



4-Channel 2:1 Mux/DeMux, Enable Low 1.8V/25V/33V, 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)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, 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 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.

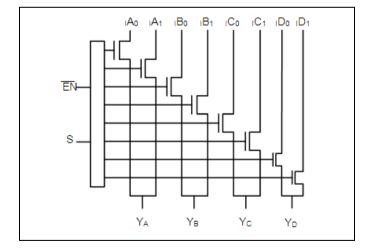
The PI3CH480 device is very useful in switching signals that have high bandwidth (500 MHz).

Truth Table

EX	S	YA	YB	YC	YD	Function
Н	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Disable
L	L	IA0	IB0	IC0	ID0	S=0
L	Н	IA1	IB1	IC1	ID1	S=1

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

Block Diagram



Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.

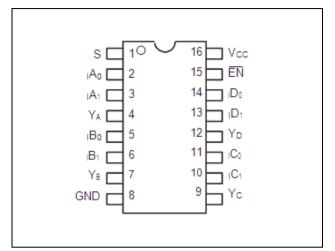
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.

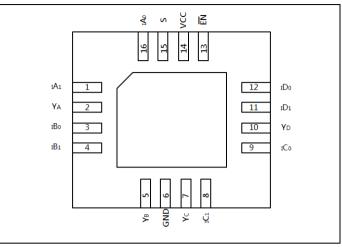
3. Halogen- and Antimony-free, "Green" products are defined as those which contain < 900ppm bromine, < 900ppm chloring (< 1500ppm total Br + Cl) and < 1000ppm

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





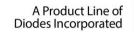
TSSOP/QSOP Top View

UQFN3x3-16 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	${}_{I}A_{0}, {}_{I}A_{1}, {}_{I}B_{0}, {}_{I}B_{1}, \\ {}_{I}C_{0}, {}_{I}C_{1, I}D_{0}, {}_{I}D_{1}$	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	EN	Enable
16	14	V _{CC}	Power
_	Center Pad	GND	_







Maximum Ratings

Storage Temperature	65°C to +150°C
Supply Voltage to Ground Potential	
DC Input Voltage	-0.5V to +6.0V
DC Output Current	120mA
Power Dissipation	0.5W
Junction Temperature (Tj)	125°C

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, $\underline{T_A} = -40$ °C ~ +85°C, $\underline{V_{CC}} = 3.3$ V ± 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
$V_{\rm IL}$	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	μΑ
${ m I}_{ m IL}$	Input Low Current	$V_{CC} = Max., V_{IN} = GND$	_	_	±1	μΑ
I_{OZH}	High-Impedance Current ⁽³⁾	$0 \le Y$, $In \le V_{CC}$	_	_	±1	μΑ
D	Switch On-Resistance ⁽⁴⁾	$V_{CC} = Min., V_{IN} = 0.0V$ $I_{ON} = -48mA \text{ or } -64mA$	_	4	6	Ω
R_{ON}	Switch On-Resistance	$V_{CC} = Min., V_{IN} = 3.6V$ $I_{ON} = -15mA$	_	5	8	22

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 $\sim +85$ °C, $V_{CC} = 2.5$ V ± 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	μΑ
$I_{\rm IL}$	Input Low Current	$V_{CC} = Max., V_{IN} = GND$	_	_	±1	μΑ
I_{OZH}	High-Impedance Current ⁽³⁾	$0 \le Y$, $In \le V_{CC}$	_	_	±1	μΑ
R _{ON}	Switch On-Resistance ⁽⁴⁾	$V_{CC} = Min., V_{IN} = 0.0V$ $I_{ON} = -48mA$		4	8	Ω
Kon	Switch On-Resistance	$V_{CC} = Min., V_{IN} = 2.25V$ $I_{ON} = -15mA$	_	7	14	22

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, $V_{CC} = 1.8V \pm 10$ %, 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
$V_{\rm IL}$	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	μΑ
I_{IL}	Input Low Current	$V_{CC} = Max., V_{IN} = GND$			±1	μΑ
I_{OZH}	High-Impedance Current ⁽³⁾	$0 \le Y$, $In \le V_{CC}$			±1	μΑ
D	Switch On-Resistance ⁽⁴⁾	$V_{CC} = Min., V_{IN} = 0.0V$ $I_{ON} = -48mA$	_	4	8	Ω
R _{ON}	Switch On-Resistance	$V_{CC} = Min., V_{IN} = 1.6V$ $I_{ON} = -15mA$	_	10	25	72

