

### 3.3V, PCI Express® 3.0 2-Lane, 2x2 Matrix Switch

#### Features

- 2-lane PCIe® 3.0, 2x2 Matrix Switch
- 8.0Gbps PCI Express 3.0 performance
- Bi-directional operation
- Low Bit-to-Bit Skew: 10ps (between +/- signals)
- Low Crosstalk: -19dB @ 4.0GHz (8.0Gbps)
- Low Insertion Loss: -1.5dB @ 4.0GHz (8.0Gbps)
- V<sub>DD</sub> Operating Range: 3.3V +/-10%
- ESD Tolerance = 2kV HBM
- Packaging (Pb-free & Green): 42-contact, TQFN (ZH42)

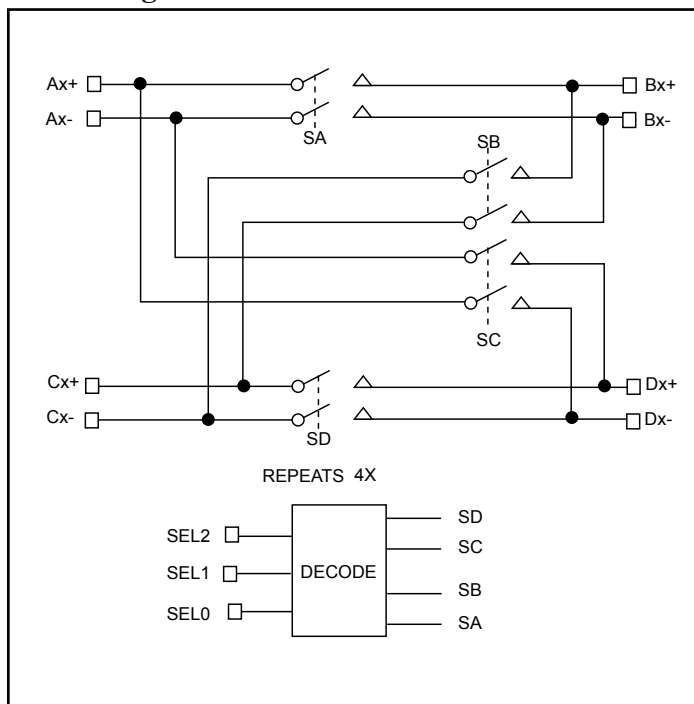
#### Truth Table<sup>(1)</sup>

Function	SEL2	SEL1	SEL0
Disconnect (A,B,C,D = Hi-Z)	L	L	L
A to B (C,D = Hi-Z)	L	L	H
C to D (A,B = Hi-Z)	L	H	L
A to B and C to D	L	H	H
Disconnect (A,B,C,D = Hi-Z)	H	L	L
A to D (B,C = Hi-Z)	H	L	H
C to B (A,D = Hi-Z)	H	H	L
A to D and C to B	H	H	H

