



**THE DATASHEET OF
PI3CH400ZBEX**



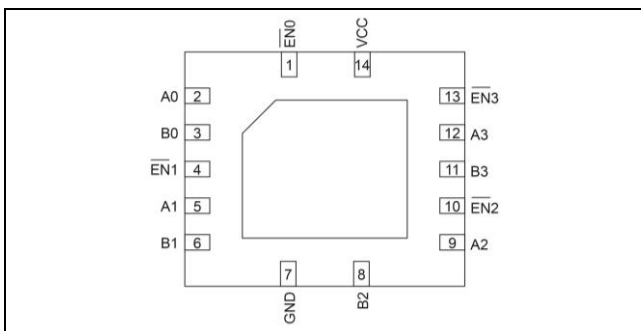
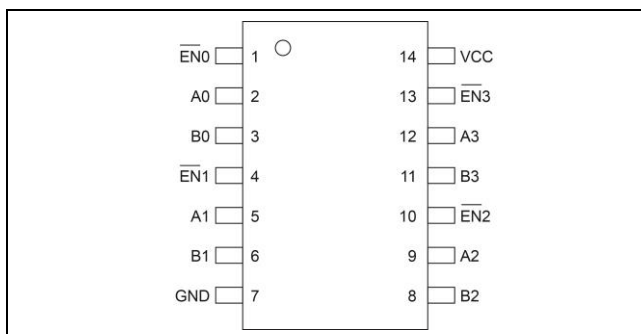
PI3CH400

4-Bit Bus Switch, Enable Low 1.8V/2.5V/3.3V, High-Bandwidth, Hot Plug

Features

- ➔ Near-Zero propagation delay
- ➔ 5-ohm switches connect inputs to outputs
- ➔ High signal passing bandwidth (500 MHz)
- ➔ 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](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.
- ➔ Packaging (Pb-free & Green available):
 - 14-pin TSSOP (L)
 - 14-pin QFN (ZB)

Pin Configuration



Description

The PI3CH400 is a low voltage, 4-channel switch designed with fast individual enables. The switch introduces no additional ground bounce noise or additional propagation delay.

The PI3CH400 device has active low enables. It is very useful in switching signals that have high bandwidth (500 MHz).

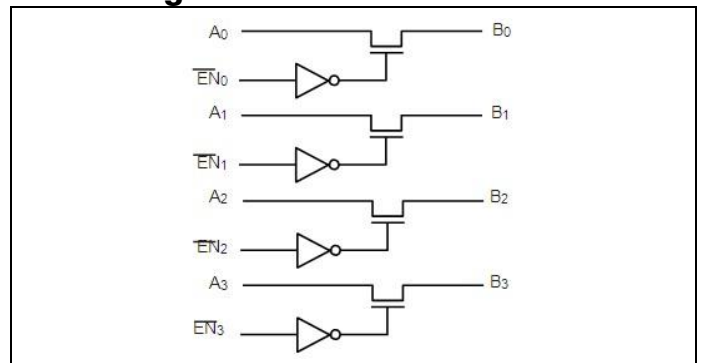
Applications

- ➔ High Bandwidth Data Switching
- ➔ Hot-Docking
- ➔ Analog Signal Switching
- ➔ Differential Signal Switching

Pin Description

Pin No	Pin Name	Description
1, 4, 10	$\overline{EN}_0, \overline{EN}_1, \overline{EN}_2$	Switch Enables
2, 5, 9, 12	A0-A3	A Ports
3, 6, 8, 11	B0-B3	B Ports
14	V _{CC}	Power
7	GND	Ground

Block Diagram



Truth Table⁽¹⁾

\overline{EN}_x	A _x	B _x	V _{CC}	Function
X ⁽²⁾	Hi-Z	Hi-Z	GND	Disconnect
H	Hi-Z	Hi-Z	V _{CC}	Disconnect
L	B _x	A _x	V _{CC}	Connect

Note:

1. H=High Voltage Level; L=Low Voltage Level; Hi-Z=High Impedance
2. A pull-up resistor should be provided for power-up protection

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.