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	Тур.	Max.	Unit
C_{IN}	Input Capacitance		1.6	2.5	
C _{OFF(IN)}	In Capacitance, Switch Off	V 0V	3.2	4.5	T
C _{OFF(Y)}	Y Capacitance, Switch Off	$V_{IN} = 0V$	4.9	6.5	pF
C _{ON}	Y/In Capacitance, Switch On		8.4	10	

Note:

Power Supply Characteristics

Symbol	Description	Test Conditions ⁽¹⁾	Min	Тур	Max	Unit
		$V_{CC} = 3.6V$, $V_{IN} = GND$ or V_{CC}		0.2	0.5	mA
I_{CC}	Quiescent Power Supply Current	$V_{CC} = 2.5V$, $V_{IN} = GND$ or V_{CC}		0.25	0.6	mA
	Curront	$V_{CC} = 1.8V$, $V_{IN} = GND$ or V_{CC}	_	0.8	1.5	mA

Note:

Dynamic Electrical Characteristics

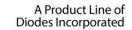
(Over Operating Range, $T_A = -40$ °C ~ +85°C, $V_{CC} = 3.3$ V ± 10 %)

Symbol	Description	Test Conditions	Min	Тур	Max	Unit
X_{TALK}	Crosstalk	See Test Diagram	_	-60		ДD
O _{IRR}	Off-Isolation	See Test Diagram	_	-60	_	dB
BW	-3dB Bandwidth	See Test Diagram	200	500		MHz

^{1.} These parameters are determined by device characterization but are not production tested

^{1.} For maximum or minimum conditions, use appropriate value specified under Electrical Characteristics for the applicable device.







Switch Characteristics

Over 3.3V Operating Range

Symbol	Description	Test Conditions ⁽¹⁾	Min	Тур	Max	Unit
$t_{\rm PLH,}t_{\rm PHL}$	Propagation Delay ^(2, 3) Y to In, In to Y	See Test Diagram	_	_	0.3	
t _{PZH} , t _{PZL}	Enable Time S or EN to Y or In	See Test Diagram	1.5	_	9.0	ns
t _{PHZ} , t _{PLZ}	Disable Time S or 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

<u> </u>	5 11 6 1					
Symbol	Description	Test Conditions ⁽¹⁾	Min	Тур	Max	Unit
$t_{\mathrm{PLH},}t_{\mathrm{PHL}}$	Propagation Delay ^(2, 3) Y to In, In to Y	See Test Diagram	_	_	0.3	
t _{PZH} , t _{PZL}	Enable Time S or EN to Y or In	See Test Diagram	1.5	_	15.0	ns
t _{PHZ} , t _{PLZ}	Disable Time S or 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	Тур	Max	Unit
$t_{\rm PLH,}t_{\rm PHL}$	Propagation Delay ^(2, 3) Y to In, In to Y	See Test Diagram	_	_	0.3	
t _{PZH} , t _{PZL}	Enable Time S or EN to Y or In	See Test Diagram	1.5	_	25.0	ns
t _{PHZ} , t _{PLZ}	Disable Time S or EN to Y or In	See Test Diagram	1.5	_	12.0	

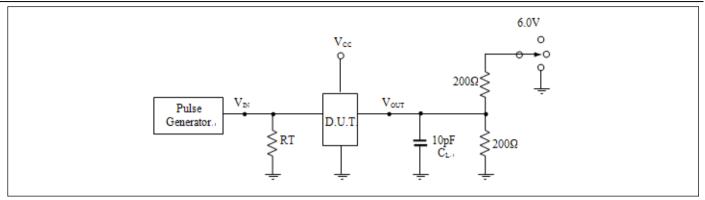
Notes:

- 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



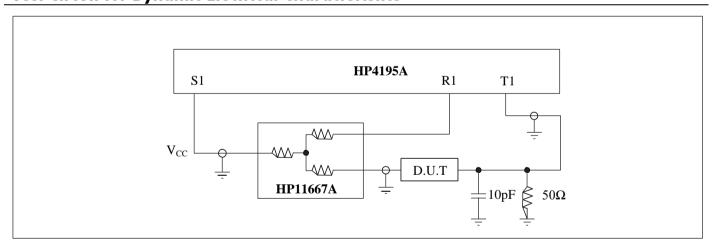
Notes:

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

Switch Positions

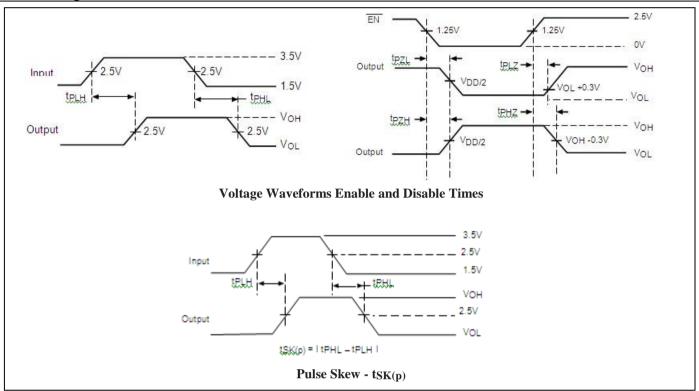
Test	Switch
t _{PLZ} , t _{PZL}	6.0V
t _{PHZ} , t _{PZH}	GND
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics





