

## PCI Express® 2.0, 2-lane Exchange Switch

## Features

- 8 Differential Channel (2-lane) Exchange Switch
- PCI Express® 2.0 performance, 5.0 Gbps
- Low Bit-to-Bit Skew: 10ps (between +/- signals)
- Low Crosstalk: -28dB @ 2.5 GHz (5Gbps)
- Low Insertion Loss: -2.1dB @ 2.5 GHz (5Gbps)
- V<sub>DD</sub> Operating Range: +1.5V to +1.8V ±10%
- ESD Tolerance: 2kV HBM
- Packaging: 42-contact TQFN (ZH42)

## Description

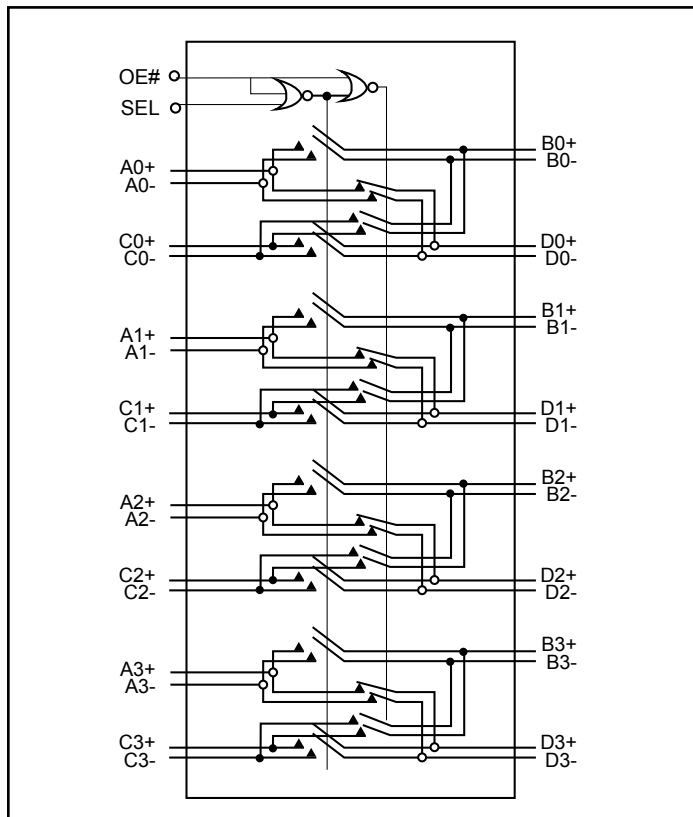
Pericom Semiconductor's PI2PCIE2442 is a differential exchange switch featuring pass-through pinout. It supports two full PCI Express lanes operating at 5.0Gbps PCIe® 2.0 performance.

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-through. When the select control input is high Port A connects to Port D, and Port B connects to Port C.

