A product Line of
Diodes Incorporated

PI3PCIE3242A

3.3V PCI Express® 3.0 4 Channel 2x2 Exchange Switch

Features

- 4 Differential Channel 2x2 Exchange Switch
- PCI Express® 3.0 performance, 8.0 Gbps
- Bi-directional operation
- Low Bit-to-Bit Skew: 10ps (between ± signals)
- Low Crosstalk: -29dB @ 2.5GHz (5Gbps)
  -20dB @ 4.0GHz (8Gbps)
- Low Insertion Loss: -1.1dB @ 2.5GHz (5Gbps)
  -1.45dB @ 4.0GHz (8Gbps)
- V_{DD} Operating Range: 3.3V ±10%
- Industrial Temperature Range: -40°C to 85°C
- ESD Tolerance: 2kV HBM
- Packaging (Pb-free & Green):
  - 30-contact, TQFN (ZL30), 2.5 x 4.5mm.

Description

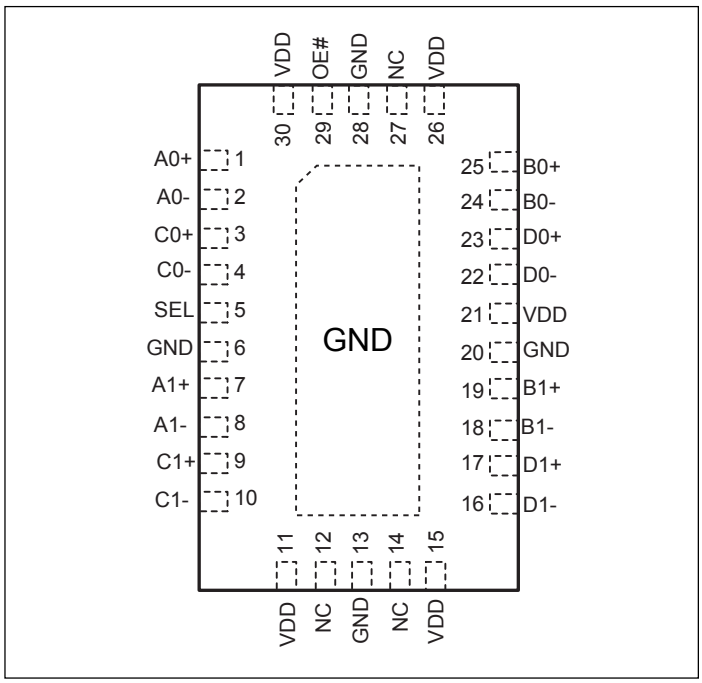
The PI3PCIE3242A is a differential exchange switch featuring pass-through pinout. It supports one full PCI Express® lane 2x2 Exchange Switch operating at 8.0Gbps PCIe® 3.0 performance.

With the select control input low, Port A connects to Port B, and Port C connects to port D for an 8-channel differential pass-though. When the select control input is high Port A connects to Port D, and Port B connects to Port C.

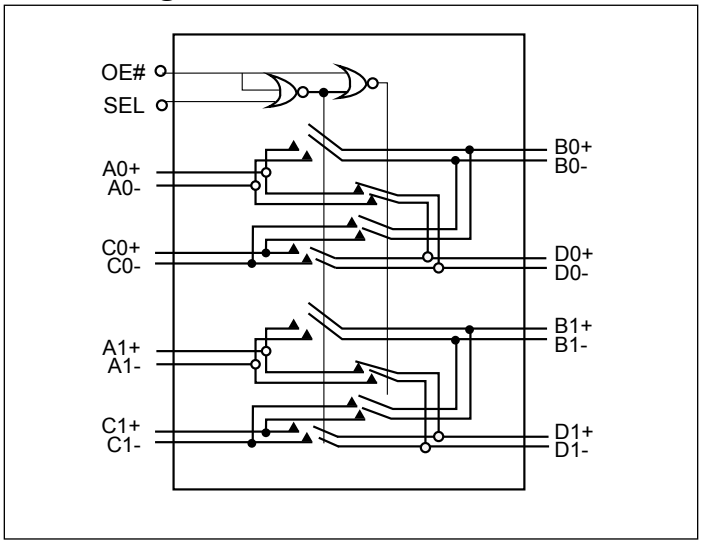
Truth Table

Function	SEL	OE#
Ax = Bx Cx = Dx	0	0
Ax = Dx Cx = Bx	1	0
Ax, Bx, Cx, Dx = Hi-Z (disconnect)	x	1