#### Note:

1. H = High Voltage Level  
L = Low Voltage Level

#### Block Diagram



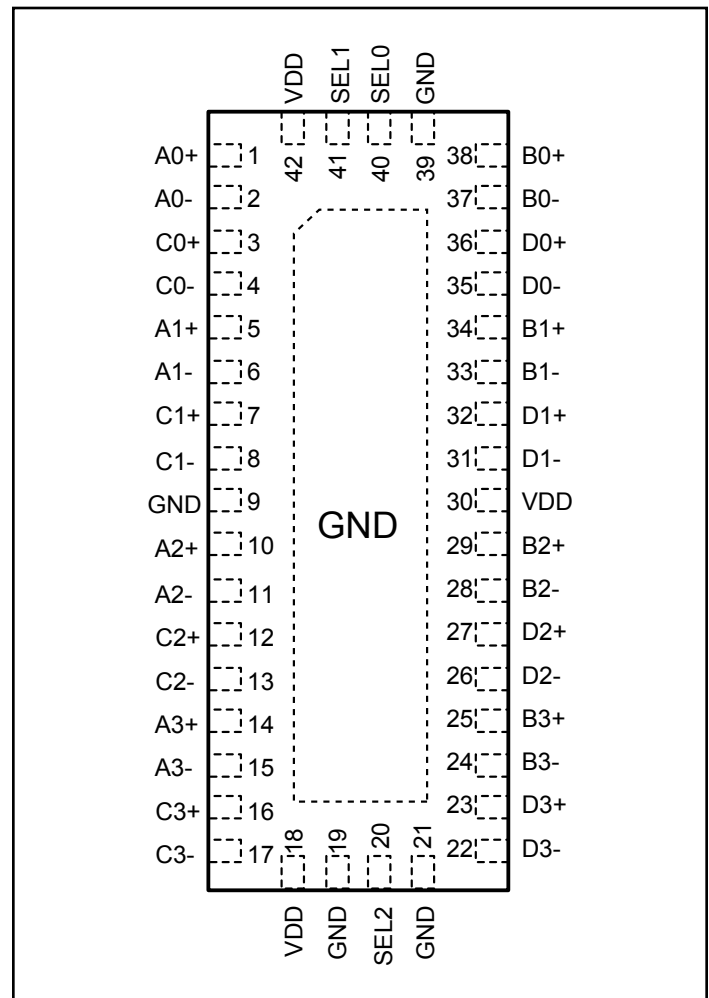
#### Description

Pericom semiconductor's PI3PCIE3452 is an 8 channel differential matrix switch featuring flexible port control and routing options. It supports two full PCI Express® lanes at 5.0Gbps PCIe 3.0 performance.

Port A or C can connect to either Port B or Port D, for pass-through or mux/demux operations in flexible configurations. Isolation of all ports is also an option.

The PI3PCIE3452 is intended for redundancy applications in sensor, storage and telecom systems.

#### Pin Description (Top-side view)



**Pin Description**

Pin #	Pin Name	I/O	Description
1 2	A0+ A0-	I/O	Differential Signal I/O
5 6	A1+ A1-	I/O	Differential Signal I/O
10 11	A2+ A2-	I/O	Differential Signal I/O
14 15	A3+ A3-	I/O	Differential Signal I/O
38 37	B0+ B0-	I/O	Differential Signal I/O
34 33	B1+ B1-	I/O	Differential Signal I/O
29 28	B2+ B2-	I/O	Differential Signal I/O
25 24	B3+ B3-	I/O	Differential Signal I/O
3 4	C0+ C0-	I/O	Differential Signal I/O
7 8	C1+ C1-	I/O	Differential Signal I/O
12 13	C2+ C2-	I/O	Differential Signal I/O
16 17	C3+ C3-	I/O	Differential Signal I/O
36 35	D0+ D0-	I/O	Differential Signal I/O
32 31	D1+ D1-	I/O	Differential Signal I/O
27 26	D2+ D2-	I/O	Differential Signal I/O
23 22	D3+ D3-	I/O	Differential Signal I/O
9, 19, 21, 39, Center Pad	GND	Power	Power ground
20 41 40	SEL2 SEL1 SEL0	I	SELECT Inputs (see Truth Table for operation)
18, 30, 42	V <sub>DD</sub>	Power	Positive supply voltage, 3.3V ±10%

## 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 +4.6V
DC Input Voltage .....	-0.5V to V <sub>DD</sub>
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.

## Electrical Characteristics

### Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>DD</sub>	3.3V Power Supply		3.0	3.3	3.6	V
I <sub>DD</sub>	Total current from V <sub>DD</sub> 3.3V supply	SELx = 0V or V <sub>DD</sub>			300	μA
T <sub>CASE</sub>	Case temperature range for operation within spec.		-40		85	Celsius