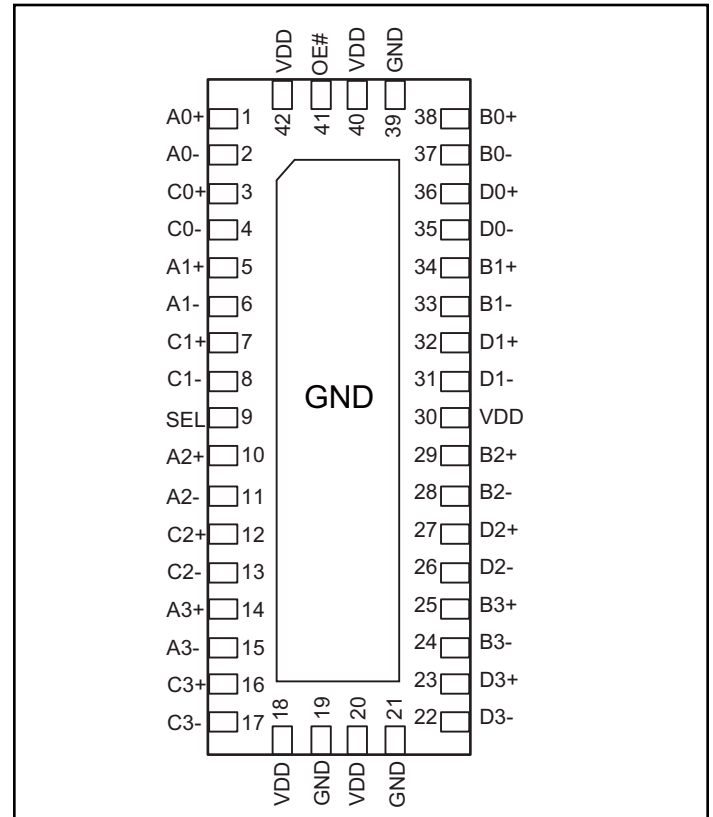
## Truth Table

Function	SEL	OE#
Ax = Bx Cx = Dx	L	0
Ax = Dx Cx = Bx	H	0
Ax, Bx, Cx, Dx = Hi-Z	x	1

### Block Diagram



### Pin Diagram



**Pin Description**

Pin #	Pin Name	I/O	Description
1 2	A0+ A0–	I/O	Signal I/O, Channel 0, Port A
5 6	A1+ A1–	I/O	Signal I/O, Channel 1, Port A
10 11	A2+ A2–	I/O	Signal I/O, Channel 2, Port A
14 15	A3+ A3–	I/O	Signal I/O, Channel 3, Port A
38 37	B0+ B0–	I/O	Signal I/O, Channel 0, Port B
34 33	B1+ B1–	I/O	Signal I/O, Channel 1, Port B
29 28	B2+ B2–	I/O	Signal I/O, Channel 2, Port B
25 24	B3+ B3–	I/O	Signal I/O, Channel 3, Port B
3 4	C0+ C0–	I/O	Signal I/O, Channel 0, Port C
7 8	C1+ C1–	I/O	Signal I/O, Channel 1, Port C
12 13	C2+ C2–	I/O	Signal I/O, Channel 2, Port C
16 17	C3+ C3–	I/O	Signal I/O, Channel 3, Port C
36 35	D0+ D0–	I/O	Signal I/O, Channel 0, Port D
32 31	D1+ D1–	I/O	Signal I/O, Channel 1, Port D
27 26	D2+ D2–	I/O	Signal I/O, Channel 2, Port D
23 22	D3+ D3–	I/O	Signal I/O, Channel 3, Port D
41	OE#	I	Output Enable, active low. When OE# = 0 the device I/O is enabled. When OE#=1, all I/O are high impedance
9	SEL	I	Operation mode Select (when SEL=0: A→B, C→D, when SEL=1: A→D, C→B)
18, 20, 30, 40, 42	V <sub>DD</sub>	Pwr	1.5V to 1.8V (±0.1V) Positive Supply Voltage
19, 21, 39, Center Pad	GND	Pwr	Power ground

## 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 +2.5V
DC Input Voltage .....	–0.5V to $V_{DD}$
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.

## Power Supply Characteristics

Parameters	Description	Test Conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Units
$I_{DD}$	Quiescent Power Supply Current	$V_{DD} = \text{Max.}, V_{IN} = \text{GND or } V_{DD}$			400	$\mu\text{A}$

### Notes:

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

## DC Electrical Characteristics for Switching over Operating Range

( $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $V_{DD} = 1.5\text{V}$  to  $1.8\text{V} \pm 10\%$ )