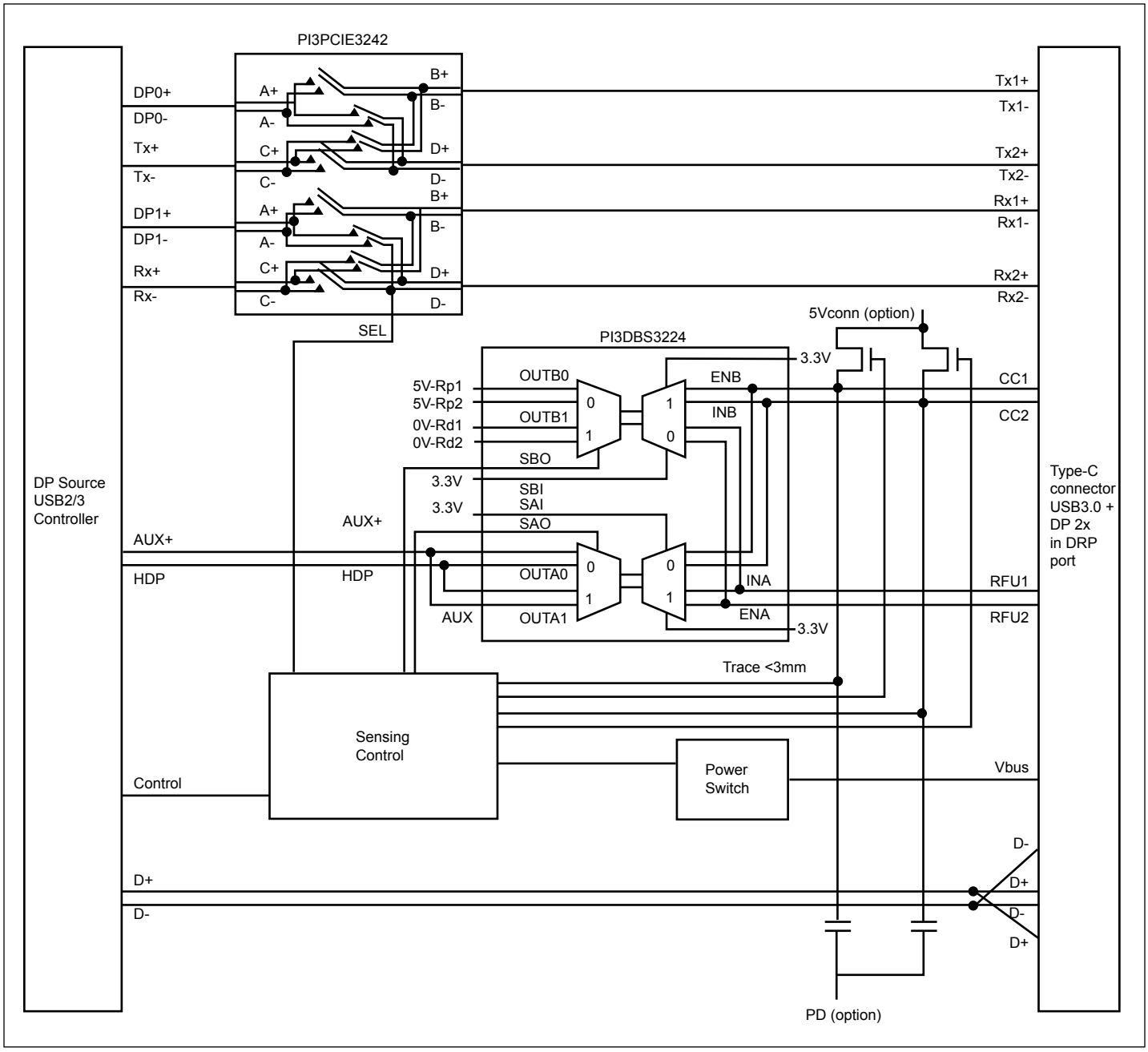
Pin Diagram 30-TQFN



Block Diagram



Application Diagram in Switching 2 Lanes of DP1.2 & USB 3.0 Signals Over Type C Connector Notebook or Tablet



Pin Description (30-TQFN)

Pin #	Pin Name	I/O	Description
1 2	A0+ A0–	I/O	Signal I/O, Channel 0, Port A
7 8	A1+ A1–	I/O	Signal I/O, Channel 1, Port A
25 24	B0+ B0–	I/O	Signal I/O, Channel 0, Port B
19 18	B1+ B1–	I/O	Signal I/O, Channel 1, Port B
3 4	C0+ C0–	I/O	Signal I/O, Channel 0, Port C
9 10	C1+ C1–	I/O	Signal I/O, Channel 1, Port C
23 22	D0+ D0–	I/O	Signal I/O, Channel 0, Port D
17 16	D1+ D1–	I/O	Signal I/O, Channel 1, Port D
29	OE#	I	Output Enable, active low. When OE# = 0 the device I/O is enabled. When OE#=1, all I/O are high impedance
5	SEL	I	Operation mode Select (when SEL=0: A→B, C→D, when SEL=1: A→D, C→B)
11, 15, 21, 26, 30	V_{DD}	Pwr	3.3V ±10% Positive Supply Voltage
6, 13, 20, 28, Center Pad	GND	Pwr	Power ground
12, 14, 27	NC		No Connect