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, $T_A = -40 \sim +85^\circ\text{C}$, $V_{CC} = 3.3V \pm 10\%$, unless otherwise noted)

Symbol	Description	Test Conditions ⁽¹⁾	Min	Typ ⁽²⁾	Max	Unit
V_{IH}	Control Input HIGH Voltage	Guaranteed Logic HIGH Level	2.0	-	-	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.5	-	0.8	V
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$	-	-1.3	-1.8	V
I_{IH}	Input HIGH Current	$V_{CC} = \text{Max.}, V_{IN} = V_{CC}$	-	-	± 1	μA
I_{IL}	Input Low Current	$V_{CC} = \text{Max.}, V_{IN} = \text{GND}$	-	-	± 1	μA
I_{OZH}	High-Impedance Current	$0 \leq A, B \leq V_{CC}$	-	-	± 1	μA
R_{ON}	Switch On-Resistance ⁽³⁾	$V_{CC} = \text{Min.}, V_{IN} = 0.0\text{V}$ $I_{ON} = -48\text{mA}$ or -64mA	-	4	6	Ω
		$V_{CC} = \text{Min.}, V_{IN} = 3.6\text{V}$ $I_{ON} = -15\text{mA}$	-	5	8	

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 3.3\text{V}$, $T_A = 25^\circ\text{C}$ ambient and maximum loading.
- 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 (Ax, Bx) pins.

2.5V supply (Over operating range, $T_A = -40 \sim +85^\circ\text{C}$, $V_{CC} = 2.5V \pm 10\%$, unless otherwise noted)

Symbol	Description	Test Conditions ⁽¹⁾	Min	Typ ⁽²⁾	Max	Unit
V_{IH}	Control Input HIGH Voltage	Guaranteed Logic HIGH Level	1.8	-	$V_{CC} + 0.3$	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.3	-	0.8	V
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Max.}, I_{IN} = -6\text{mA}$	-	-0.7	-1.8	V
I_{IH}	Input HIGH Current	$V_{CC} = \text{Max.}, V_{IN} = V_{CC}$	-	-	± 1	μA
I_{IL}	Input Low Current	$V_{CC} = \text{Max.}, V_{IN} = \text{GND}$	-	-	± 1	μA
I_{OZH}	High-Impedance Current	$0 \leq A, B \leq V_{CC}$	-	-	± 1	μA
R_{ON}	Switch On-Resistance ⁽³⁾	$V_{CC} = \text{Min.}, V_{IN} = 0.0\text{V}$ $I_{ON} = -48\text{mA}$	-	4	8	Ω
		$V_{CC} = \text{Min.}, V_{IN} = 2.25\text{V}$ $I_{ON} = -15\text{mA}$	-	7	14	

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 2.5\text{V}$, $T_A = 25^\circ\text{C}$ ambient and maximum loading.
- 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 (Ax, Bx) pins.

1.8V supply (Over operating range, $T_A = -40 \sim +85^\circ\text{C}$, $V_{CC} = 1.8\text{V} \pm 10\%$, 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_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level	-0.3	-	0.6	V
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$	-	-0.7	-1.8	V
I_{IH}	Input HIGH Current	$V_{CC} = \text{Max.}, V_{IN} = V_{CC}$	-	-	± 1	μA
I_{IL}	Input Low Current	$V_{CC} = \text{Max.}, V_{IN} = \text{GND}$	-	-	± 1	μA
I_{OZH}	High-Impedance Current	$0 \leq A, B \leq V_{CC}$	-	-	± 1	μA
R_{ON}	Switch On-Resistance ⁽³⁾	$V_{CC} = \text{Min.}, V_{IN} = 0.0\text{V}$ $I_{ON} = -48\text{mA}$	-	4	8	Ω
		$V_{CC} = \text{Min.}, V_{IN} = 1.6\text{V}$ $I_{ON} = -15\text{mA}$	-	10	25	

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 1.8\text{V}$, $T_A = 25^\circ\text{C}$ ambient and maximum loading.
- 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 (Ax, Bx) pins.

