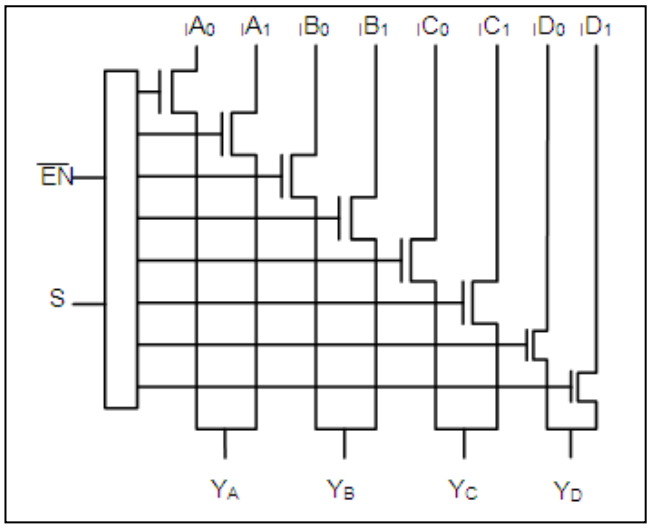


TSSOP/QSOP Top View



UQFN3x3-16 Top View

Block Diagram



Truth Table

$\overline{EN}$	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

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 Description

Pin No of TSSOP QSOP	Pin No of UQFN3x3-16	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
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 + 6.0V
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

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} = Min., 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
R_{ON}	Switch On-Resistance[4]	V_{CC} = Min., V_{IN} = 0.0V I_{ON} = -48mA or -64mA	—	4	6	Ω
		V_{CC} = Min., V_{IN} = 3.6V I_{ON} = -15mA	—	5	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	1.8	—	V_{CC}+0.3	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.3	—	0.8	V
V_{IK}	Clamp Diode Voltage	V_{CC} = Max., I_{IN} = -6mA	—	-0.7	-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
R_{ON}	Switch On-Resistance[4]	V_{CC} = Min., V_{IN} = 0.0V I_{ON} = -48mA	—	4	8	Ω
		V_{CC} = Min., V_{IN} = 2.25V I_{ON} = -15mA	—	7	14	

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	—	-0.7	-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
R_{ON}	Switch On-Resistance[4]	V_{CC} = Min., V_{IN} = 0.0V I_{ON} = -48mA	—	4	8	Ω
		V_{CC} = Min., V_{IN} = 1.6V I_{ON} = -15mA	—	10	25	

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	2.5	pF
$C_{OFF(IN)}$	In Capacitance, Switch Off		3.2	4.5	
$C_{OFF(Y)}$	Y Capacitance, Switch Off		4.9	6.5	
C_{ON}	Y/In Capacitance, Switch On		8.4	10	

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}	—	0.2	0.5	mA
		V_{CC} = 2.5V, V_{IN} = GND or V_{CC}	—	0.25	0.6	mA
		V_{CC} = 1.8V, V_{IN} = GND or V_{CC}	—	0.8	1.5	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	200	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	—	9.0	
t_{PHZ}, t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	9.0	

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	—	15.0	
t_{PHZ}, t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	12.0	

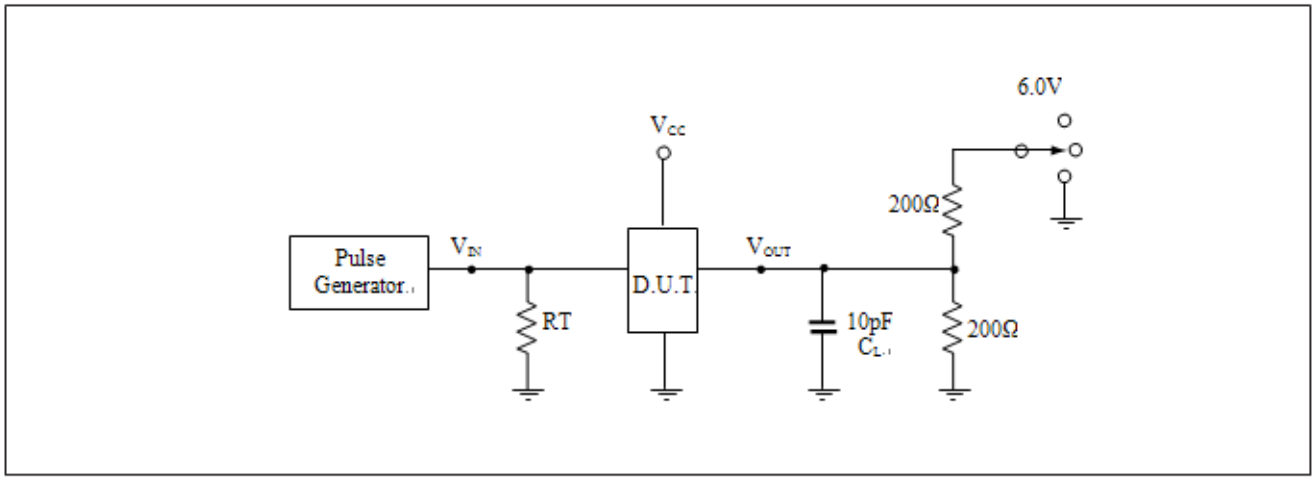
Note:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on propagation delays.
3. The switch contributes no propagation delay other than the RC delay of the on-resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 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	—	25.0	
t_{PHZ}, t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	—	12.0	