Maximum Ratings

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

Storage Temperature	–65°C to +150°C
Supply Voltage to Ground Potential	–0.5V to +3.7V
DC Input Voltage	–0.5V to V_{DD}
DC Output Current	120mA
Power Dissipation	0.5W
Junction Temperature	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.

Electrical Characteristics Recommended Operating Conditions

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_{DD}	3.3V Power Supply		3.0	3.3	3.6	V
I_{DD}	Total current from V_{DD} 3.3V supply	SEL and OE# at OV or V_{DD}			200	µA
T_A	Operating temperature range		-40		85	°C

DC Electrical Characteristics for Switching over Operating Range

Parameters	Description	Test Conditions(1)	Min.	Typ.(1)	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed HIGH level	0.65 x V_{DD}			V
V_{IL}	Input LOW Voltage	Guaranteed LOW level	–0.5		0.35 x V_{DD}	
V_{IK}	Clamp Diode Voltage	V_{DD} = Max., I_{IN} = –18mA		–0.7	–1.2	
I_{IH}	Input HIGH Current, SEL	V_{DD} = Max., V_{IN} = V_{DD}	–10		+10	µA
I_{IL}	Input LOW Current, SEL	V_{DD} = Max., V_{IN} = GND	–10		+10	
IIH	Input HIGH Current, A_X, B_X, C_X, D_X	V_{DD} = Max., V_{IN} = 1.8V	–10		+10	µA
IIL	Input LOW Current, A_X, B_X, C_X ,D_X	V_{DD} = Max., V_{IN} = 0V	–10		+10	

Note:

1. Typical values are at VDD = 3.3V, TA = 25°C ambient and maximum loading.

Switching Characteristics

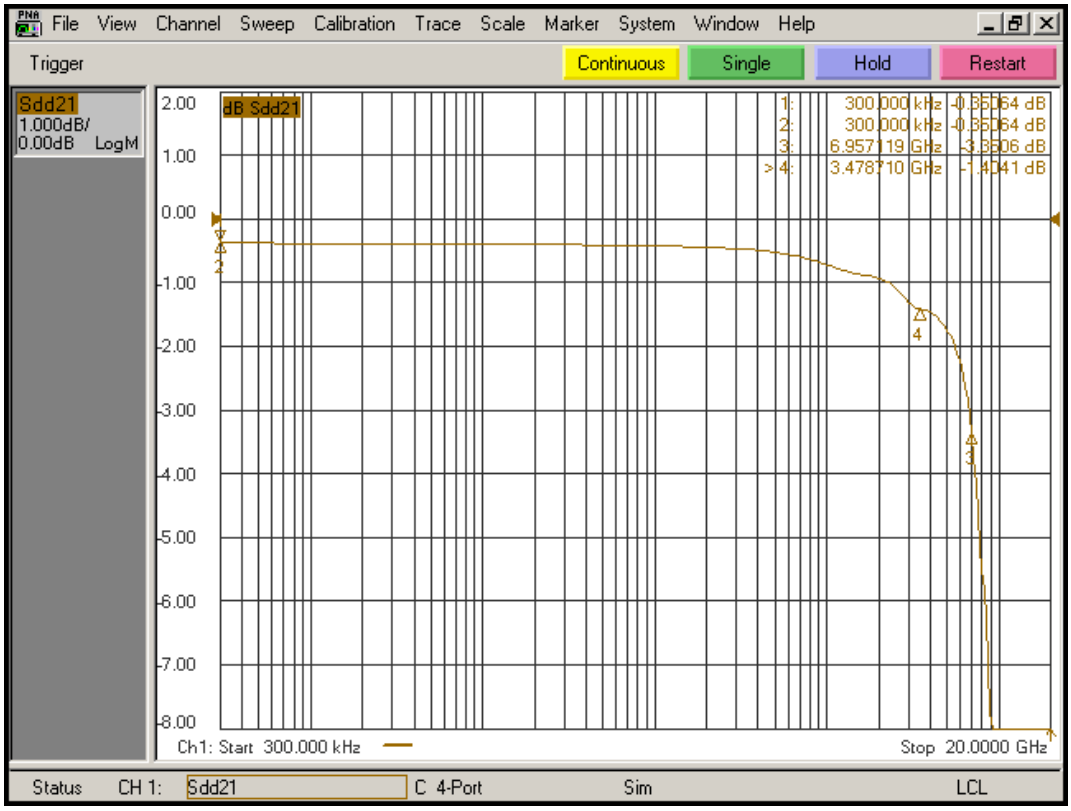
Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
t_{PZH}, t_{PZL}	Line Enable Time - SEL to A_N, B_N, C_N, D_N		0.5		45	ns
t_{PHZ}, t_{PLZ}	Line Disable Time - SEL to A_N, B_N, C_N, D_N		0.5		25	
t_{b-b}	Bit-to-bit skew within the same differential pair				10	ps
t_{ch-ch}	Channel-to-channel skew				20	