### DC Electrical Characteristics for Switching over Operating Range

Parameters	Description	Test Conditions <sup>(1)</sup>	Min	Typ <sup>(1)</sup>	Max	Units
V <sub>IH</sub>	Input HIGH Voltage	Guaranteed HIGH level	0.65 x V <sub>DD</sub>			V
V <sub>IL</sub>	Input LOW Voltage	Guaranteed LOW level	-0.5		0.35 x V <sub>DD</sub>	
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>DD</sub> = Max., I <sub>IN</sub> = -18mA		-0.7	-1.2	
I <sub>IH</sub>	Input HIGH Current	V <sub>DD</sub> = Max., V <sub>IN</sub> = V <sub>DD</sub>			±5	μA
I <sub>IL</sub>	Input LOW Current	V <sub>DD</sub> = Max., V <sub>IN</sub> = GND			±5	
R <sub>ON</sub>	On Channel Resistance	V <sub>DD</sub> = Min., V <sub>IN</sub> = 1.3V, I <sub>IN</sub> = 40mA		8	15	Ohm
C <sub>ON</sub>	On Channel Capacitance	V <sub>DD</sub> = 3.3V., V <sub>IN</sub> = 0		2.0		pF
I <sub>IH</sub>	Input HIGH Current, A <sub>x</sub> , B <sub>x</sub> , C <sub>x</sub> , D <sub>x</sub>	V <sub>DD</sub> = Max., V <sub>IN</sub> = 1.8V	-10		10	μA
I <sub>IL</sub>	Input LOW Current, A <sub>x</sub> , B <sub>x</sub> , C <sub>x</sub> , D <sub>x</sub>	V <sub>DD</sub> = Max., V <sub>IN</sub> = 0V	-10		10	

**Note:**

1. Typical values are at V<sub>DD</sub> = 3.3V, T<sub>A</sub> = 25°C ambient and maximum loading.

## Switching Characteristics

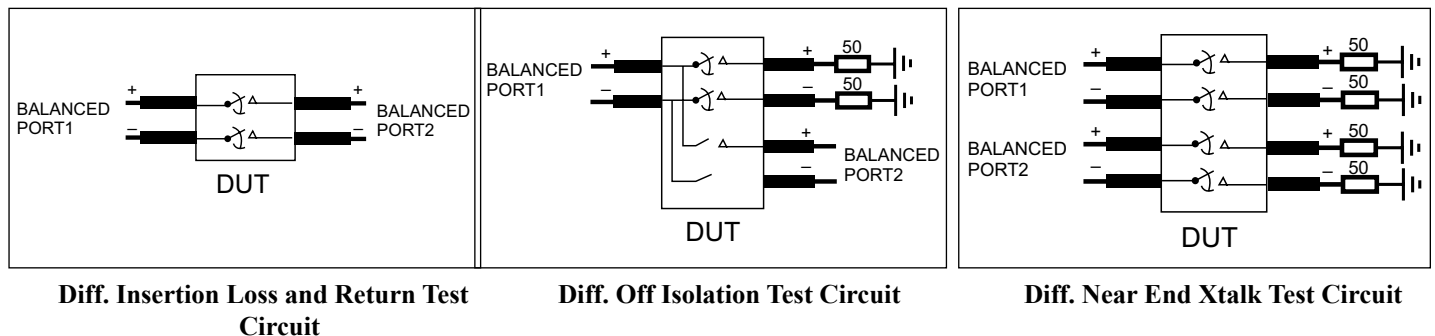
Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
t <sub>PZH</sub> , t <sub>PZL</sub>	Line Enable Time - SEL to A <sub>N</sub> , B <sub>N</sub> , C <sub>N</sub> , D <sub>N</sub>		2		40	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	Line Disable Time - SEL to A <sub>N</sub> , B <sub>N</sub> , C <sub>N</sub> , D <sub>N</sub>		2		10	
t <sub>b-b</sub>	Bit-to-bit skew within the same differential pair				10	ps
t <sub>ch-ch</sub>	Channel-to-channel skew				20	ps