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

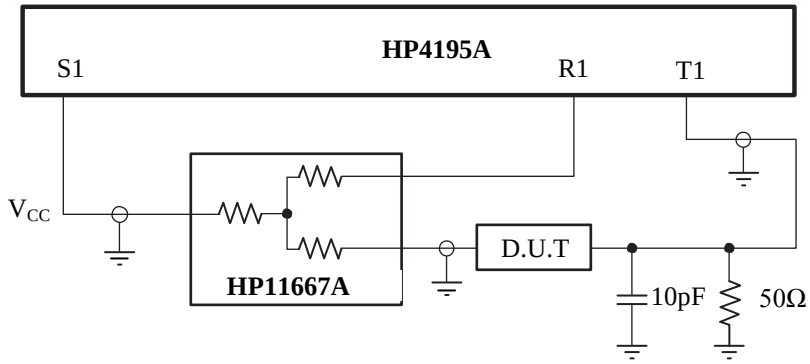


Notes:
1. C_L = Load capacitance: includes jig and probe capacitance.
2. R_T = Termination resistance: should be equal to Z_{OUT} of the pulse generator.
3. All input impulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O = 50\Omega$, $t_R \leq 2.5$ns, $t_F \leq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

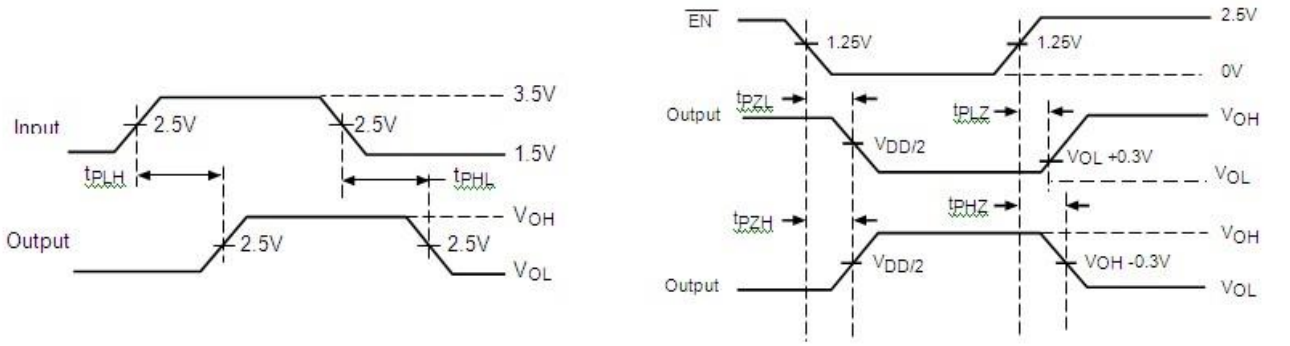
Switch Positions

Test	Switch
t_{PLZ}, t_{PZL}	6.0V
t_{PHZ}, t_{PZH}	GND
Prop Delay	Open

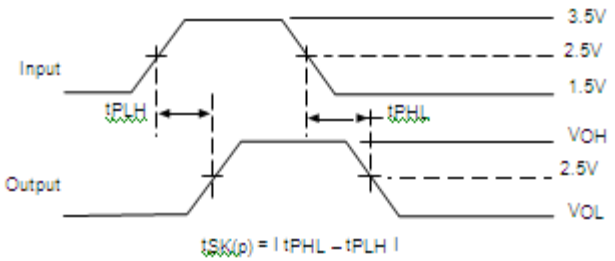
Test Circuit for Dynamic Electrical Characteristics