Dynamic Electrical Characteristics

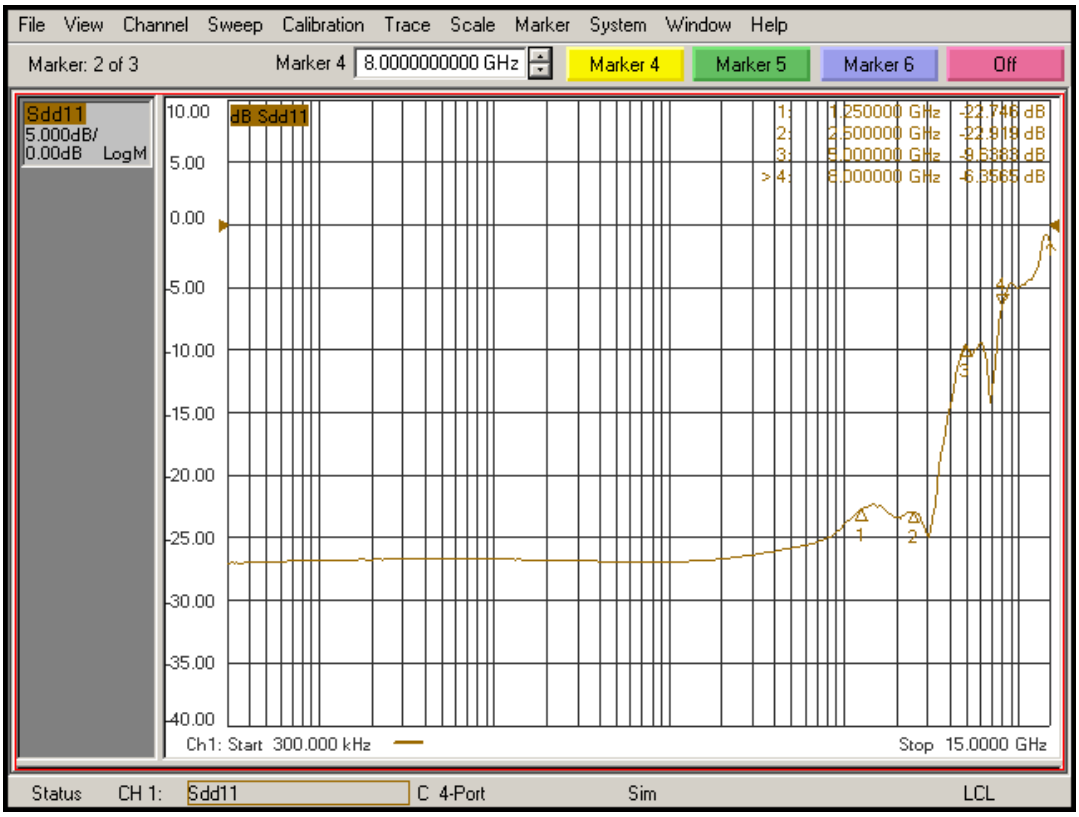
Parameter	Description	Test Conditions	Min.	Typ.(1)	Max.	Units
DDIL	Differential Insertion Loss (V_{IN} = -10dBm, DC = 0V)	f=1.2GHz		-0.8	-1.0	dB
		f=2.5GHz		-1.0	-1.2	
		f=4.0GHz		-1.3	-1.9	
		f=5.0GHz		-1.8	-2.6	
		f=7.5GHz		-4.5	-5.6	
$DDIL_{OFF}$	Differential Off Isolation	f= 4.0GHz		-19		dB
DDRL	Differential Return Loss	f= 0 to 2.8GHz		-26		dB
		f= 2.8 to 5.0GHz		-14		
		f= 5.0 to 8.0GHz		-7.5		
DDNEXT	Near End Crosstalk	f= 0 to 2.8GHz		-26		dB
		f= 2.8 to 5.0GHz		-20		
		f= 5.0 to 8.0GHz		-16		
V_{IF}	Max Signal Frequency Range	Insertion loss 1.5dB, V_{IN}=0.623Vpp, DC=0V		4.0		GHz
		Insertion loss 1.5dB, V_{IN}=0.623Vpp, DC=0.9V		4.0		
		Insertion loss 3dB, V_{IN}=0.623Vpp, DC=0V		8.0		
		Insertion loss 3dB, V_{IN}=0.623Vpp, DC=0.9V		8.0		
BW	-3dB Bandwidth			6.5		GHz