Parameter	Description	Test Conditions	Min	Typ <sup>(1)</sup>	Max	Units
$V_{IH}$	Input HIGH Voltage, SEL and OE#	Guaranteed HIGH level	$0.65 \times V_{DD}$			V
$V_{IL}$	Input LOW Voltage, SEL and OE#	Guaranteed LOW level	–0.5		$0.35 \times V_{DD}$	
$V_{IK}$	Clamp Diode Voltage, SEL and OE#	$V_{DD} = \text{Max.}, I_{IN} = -18\text{mA}$		–0.7	–1.2	
$I_{IH}$	Input HIGH Current, SEL and OE#	$V_{DD} = \text{Max.}, V_{IN} = V_{DD}$			$\pm 5$	$\mu\text{A}$
$I_{IL}$	Input LOW Current, SEL and OE#	$V_{DD} = \text{Max.}, V_{IN} = \text{GND}$			$\pm 5$	
$V_{IDC}$	DC Signal Voltage Range, channel I/O ( $A_X, B_X, C_X, D_X$ )	$V_O/V_I > 95\%$ , $R_L = 10\text{K-Ohms}$	–0.4		2.5	V
		$V_O/V_I > 80\%$ , $R_L = 50\text{-Ohms}$	–0.3		1.2	
$R_{ON}$	Channel On Resistance	$V_{DD} = \text{Min.}, V_{IN} = 1.3\text{V}, I_{IN} = 40\text{mA}$			10	Ohm
$C_{ON(AB)}$	Channel On Capacitance	$V_{IN} = 0, V_{DD} = 1.8\text{V}$		2.2	3.0	pF

### Note:

- Typical values are at  $V_{DD} = 1.8\text{V}$ ,  $T_A = 25^\circ\text{C}$  ambient and maximum loading.

### Switching Characteristics

( $T_A = -40^\circ$  to  $+85^\circ\text{C}$ ,  $V_{DD} = 1.5\text{V}$  to  $1.8\text{V} \pm 10\%$ )

Parameter	Description	Min.	Typ.	Max.	Units
$t_{PZH}, t_{PZL}$	Line Enable Time - SEL to $A_N, B_N$	0.5		8	ns
$t_{PHZ}, t_{PLZ}$	Line Disable Time - SEL to $A_N, B_N$	0.5		8	
$t_{b-b}$	Bit-to-bit skew within same differential pair			4	ps
$t_{ch-t_{ch}}$	Channel-to-channel timing skew			35	

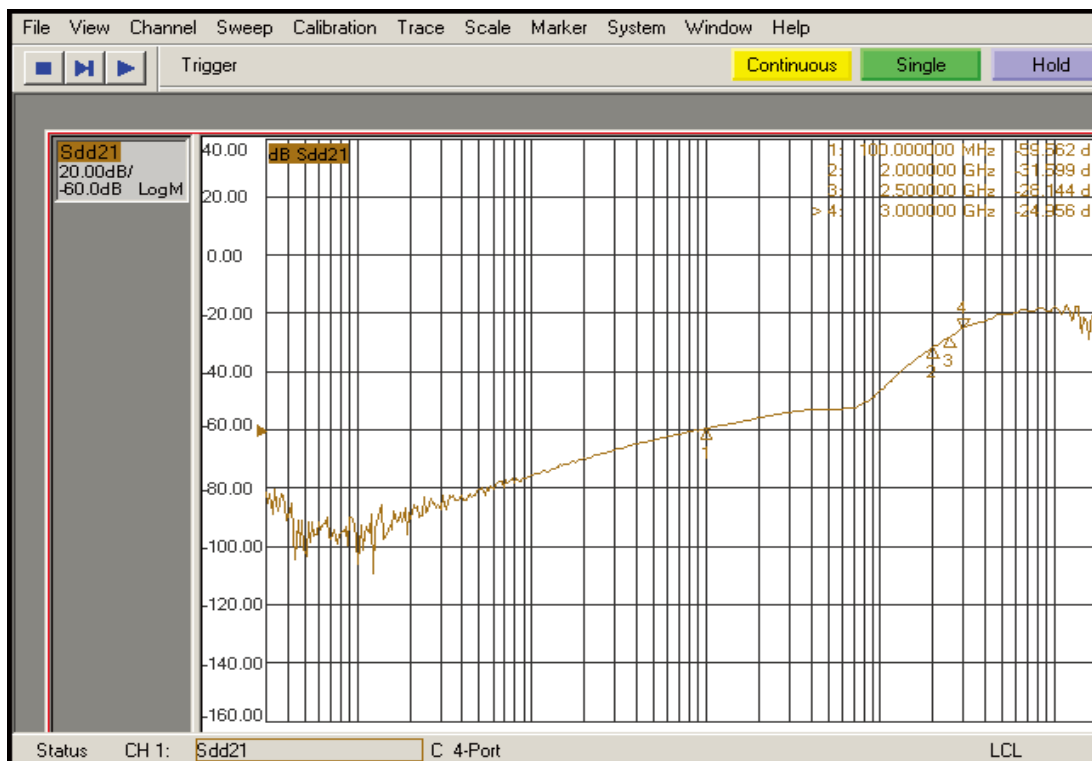
### Dynamic Electrical Characteristics Over the Operating Range