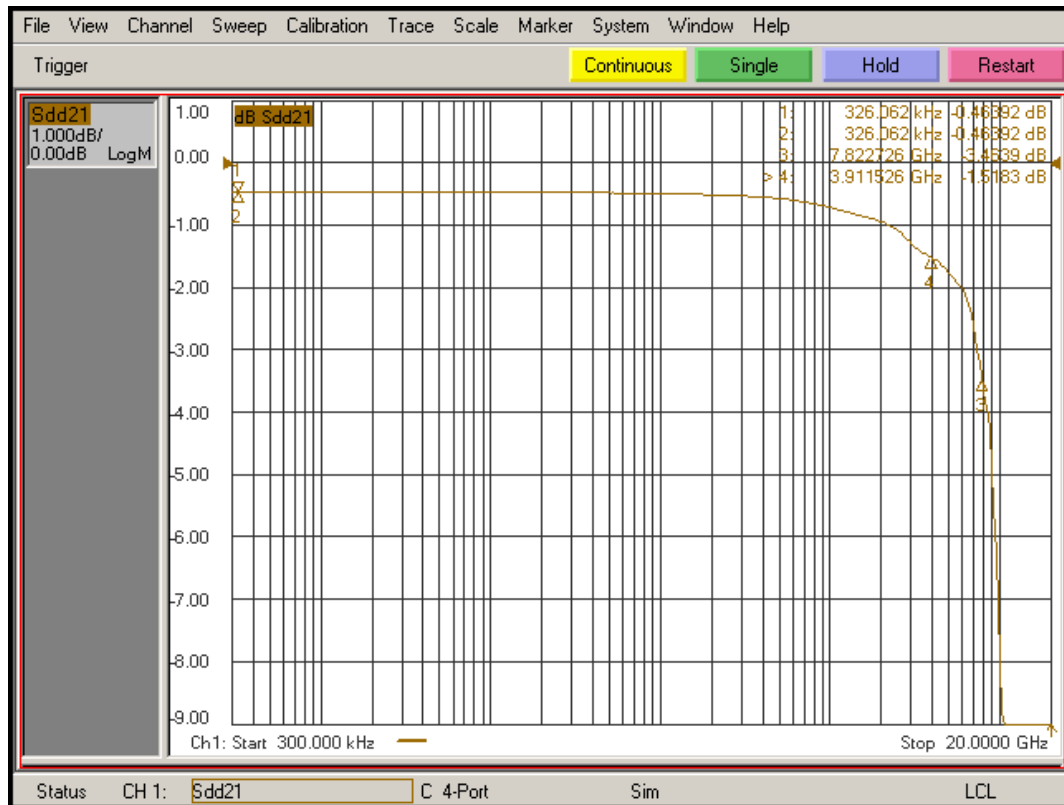
### Dynamic Electrical Characteristics

Parameter	Description	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Units
BW	Bandwidth -3dB			7.8		GHz
DDIL	Differential Insertion Loss ( $V_{IN} = -10\text{dBm}$ , DC = 0V)	f=1.2GHz f=2.5GHz f=4.0GHz f=5.0GHz f=7.5GHz	-0.9 -1.13 -1.70 -2.00 -3.5	-0.8 -1.10 -1.50 -1.8 -3.2		dB
DDIL <sub>OFF</sub>	Differential Off Isolation	f= 4.0GHz		-19		dB
DDRL	Differential Return Loss	f= 0 to 2.8GHz f= 2.8 to 5.0GHz f= 5.0 to 8.0GHz		-26 -14 -7.5		dB
DDNEXT	Near End Crosstalk	f= 0 to 2.8GHz f= 2.8 to 5.0GHz f= 5.0 to 8.0GHz		-26 -20 -16		dB
V <sub>IF</sub>	Max Signal Frequency Range	Insertion loss 1.5dB, $V_{IN}=0.623\text{Vpp}$ , DC=0V		4.0		GHz
		Insertion loss 1.5dB, $V_{IN}=0.623\text{Vpp}$ , DC=0.9V		4.0		