Notes:

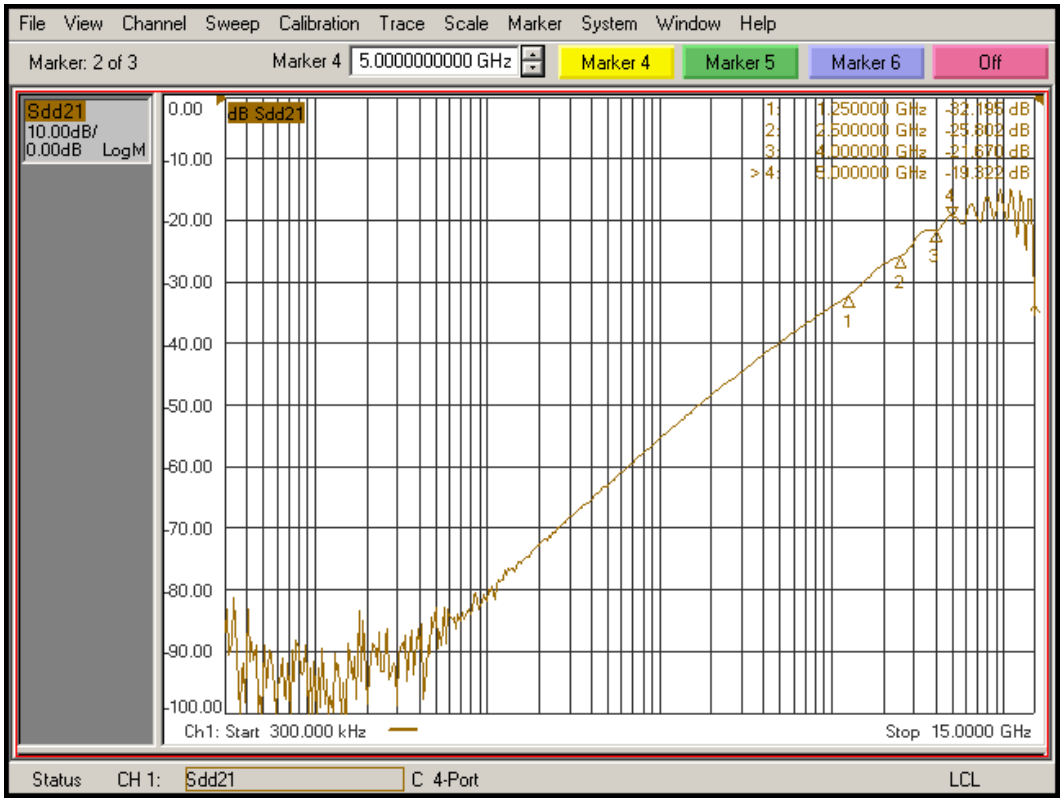
1. Guaranteed by design. Typical values are at V_{DD} = 3.3V , T_A = 25°C ambient and maximum loading.