( $T_A = -40^\circ$  to  $+85^\circ\text{C}$ ,  $V_{DD} = 1.5\text{V}$  to  $1.8\text{V} \pm 10\%$ )

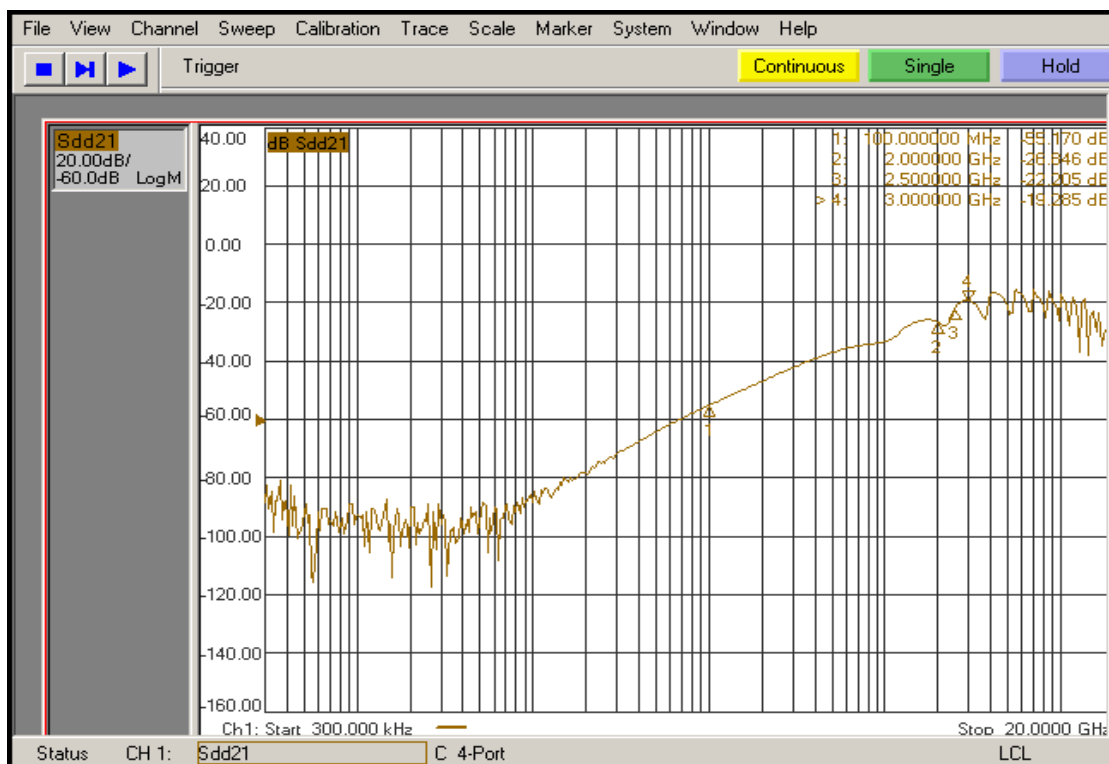
Parameter	Description	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Units
BW	Bandwidth (-3dB)			3.4		GHz
$V_{IF}$	Max Signal Frequency Range	Insertion loss 1.5dB, $V_{IN}=0.6\text{V}_{pp}$ , DC=0V	1.6			GHz
		Insertion loss 1.5dB, $V_{IN}=0.6\text{V}_{pp}$ , DC=0.9V	1.6			
		Insertion loss 3dB, $V_{IN}=0.6\text{V}_{pp}$ , DC=0V	3.0			
		Insertion loss 3dB, $V_{IN}=0.6\text{V}_{pp}$ , DC=0.9V	3.0			
P-1dB	1 dB Compression Input Signal	$R_L = 50$ , $f=625\text{MHz}$ , sin wave, DC=0V	1.2			Vpp
		$R_L = 50$ , $f=625\text{MHz}$ , sin wave, DC=0.45V	2.0			
		$R_L = 50$ , $f=625\text{MHz}$ , sin wave, DC=0.9V	2.4			
$R_{LOSS}$	Return Loss	$f = 2.5\text{GHz}$		-18		dB
$X_{TALK}$	Crosstalk	$f = 2.5\text{GHz}$		-28		
		$f = 100\text{MHz}$		-60		
$O_{IRR}$	OFF Isolation	$f = 2.5\text{GHz}$		-22		
		$f = 100\text{MHz}$		-55		
$I_{LOSS}$	Differential Insertion Loss	$f = 2.5\text{GHz}$		-2.1		