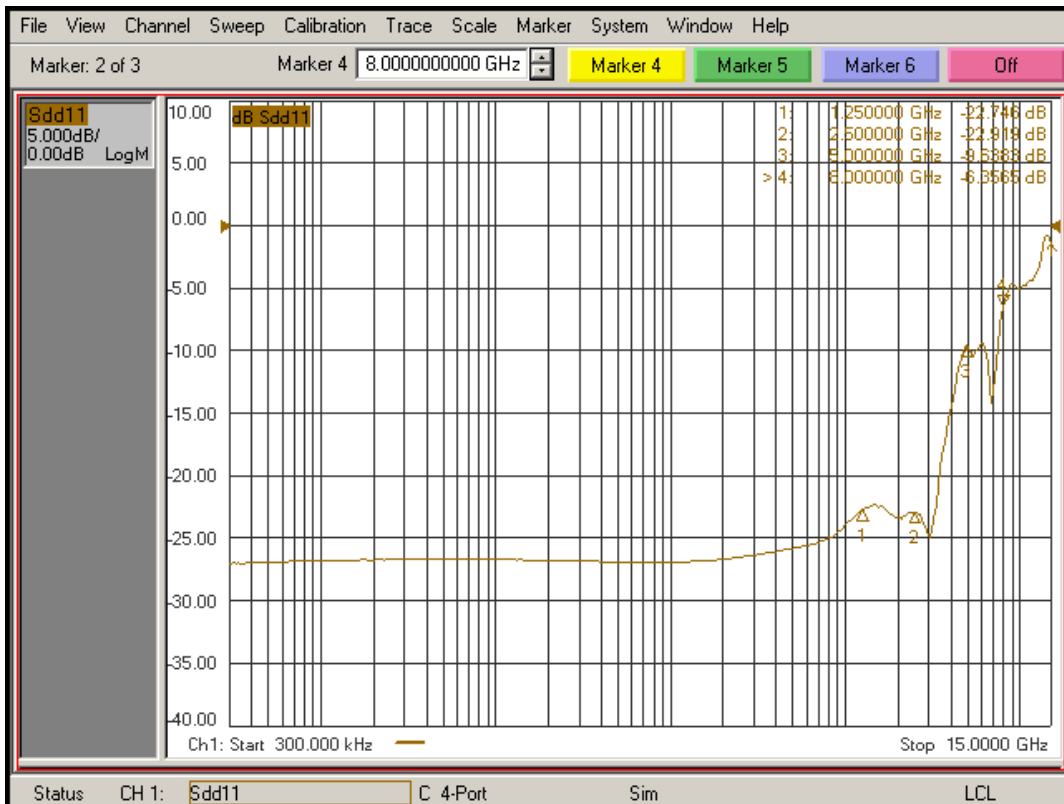
**Notes:**

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

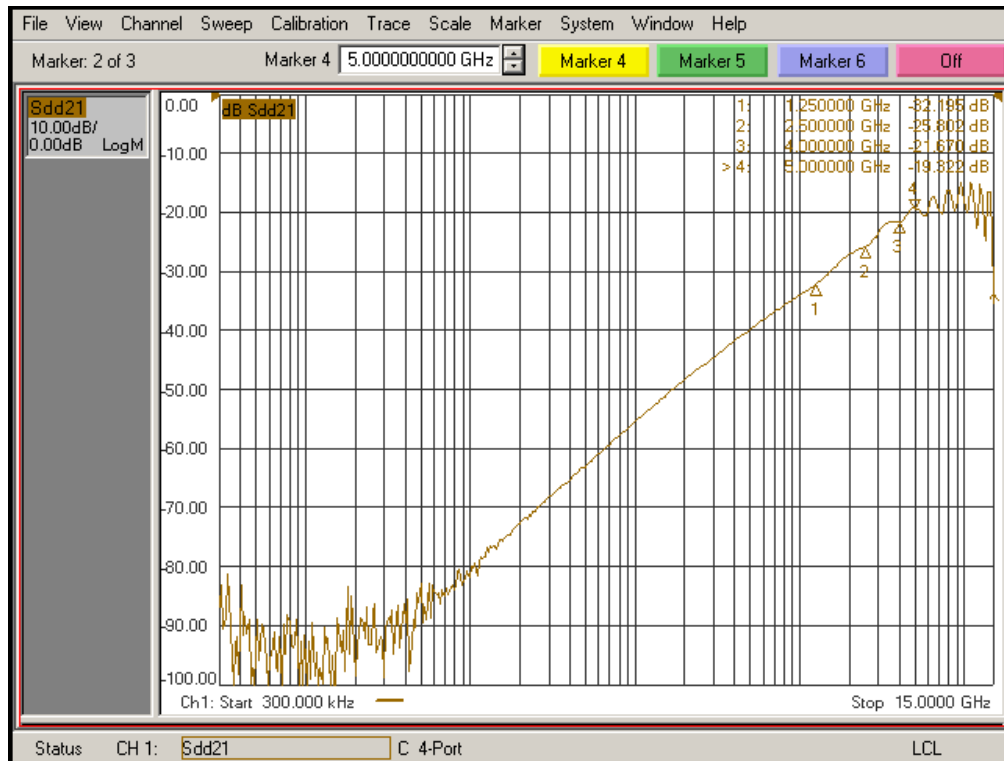




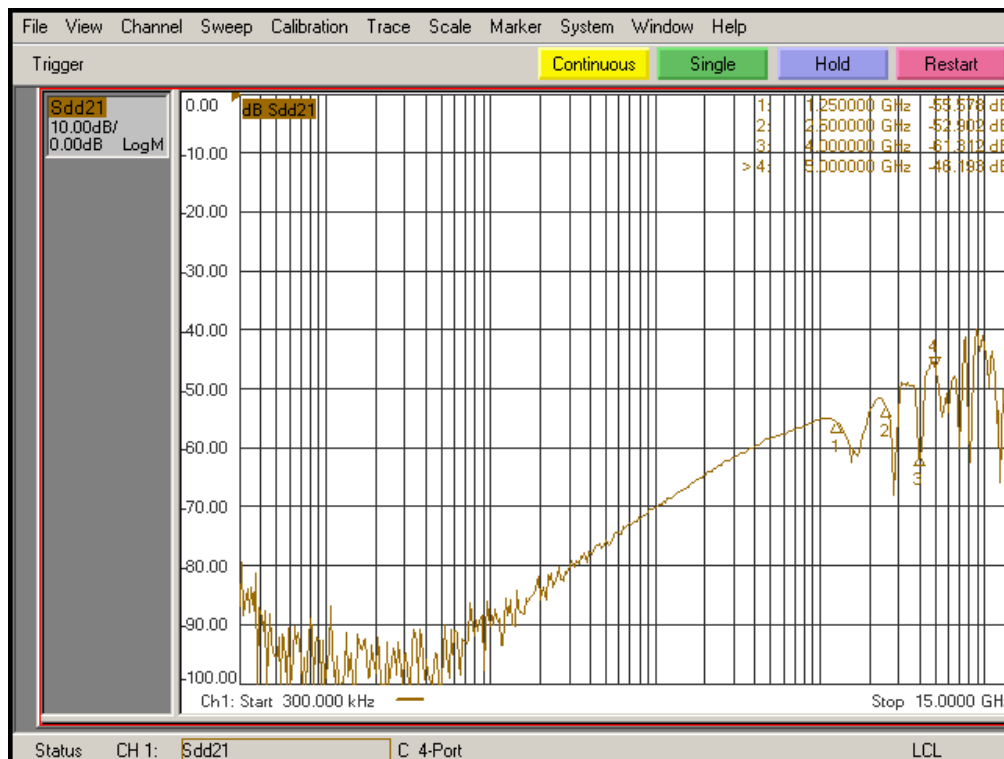
**Differential Insertion Loss**



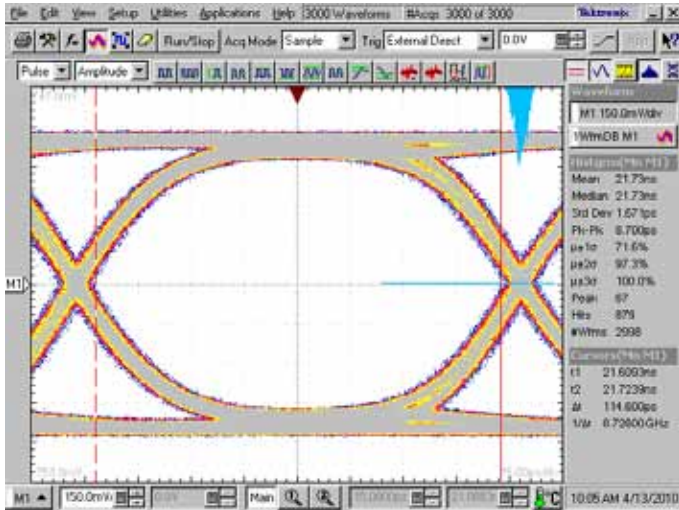