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

Z: Fixed Code
Y: Year
W: Workweek
1st X: Assembly Site Code
2nd X: Fab Site Code
Bar above "I" means Fab3 of MGN
Bar above fab code means Cu wire

Q Package

Z: Fixed Code
Y: Year
W: Workweek
1st X: Assembly Site Code
2nd X: Fab Site Code
Bar above fab code means Cu wire
Bar above "I" means Fab3 of MGN

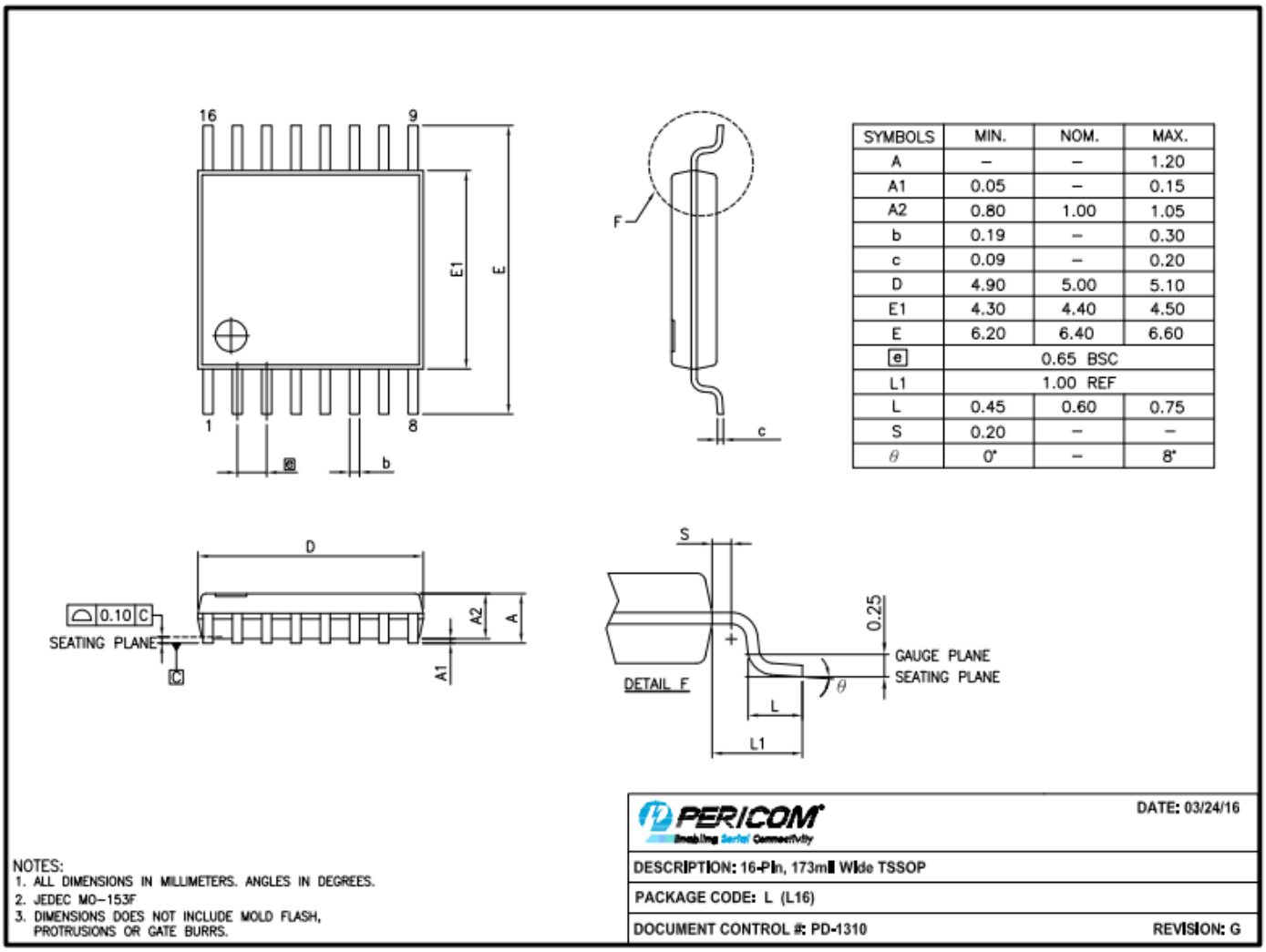
ZHD Package

Top mark is not available at this time. To obtain advanced information regarding the top mark, please contact your local sales representative.