#### Notes:

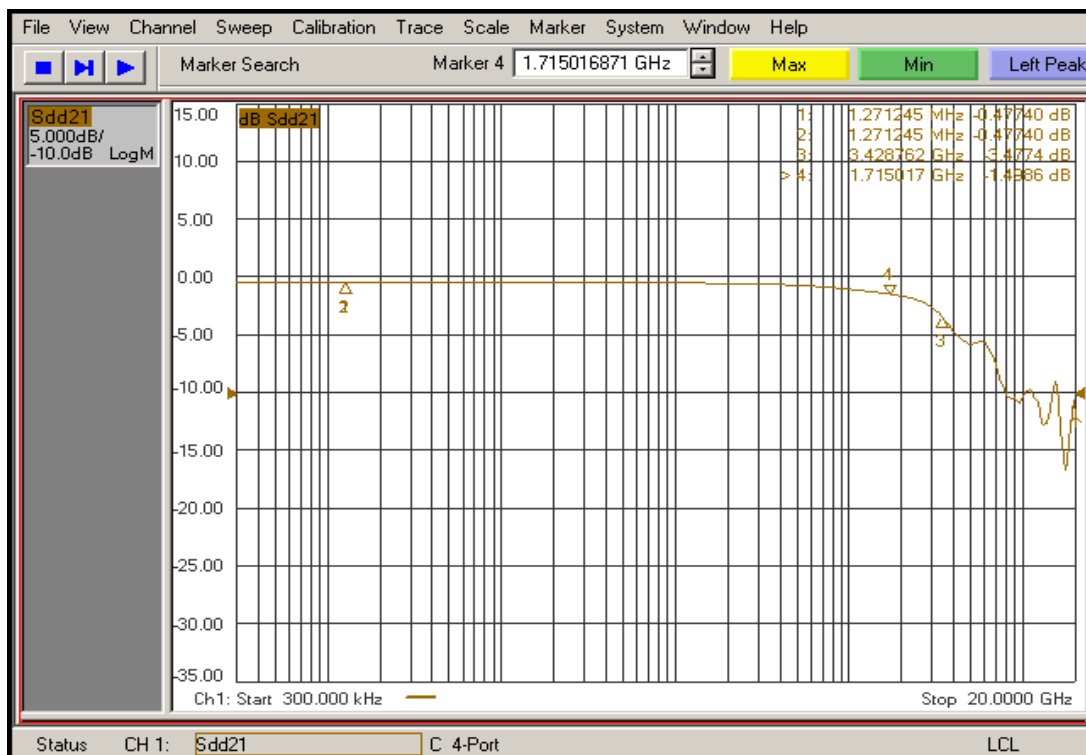
- Guaranteed by design. Typical values are at  $V_{DD} = 1.8\text{V}$ ,  $T_A = 25^\circ\text{C}$  ambient and maximum loading.