**Differential Return Loss**



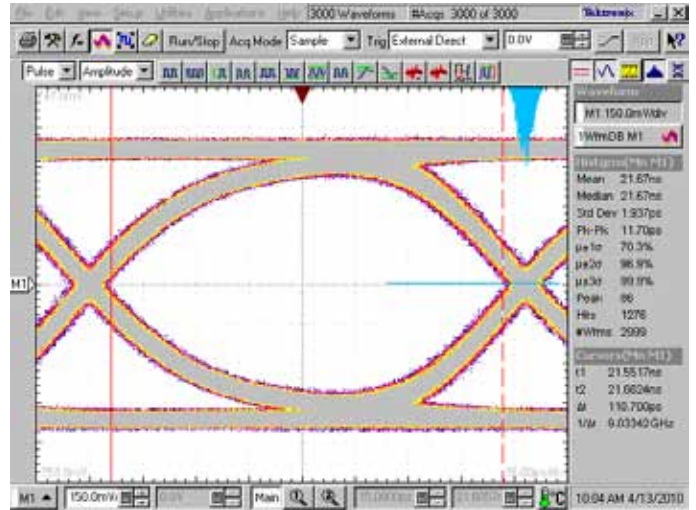
**Differential Off Isolation**



**Differential Crosstalk**

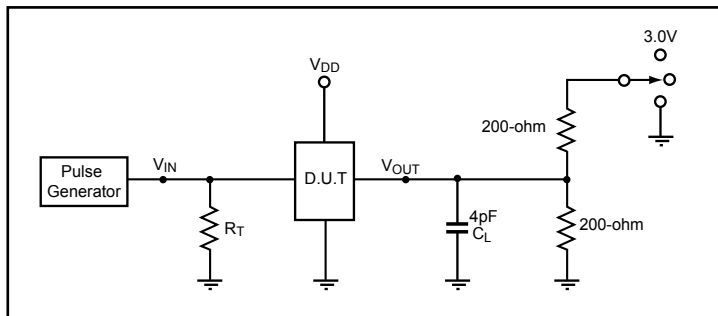


8.0 Gbps RX signal eye without PI3PCIE3452



8.0 Gbps RX signal eye with PI3PCIE3452

### Test Circuit for Electrical Characteristics<sup>(1-5)</sup>



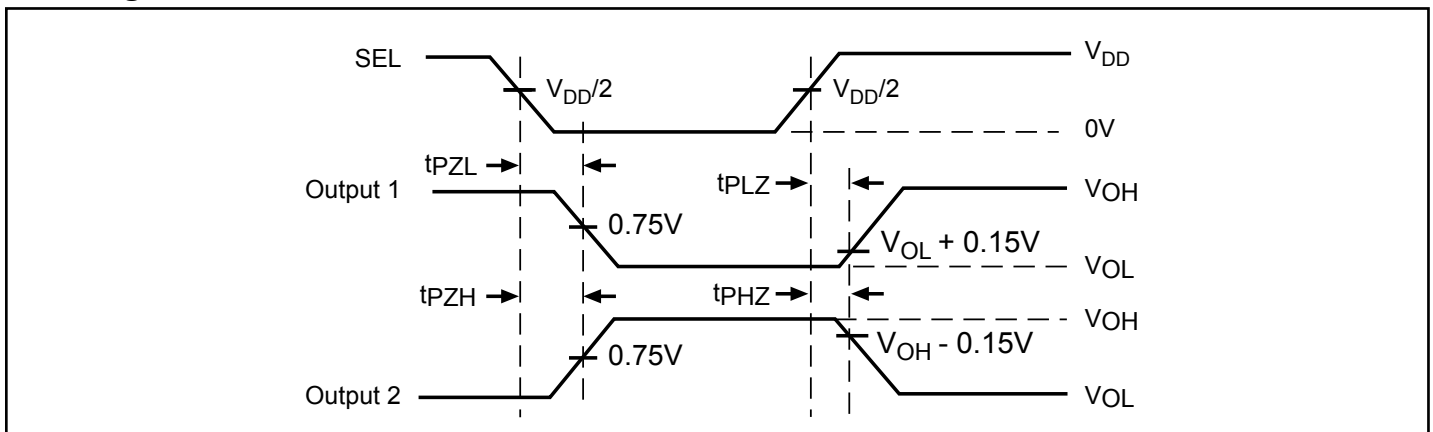
#### Notes:

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:  $PRR \leq \text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_R \leq 2.5\text{ns}$ ,  $t_F \leq 2.5\text{ns}$ .
5. The outputs are measured one at a time with one transition per measurement.