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

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 Enabling Serial Connectivity

DATE: 03/24/16

DESCRIPTION: 16-Pin, 173mil Wide TSSOP

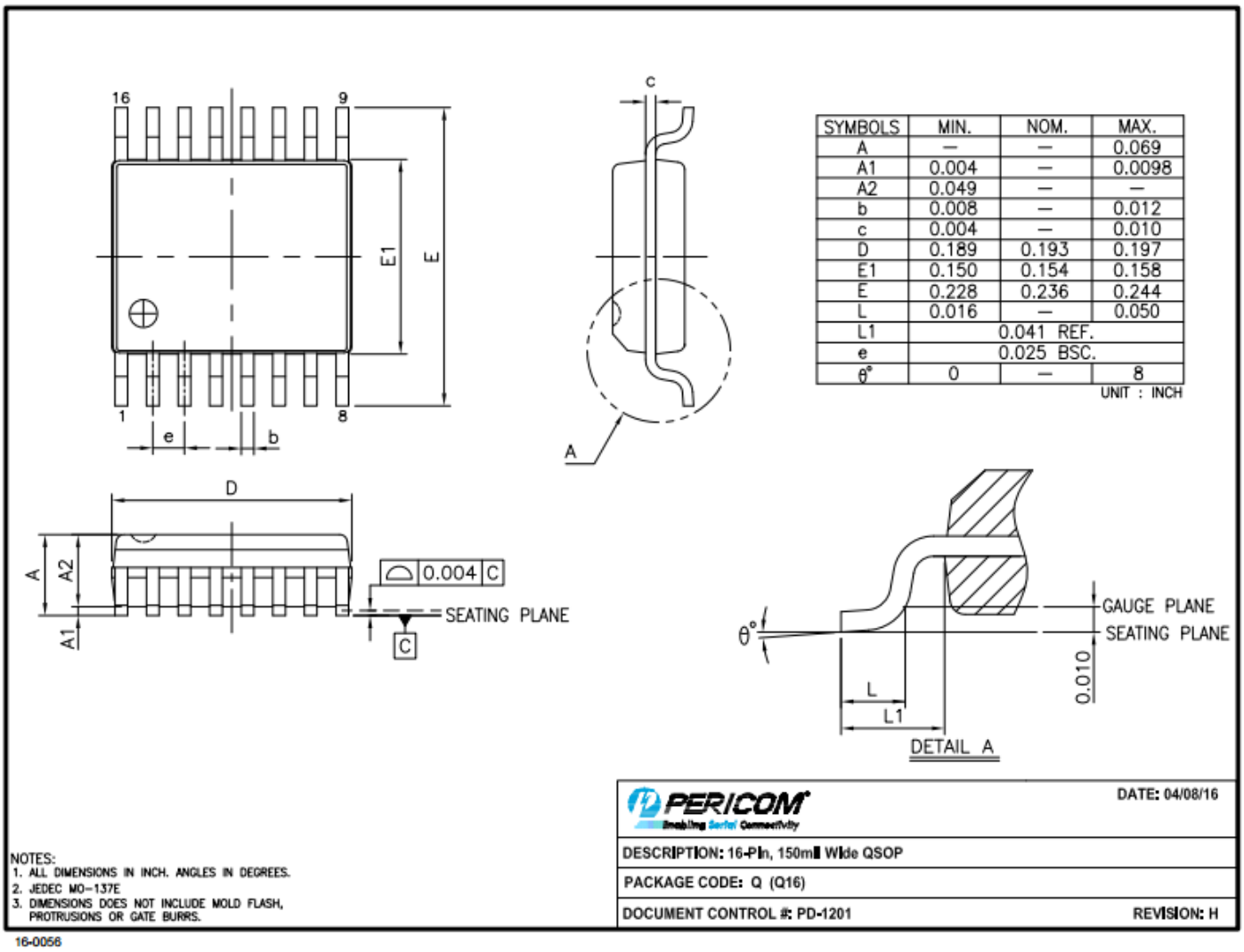
PACKAGE CODE: L (L16)

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.