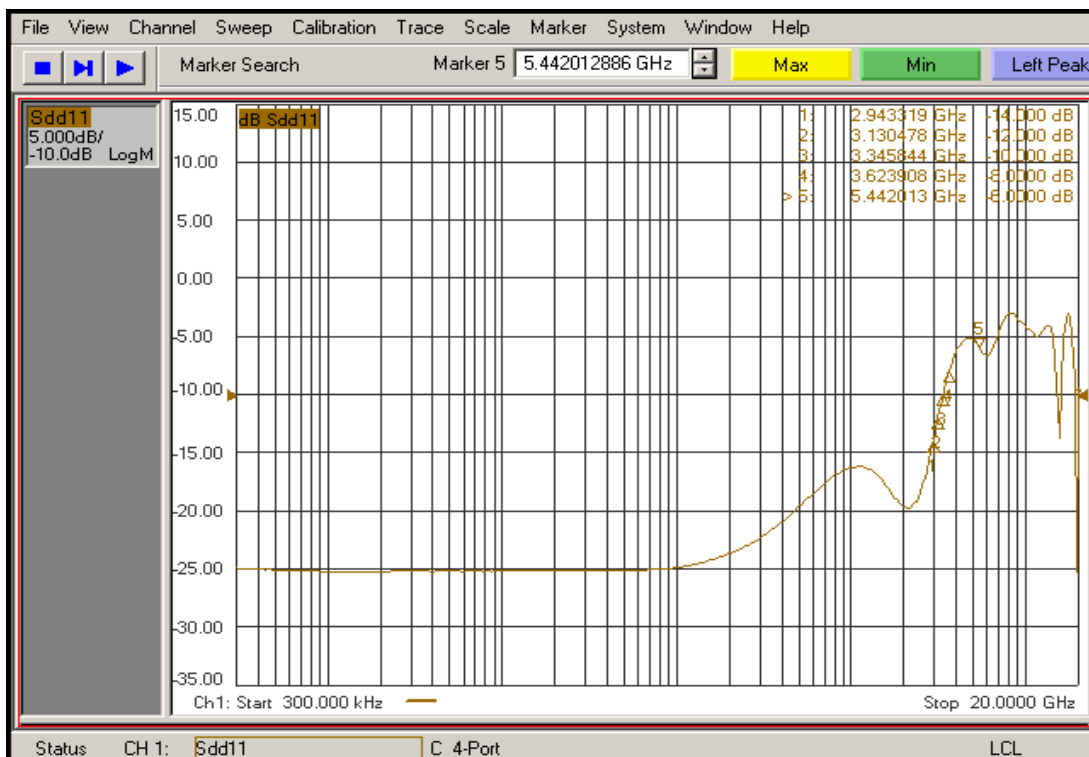
**Crosstalk ( $V_{DD} = 1.8V$ ,  $25^{\circ}C$ )**