Switching Waveforms



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, $\overline{\text{EN}}$ may be driven LOW to 0V and HIGH to 3.6V. Driving $\overline{\text{EN}}$ 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

PI3CH 480LE **ZYWXX**

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

PI3CH 480QE **ZYWXX**

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.

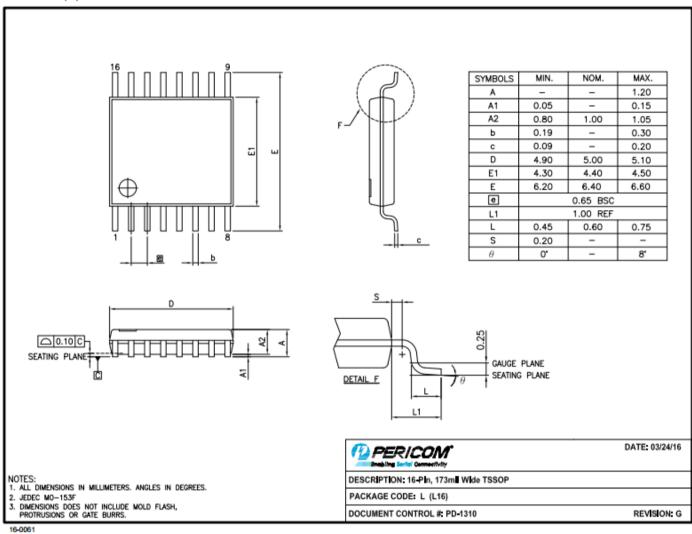
Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd.



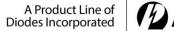


Mechanical Information

16-TSSOP (L)

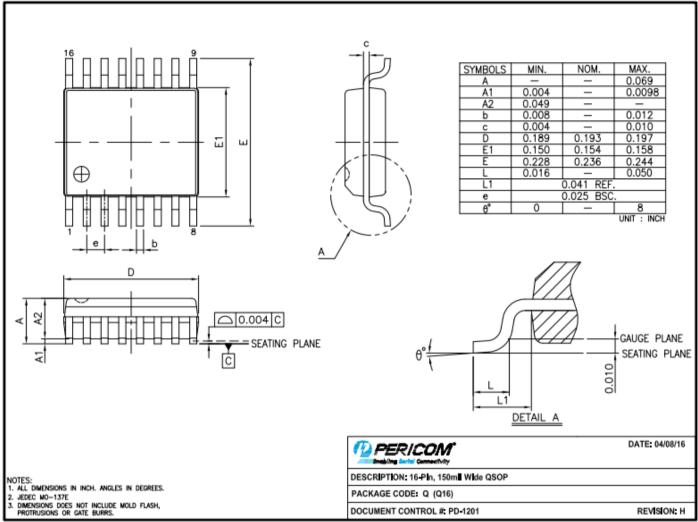








16- QSOP (Q)

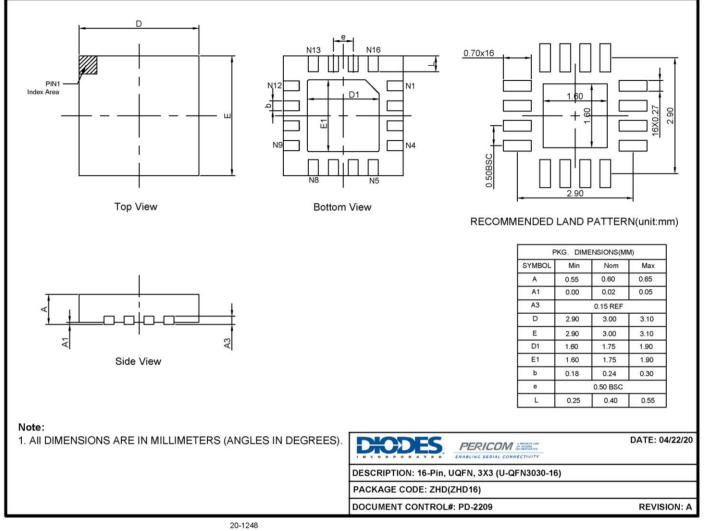


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16-UQFN (ZHD)



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)

- 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
- 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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