### Switch Positions

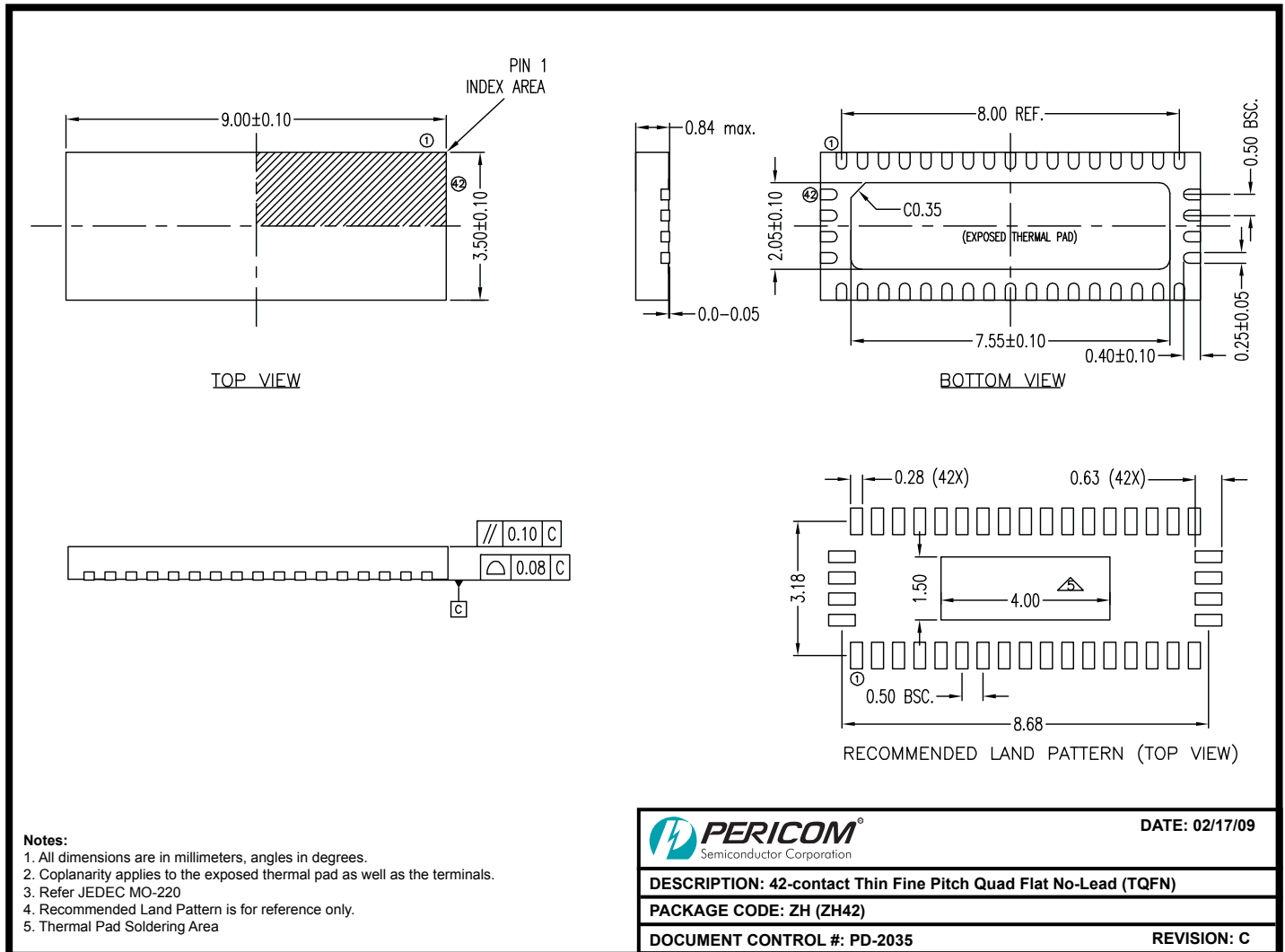
Test	Switch
$t_{PLZ}$ , $t_{PZL}$	3.0V
$t_{PHZ}$ , $t_{PZH}$	GND
Prop Delay	Open

### Switching Waveforms



Voltage Waveforms Enable and Disable Times

## Packaging Information



09-0116

**Note:**

- For latest package info, please check: <http://www.pericom.com/products/packaging/mechanicals.php>

## Ordering Information

Ordering Code	Package Code	Package Description
PI3PCIE3452ZHE	ZH	Pb-free & Green, 42-contact TQFN

**Notes:**

- Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
- "E" denotes Pb-free and Green
- Adding an "X" at the end of the ordering code denotes tape and reel packaging