PERICOM Enabling Serial Connectivity

DATE: 04/08/16

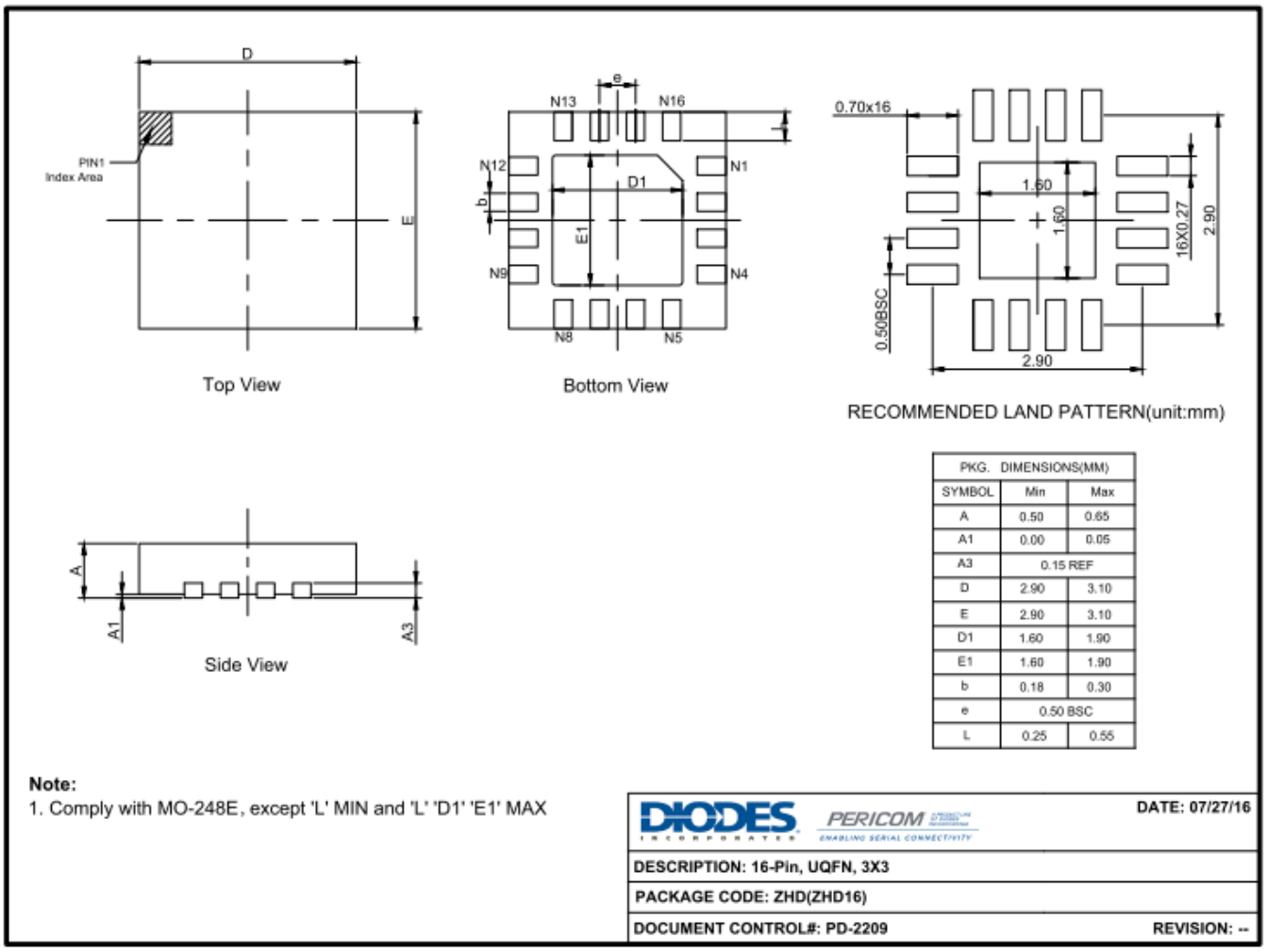
DESCRIPTION: 16-Pin, 150mil Wide QSOP

PACKAGE CODE: Q (Q16)

DOCUMENT CONTROL #: PD-1201 REVISION: H

16-0056

16-UQFN (ZHD)



PKG. DIMENSIONS(MM)		
SYMBOL	Min	Max
A	0.50	0.65
A1	0.00	0.05
A3	0.15 REF	
D	2.90	3.10
E	2.90	3.10
D1	1.60	1.90
E1	1.60	1.90
b	0.18	0.30
e	0.50 BSC	
L	0.25	0.55

Note:
1. Comply with MO-248E, except 'L' MIN and 'L' 'D1' 'E1' MAX

DATE: 07/27/16

DESCRIPTION: 16-Pin, UQFN, 3X3

PACKAGE CODE: ZHD(ZHD16)

DOCUMENT CONTROL#: PD-2209 REVISION: --

16-0092

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
PI3CH480LEX	L	16-Pin, 173mil Wide (TSSOP)
PI3CH480QEX	Q	16-Pin, 150mil Wide (QSOP)
PI3CH480ZHDEX	ZHD	16-Pin, 3x3 (UQFN)

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

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1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

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