Capacitance ($T_A = 25^\circ\text{C}$, $f = 1\text{MHz}$)

Symbol ⁽¹⁾	Description	Test Conditions	Typ ⁽²⁾	Unit
C_{IN}	Input Capacitance	$V_{IN} = 0\text{V}$	2.0	pF
C_{OFF}	A/B Capacitance, Switch Off		3.5	
C_{ON}	A/B Capacitance, Switch On		7.0	

Note:

- 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	$V_{CC} = 3.6\text{V}, V_{IN} = \text{GND or } V_{CC}$	-	0.2	0.5	mA

Note:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at $+25^\circ\text{C}$ ambient

Dynamic Electrical Characteristics

(Over Operating Range, $T_A = -40 \sim +85^\circ\text{C}$, $V_{CC} = 3.3\text{V} \pm 10\%$)

Symbol	Description	Test Conditions	Min	Typ	Max	Unit
X_{TALK}	Crosstalk	10MHz	-	-60	-	dB
O_{IRR}	Off-Isolation	10MHz	-	-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) Ax to Bx, Bx to Ax	See test Diagram	-	-	0.3	ns
t_{PZH}, t_{PZL}	Enable Time \overline{ENx} to Ax or Bx	See test Diagram	1.5	-	9.0	
t_{PHZ}, t_{PLZ}	Disable Time \overline{ENx} to Ax or Bx	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. Since 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) Ax to Bx, Bx to Ax	See test Diagram	-	-	0.3	ns
t_{PZH}, t_{PZL}	Enable Time \overline{ENx} to Ax or Bx	See test Diagram	1.5	-	15.0	
t_{PHZ}, t_{PLZ}	Disable Time \overline{ENx} to Ax or Bx	See test Diagram	1.5	-	12.0	

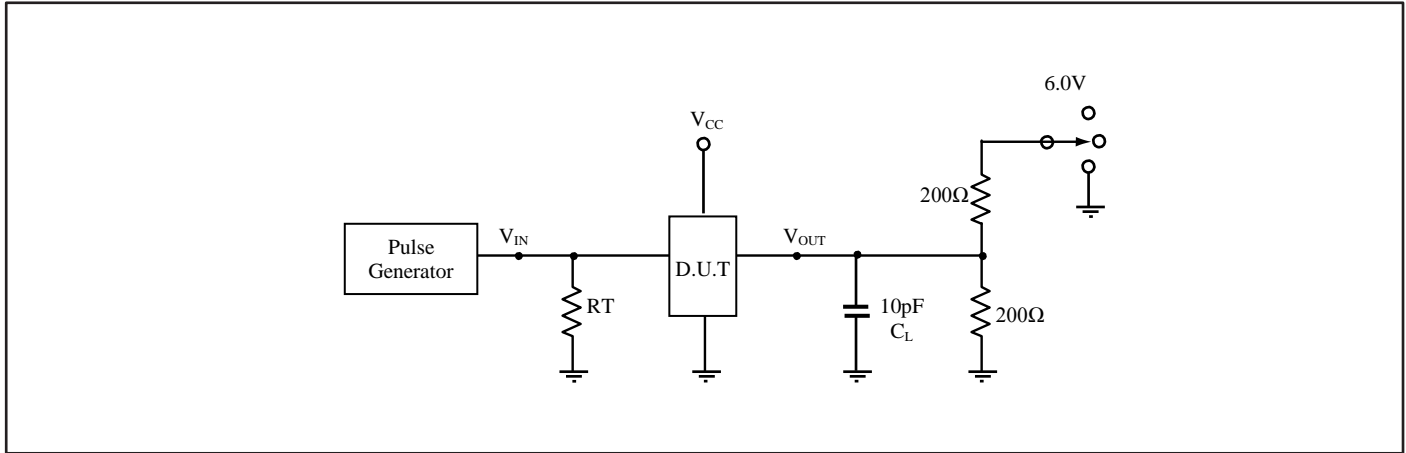
- Note:**
1. See test circuit and waveforms.
 2. This parameter is guaranteed but not tested on Propagation Delays.
 3. The switch contributes no propagation delay other than the RC delay of the On-Resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.30ns for 10pF load. Since 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) Ax to Bx, Bx to Ax	See test Diagram	-	-	0.3	ns
t_{PZH}, t_{PZL}	Enable Time \overline{ENx} to Ax or Bx	See test Diagram	1.5	-	25.0	
t_{PHZ}, t_{PLZ}	Disable Time \overline{ENx} to Ax or Bx	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. Since 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