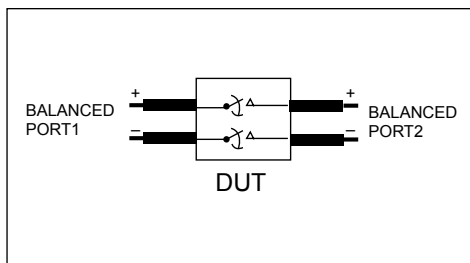
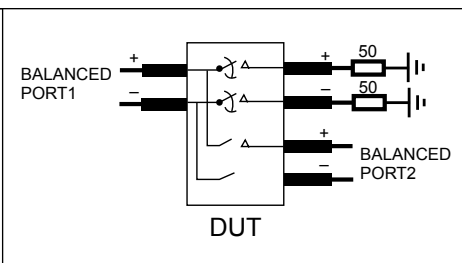
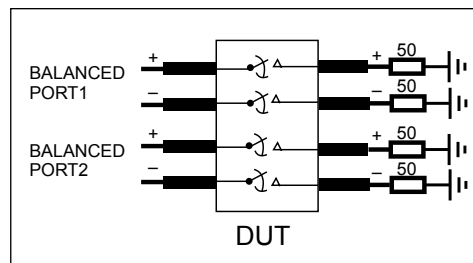
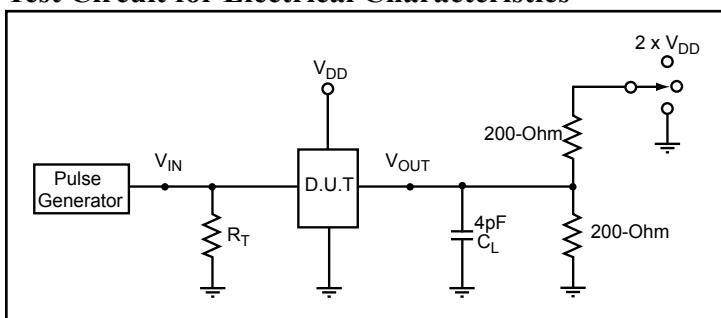
**Differential Off Isolation( $V_{DD} = 1.8V$ ,  $T_A = 25^{\circ}C$ )**



**Insertion Loss ( $V_{DD} = 1.8V$ ,  $25^{\circ}C$ )**



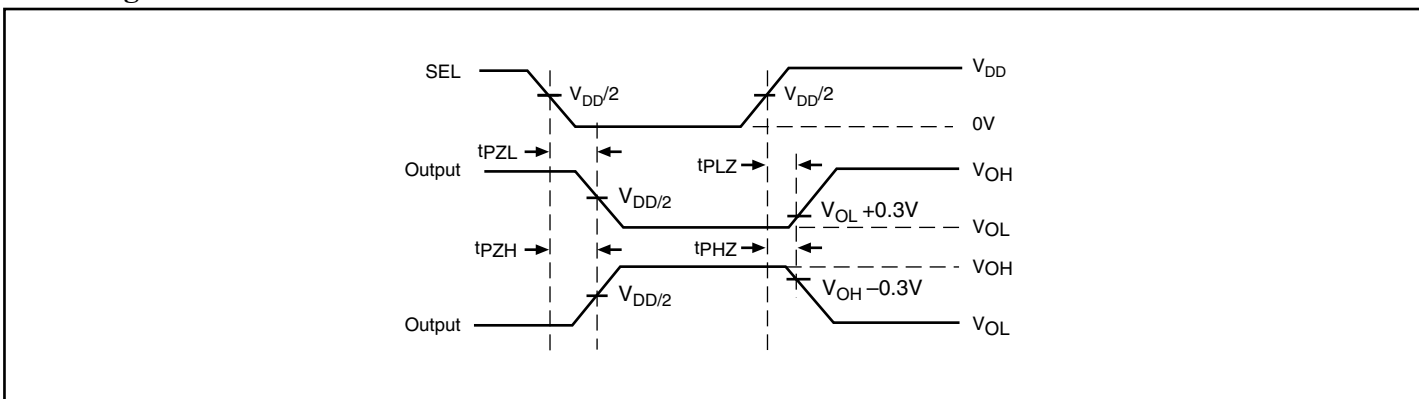
**Differential Return Loss ( $V_{DD} = 1.8V$ ,  $25^{\circ}C$ )**

