

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_{DD} Operating Range: +1.5V to +1.8V ±10%
- ESD Tolerance: 2kV HBM
- Packaging: 42-contact TQFN (ZH42)

Description

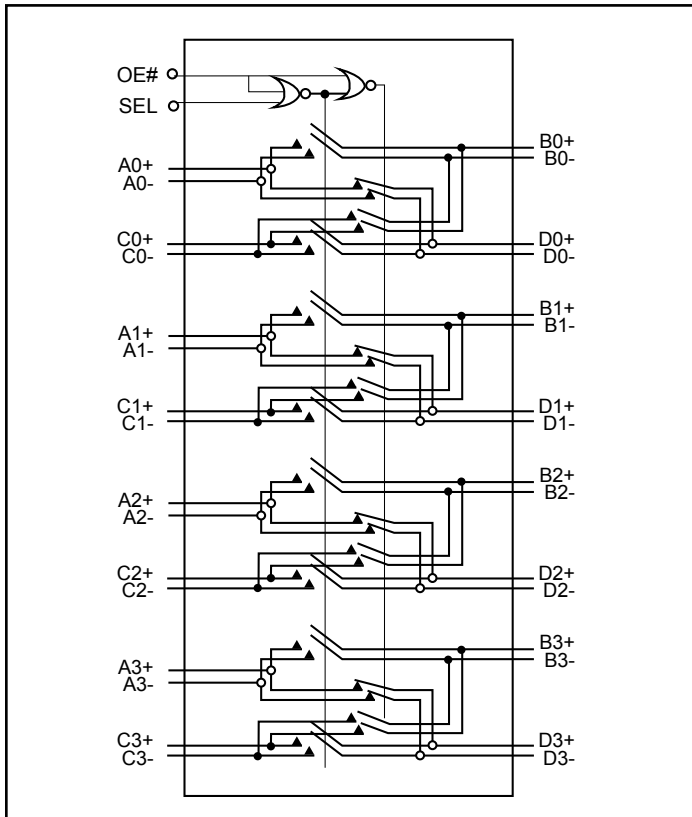
Pericom Semiconductor's PI2PCIE2442 is a differential exchange switch featuring pass-through pinout. It supports two full PCI Express lanes operating at 5.0Gbps PCIe® 2.0 performance.

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.

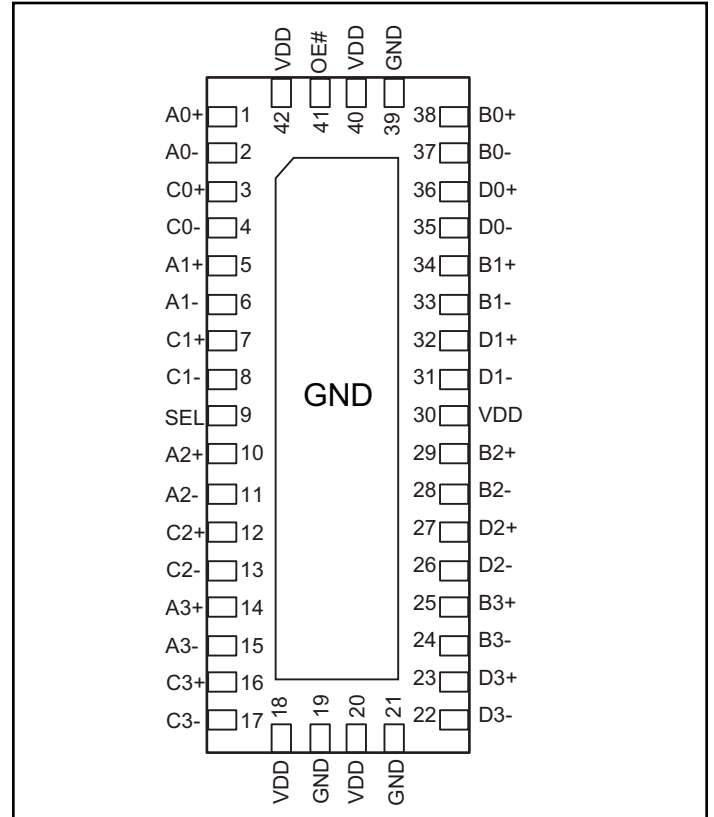
Truth Table

| 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 _{DD} | 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 ⁽¹⁾ | Min. | Typ. ⁽²⁾ | Max. | Units |
|-----------------|--------------------------------|--|------|---------------------|------|-------|
| I _{DD} | Quiescent Power Supply Current | V _{DD} = Max., V _{IN} = GND or V _{DD} | | | 400 | μA |

Notes:

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

DC Electrical Characteristics for Switching over Operating Range

(T_A = -40°C to +85°C, V_{DD} = 1.5V to 1.8V ±10%)

| Parameter | Description | Test Conditions | Min | Typ ⁽¹⁾ | Max | Units |
|---------------------|---|--|------------------------|--------------------|------------------------|-------|
| V _{IH} | Input HIGH Voltage, SEL and OE# | Guaranteed HIGH level | 0.65 x V _{DD} | | | V |
| V _{IL} | Input LOW Voltage, SEL and OE# | Guaranteed LOW level | -0.5 | | 0.35 x V _{DD} | |
| V _{IK} | Clamp Diode Voltage, SEL and OE# | V _{DD} = Max., I _{IN} = -18mA | | -0.7 | -1.2 | |
| I _{IH} | Input HIGH Current, SEL and OE# | V _{DD} = Max., V _{IN} = V _{DD} | | | ±5 | μA |
| I _{IL} | Input LOW Current, SEL and OE# | V _{DD} = Max., V _{IN} = GND | | | ±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 = 10K-Ohms | -0.4 | | 2.5 | V |
| | | V _O /V _I >80%, R _L = 50-Ohms | -0.3 | | 1.2 | |
| R _{ON} | Channel On Resistance | V _{DD} = Min., V _{IN} = 1.3V, I _{IN} = 40mA | | | 10 | Ohm |
| C _{ON(AB)} | Channel On Capacitance | V _{IN} = 0, V _{DD} = 1.8V | | 2.2 | 3.0 | pF |

Note:

- Typical values are at V_{DD} = 1.8V, T_A = 25°C ambient and maximum loading.

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

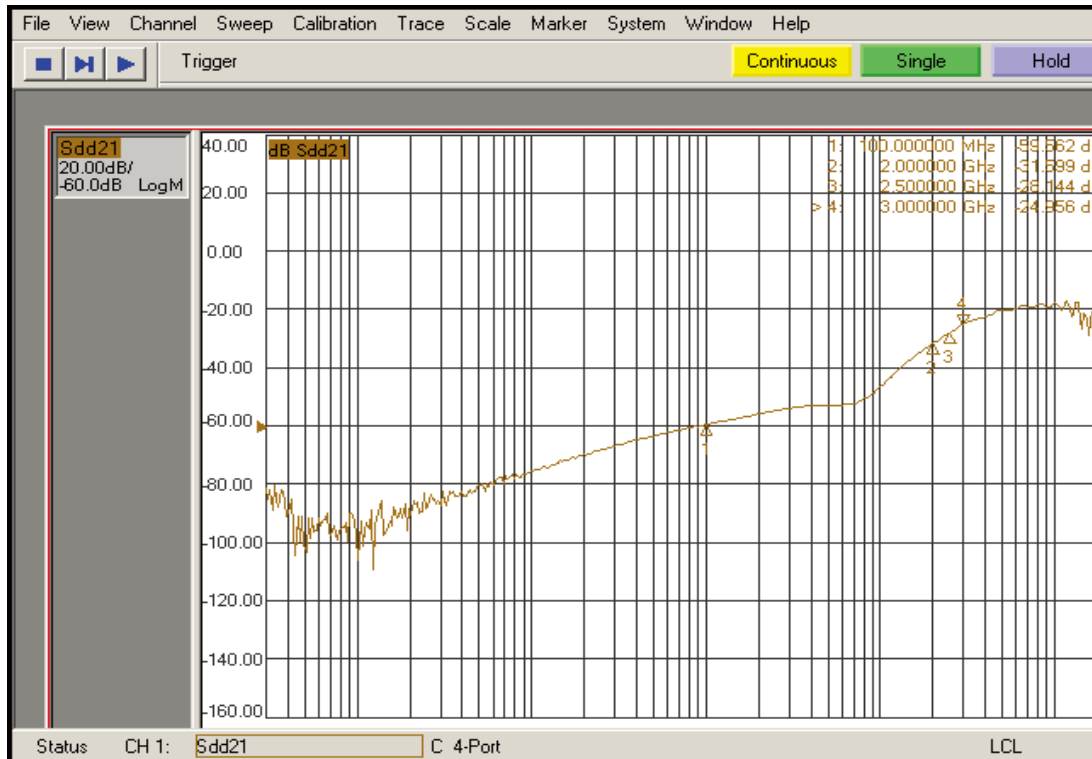
| Parameter | Description | Min. | Typ. | Max. | Units |
|--------------------|---|------|------|------|-------|
| t_{PZH}, t_{PZL} | Line Enable Time - SEL to A_N, B_N | 0.5 | | 8 | ns |
| t_{PHZ}, t_{PLZ} | Line Disable Time - SEL to A_N, B_N | 0.5 | | 8 | |
| t_{b-b} | Bit-to-bit skew within same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