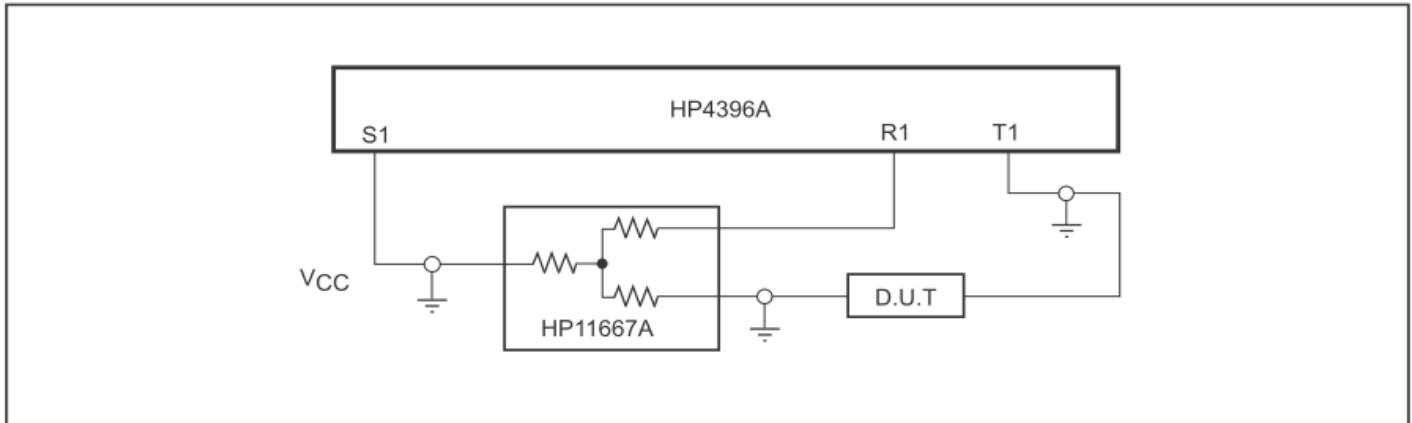
Notes:

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: $PRR \leq 10$ MHz, $Z_O = 50$ -ohm, $t_R \leq 2.5$ ns, $t_F \leq 2.5$ ns.
4. The outputs are measured one at a time with one transition per measurement.

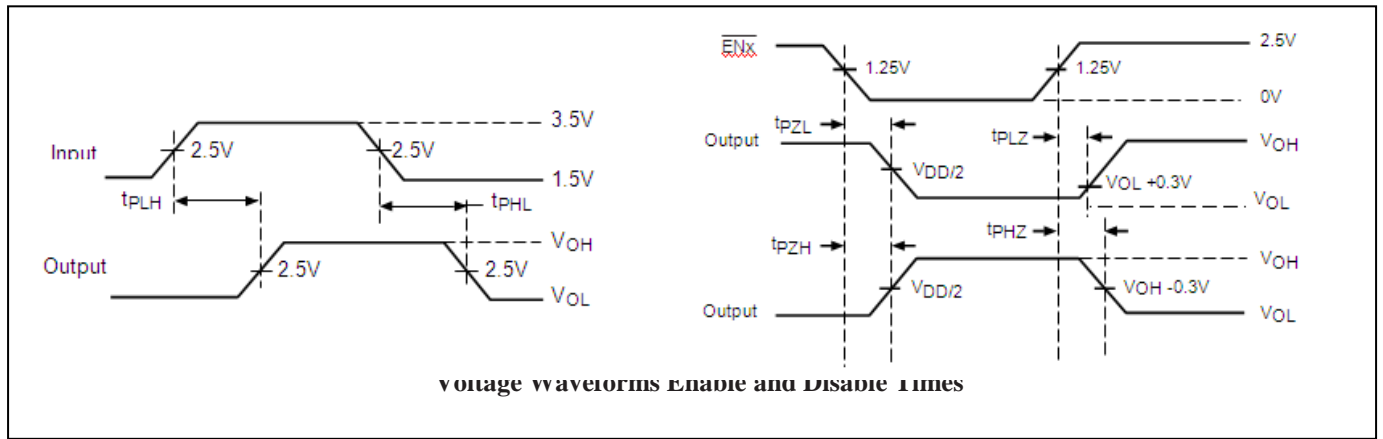
Switch Positions

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

Test Circuit for Dynamic Electrical Characteristics



Switching Waveforms



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} maybe 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 may be seen at the device input pins during hot insertion. The PI3CH400 devices have maximum limits of 6V and 120mA for 20ns. If the power is higher or applied for a longer time or repeatedly reaches the maximum limits, the devices can be damaged.