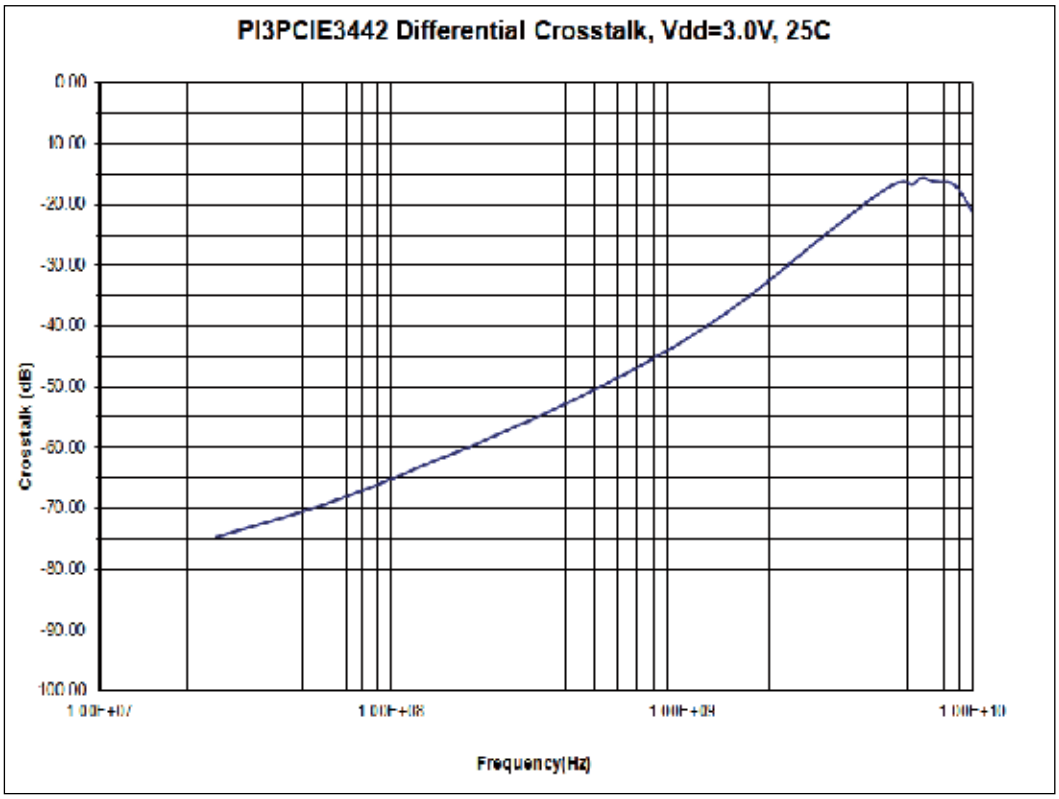
Differential Insertion Loss



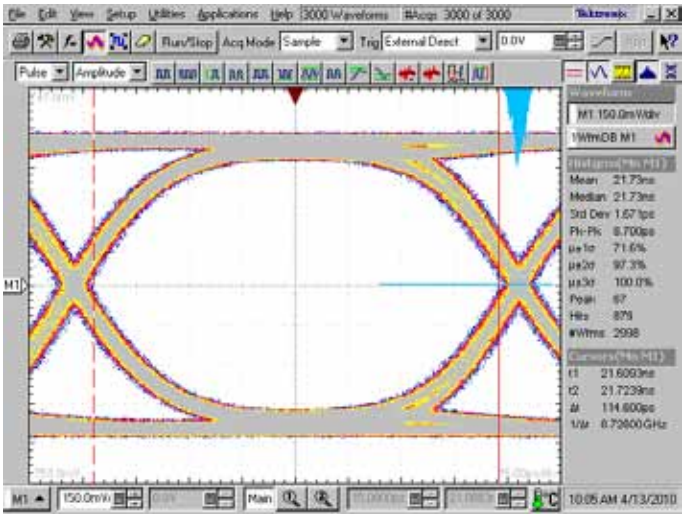
Differential Return Loss



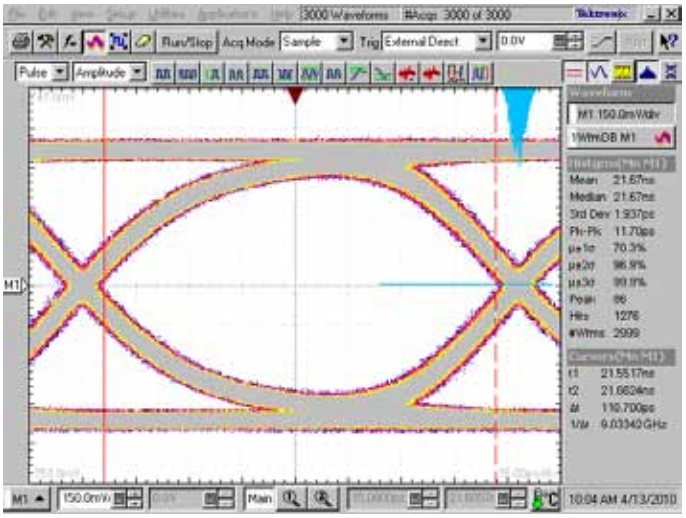
Differential Off Isolation



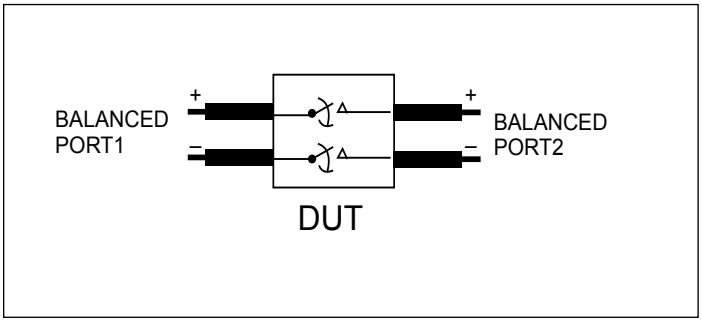
Differential Crosstalk



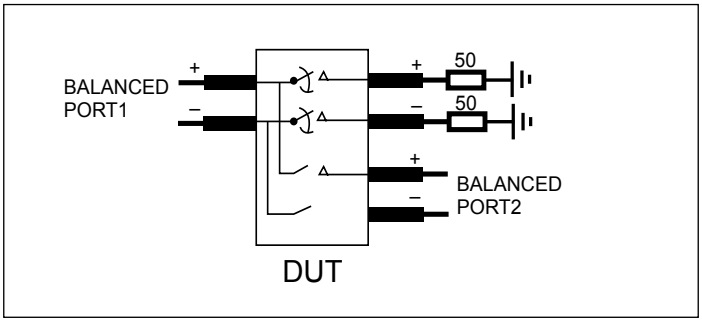