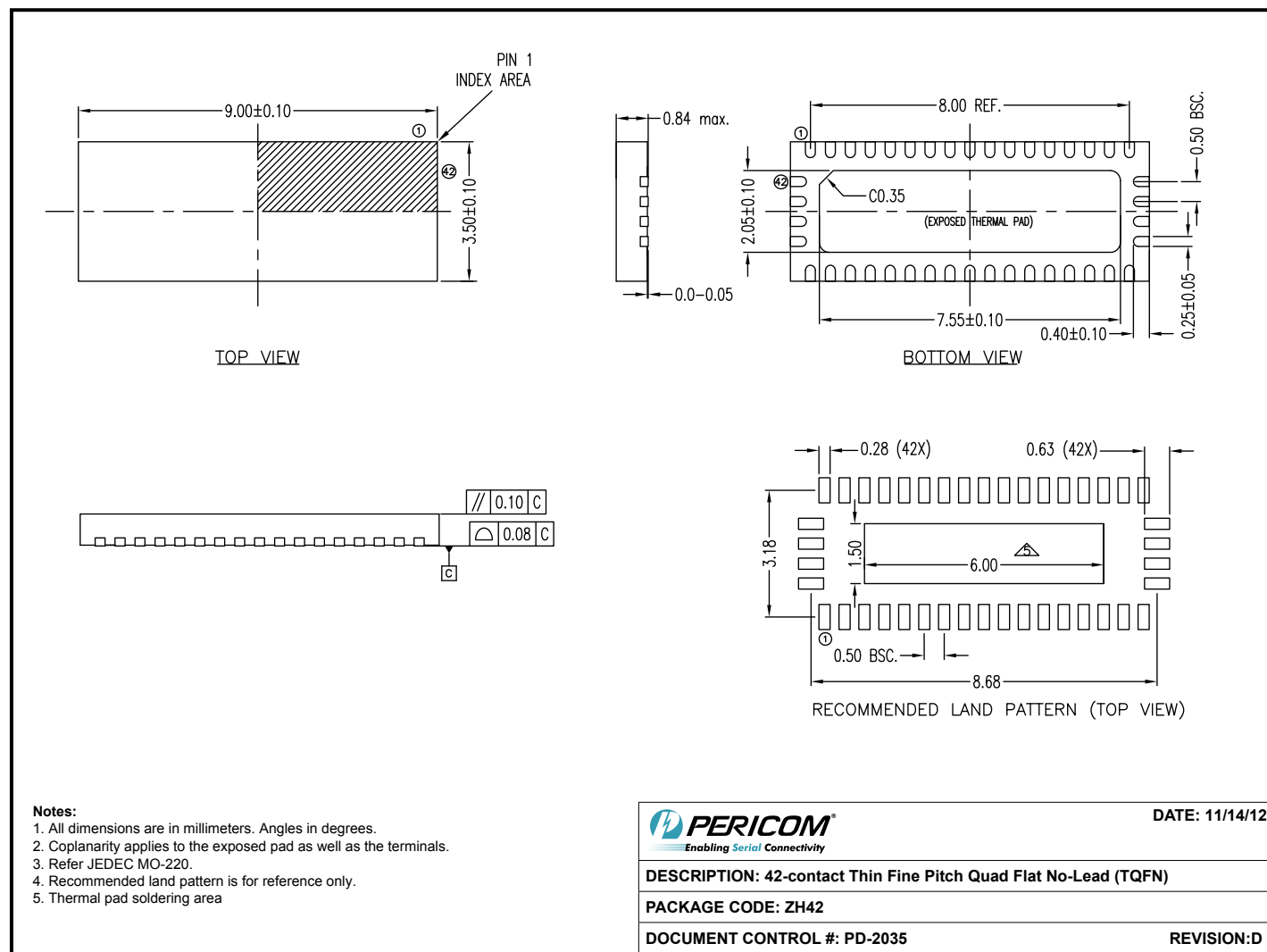

**Diff. Insertion Loss and Return Test Circuit**

**Diff. Off Isolation Test Circuit**

**Diff. Near End Xtalk Test Circuit**
**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
$t_{PLZ}$ , $t_{PZL}$	$2 \times V_{DD}$
$t_{PHZ}$ , $t_{PZH}$	GND
Prop Delay	Open

**Switching Waveforms**

**Voltage Waveforms Enable and Disable Times**

**Packaging Mechanical: 42-Contact TQFN (ZH)**


12-0529

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

**Ordering Information**

Ordering Code	Package Code	Package Description
PI2PCIE2442ZHEX	ZH	42-contact, Thin Fine Pitch Quad Flat No-Lead (TQFN)

**Notes:**

1. Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
2. E = Lead-free and green
2. X suffix = tape and reel



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