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

Part Marking

ZB Package



YYWW: Date Code (Year & Workweek)
J: Assembly Site Code
G: Wafer Fab Site Code

L Package



Z: Fixed Code
Y: Date Code (Year)
W: Date Code (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

PI3CH400

Packaging Mechanical

14-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: 14-Pin, 173mil Wide TSSOP

PACKAGE CODE: L (L14)

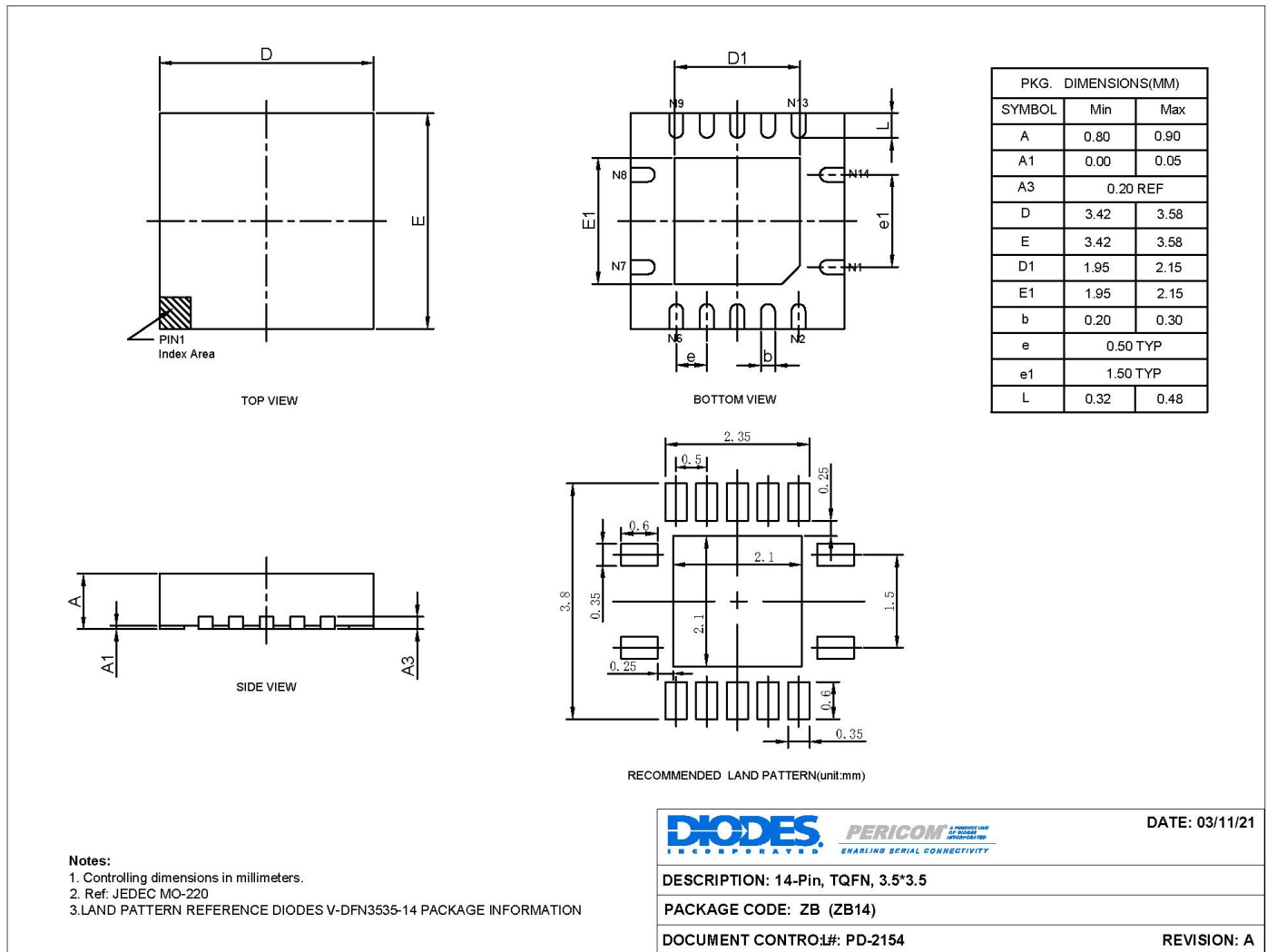
DOCUMENT CONTROL #: PD-1309

REVISION: E

16-0060

PI3CH400

14-Pin QFN (ZB)