8.0 Gbps RX signal eye without PI3PCIE3242A



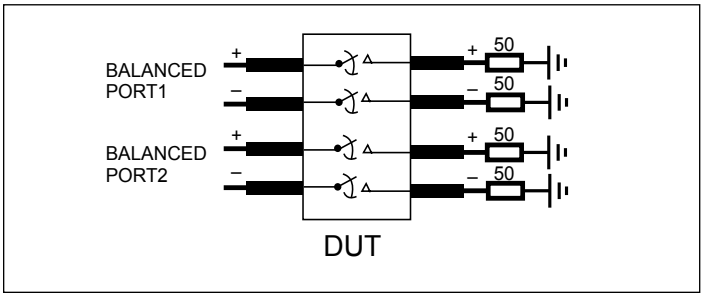
8.0 Gbps RX signal eye with PI3PCIE3242A



Differential Insertion Loss and Return Test Circuit

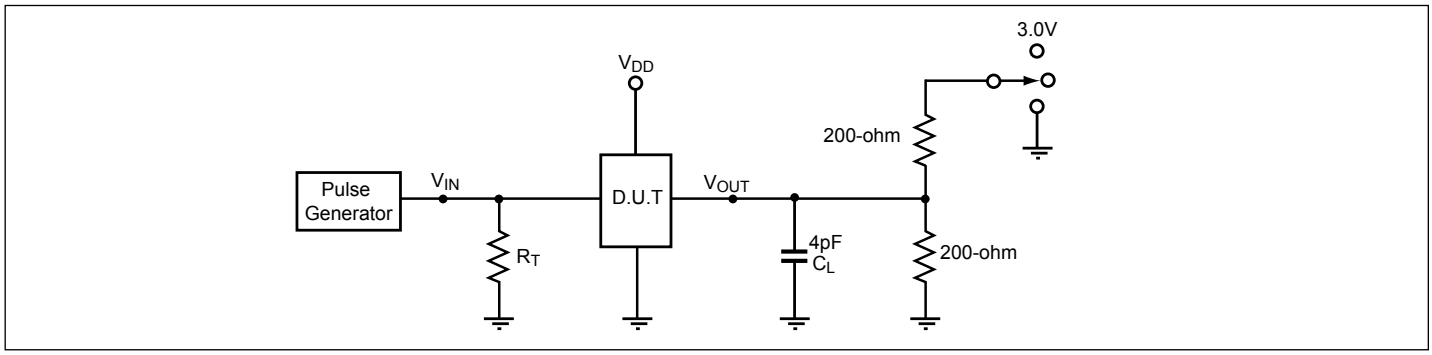


Differential Off Isolation Test Circuit



Differential Near End Xtalk Test Circuit

Test Circuit for Electrical Characteristics(1-5)