21-1377

For latest package info.

please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>

Ordering Information

Part Number	Package Cede	Package Description
PI3CH400LEX	L	14-Pin, 173mil Wide (TSSOP)
PI3CH400ZBEX	ZB	14-Pin, 3.5x3.5 (TQFN)
PI3CH400ZBEX-13R	ZB	14-Pin, 3.5x3.5 (TQFN), Pin 1 orientation is Top

- Notes:**
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 - 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.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - E = Pb-free and Green
 - X suffix = Tape/Reel
 - For packaging detail, go to our website at: <https://www.diodes.com/assets/MediaList-Attachments/Diodes-Package-Information.pdf>

IMPORTANT NOTICE



1. DIODES INCORPORATED AND ITS SUBSIDIARIES (“DIODES”) MAKE NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO ANY INFORMATION CONTAINED IN THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).
2. The Information contained herein is for informational purpose only and is provided only to illustrate the operation of Diodes products described herein and application examples. Diodes does not assume any liability arising out of the application or use of this document or any product described herein. This document is intended for skilled and technically trained engineering customers and users who design with Diodes products. Diodes products may be used to facilitate safety-related applications; however, in all instances customers and users are responsible for (a) selecting the appropriate Diodes products for their applications, (b) evaluating the suitability of the Diodes products for their intended applications, (c) ensuring their applications, which incorporate Diodes products, comply the applicable legal and regulatory requirements as well as safety and functional-safety related standards, and (d) ensuring they design with appropriate safeguards (including testing, validation, quality control techniques, redundancy, malfunction prevention, and appropriate treatment for aging degradation) to minimize the risks associated with their applications.
3. Diodes assumes no liability for any application-related information, support, assistance or feedback that may be provided by Diodes from time to time. Any customer or user of this document or products described herein will assume all risks and liabilities associated with such use, and will hold Diodes and all companies whose products are represented herein or on Diodes’ websites, harmless against all damages and liabilities.
4. Products described herein may be covered by one or more United States, international or foreign patents and pending patent applications. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks and trademark applications. Diodes does not convey any license under any of its intellectual property rights or the rights of any third parties (including third parties whose products and services may be described in this document or on Diodes’ website) under this document.
5. Diodes products are provided subject to Diodes’ Standard Terms and Conditions of Sale (<https://www.diodes.com/about/company/terms-and-conditions/terms-and-conditions-of-sales/>) or other applicable terms. This document does not alter or expand the applicable warranties provided by Diodes. Diodes does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.
6. Diodes products and technology may not be used for or incorporated into any products or systems whose manufacture, use or sale is prohibited under any applicable laws and regulations. Should customers or users use Diodes products in contravention of any applicable laws or regulations, or for any unintended or unauthorized application, customers and users will (a) be solely responsible for any damages, losses or penalties arising in connection therewith or as a result thereof, and (b) indemnify and hold Diodes and its representatives and agents harmless against any and all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim relating to any noncompliance with the applicable laws and regulations, as well as any unintended or unauthorized application.
7. While efforts have been made to ensure the information contained in this document is accurate, complete and current, it may contain technical inaccuracies, omissions and typographical errors. Diodes does not warrant that information contained in this document is error-free and Diodes is under no obligation to update or otherwise correct this information. Notwithstanding the foregoing, Diodes reserves the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes.
8. Any unauthorized copying, modification, distribution, transmission, display or other use of this document (or any portion hereof) is prohibited. Diodes assumes no responsibility for any losses incurred by the customers or users or any third parties arising from any such unauthorized use.

Copyright © 2021 Diodes Incorporated







www.diodes.com

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View PI3CH400ZBEX on WIN SOURCE](#)
-  [Diodes Incorporated Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management