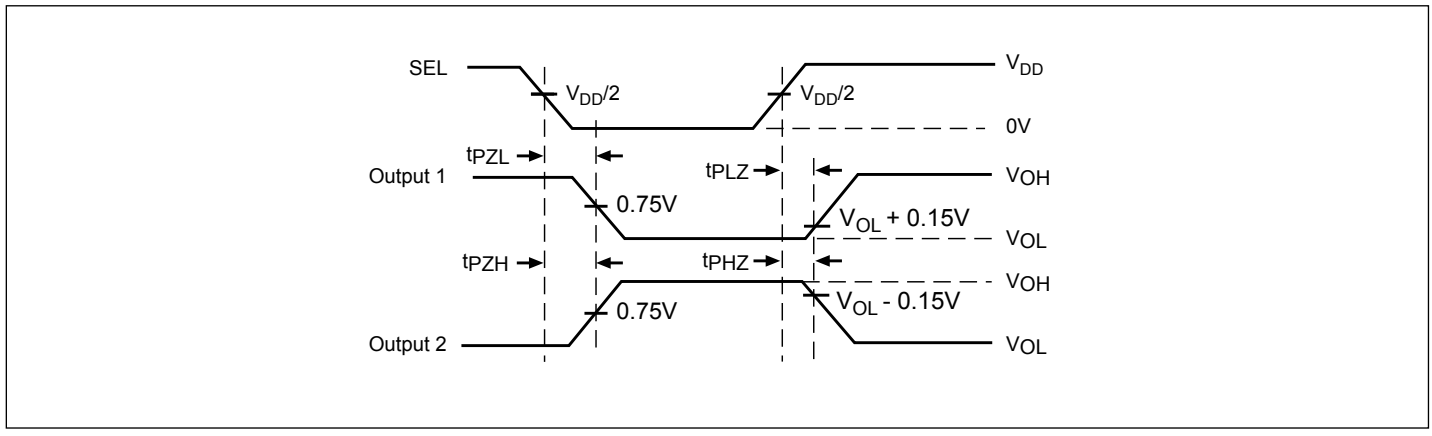
Notes:

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. Output 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
   output 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
4. All input impulses are supplied by generators having the following characteristics: PRR ≤ MHz, Z_O = 50Ω, t_R ≤ 2.5ns, t_F ≤ 2.5ns.
5. The outputs are measured one at a time with one transition per measurement.

Switch Positions

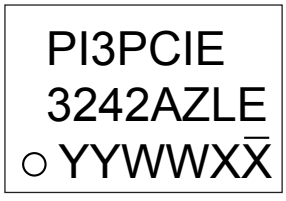
Test	Switch
t_{PLZ}, t_{PZL}	3.0V
t_{PHZ}, t_{PZH}	GND
Prop Delay	Open

Switching Waveforms



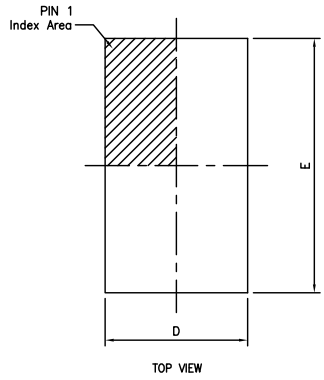
Voltage Waveforms Enable and Disable Times

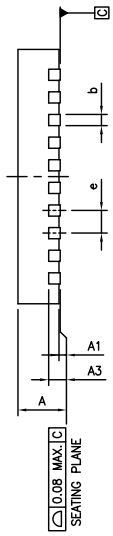
Part Marking Information

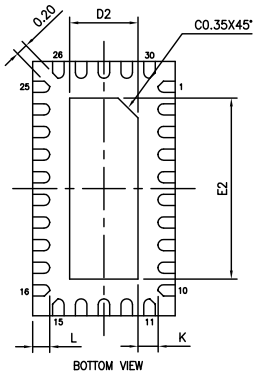


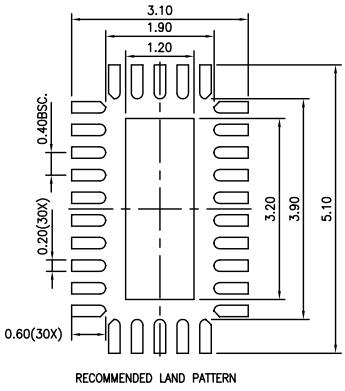
YY : Year
WW : Workweek
1st X: Assembly Code
2nd X: Fab Code

Packaging Mechanical: 30-Contact TQFN (2.5x4.5mm)









SYMBOLS	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.203 REF.		
b	0.15	0.20	0.25
D	2.40	2.50	2.60
E	4.40	4.50	4.60
D2	1.15	1.20	1.25
E2	3.15	3.20	3.25
e	0.40 BSC		
L	0.25	0.30	0.35
K	0.20	—	—

Notes:
1. All dimensions are in mm. Angles in degrees.
2. Refer JEDEC MO-220.
3. Recommended land pattern is for reference only.

PERICOM Enabling Serial Connectivity

DATE: 10/21/13

DESCRIPTION: 30-contact, Thin Fine Pitch Quad Flat No lead Package (TQFN)

PACKAGE CODE: ZL

DOCUMENT CONTROL #: PD-2172 **REVISION: --**

14-0006

For latest package info.

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

Ordering Information

Ordering Code	Package Code	Package Description
PI3PCIE3242AZLEX	ZL	30-contact, Thin Fine Pitch Quad Flat No-Lead (TQFN)

Notes:

- Thermal characteristics can be found on the company web site at www.diodes.com/design/support/packaging/
- E = Pb-free and Green
- X suffix = Tape/Reel

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

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 Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

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.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

www.diodes.com