Dynamic Electrical Characteristics Over the Operating Range
 $(T_A = -40^\circ \text{ to } +85^\circ \text{C}, V_{DD} = 1.5\text{V to } 1.8\text{V} \pm 10\%)$

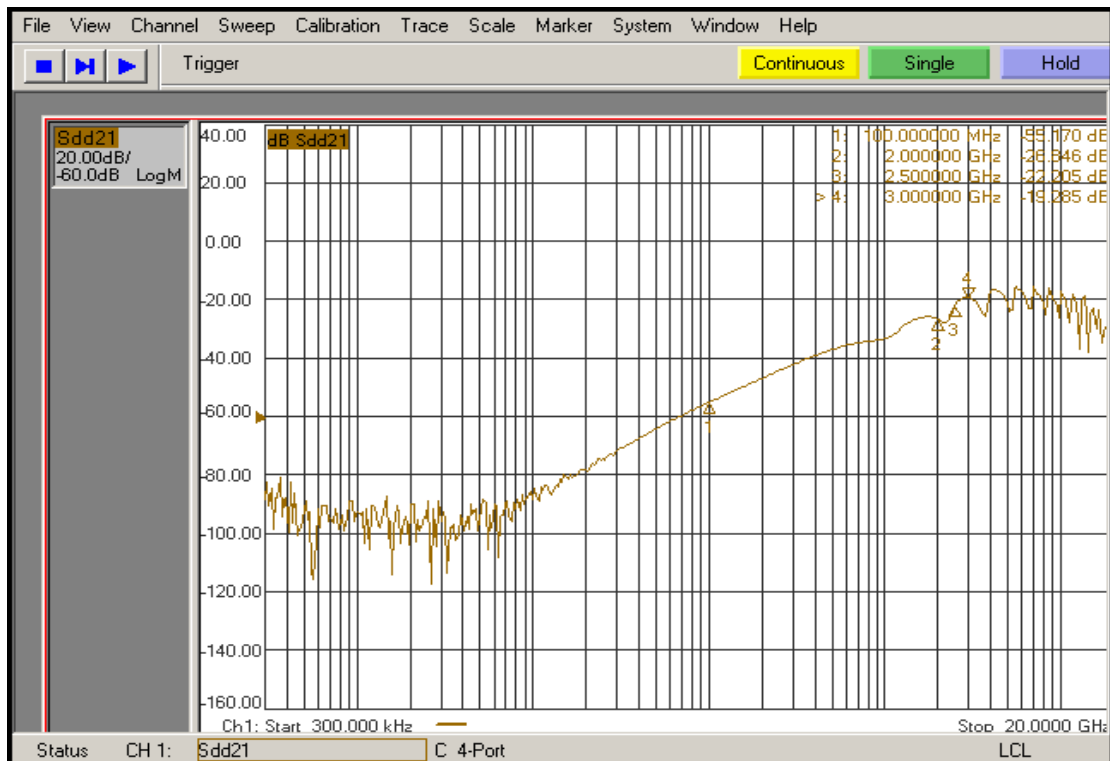
| Parameter | Description | Test Conditions | Min. | Typ. ⁽¹⁾ | Max. | Units |
|------------|-------------------------------|--|------|---------------------|------|-------|
| BW | Bandwidth (-3dB) | | | 3.4 | | GHz |
| V_{IF} | Max Signal Frequency Range | Insertion loss 1.5dB, $V_{IN}=0.6\text{Vpp}, \text{DC}=0\text{V}$ | 1.6 | | | GHz |
| | | Insertion loss 1.5dB, $V_{IN}=0.6\text{Vpp}, \text{DC}=0.9\text{V}$ | 1.6 | | | |
| | | Insertion loss 3dB, $V_{IN}=0.6\text{Vpp}, \text{DC}=0\text{V}$ | 3.0 | | | |
| | | Insertion loss 3dB, $V_{IN}=0.6\text{Vpp}, \text{DC}=0.9\text{V}$ | 3.0 | | | |
| P-1dB | 1 dB Compression Input Signal | $R_L = 50, f=625\text{MHz}, \text{sin wave}, \text{DC}=0\text{V}$ | 1.2 | | | Vpp |
| | | $R_L = 50, f=625\text{MHz}, \text{sin wave}, \text{DC}=0.45\text{V}$ | 2.0 | | | |
| | | $R_L = 50, f=625\text{MHz}, \text{sin wave}, \text{DC}=0.9\text{V}$ | 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:

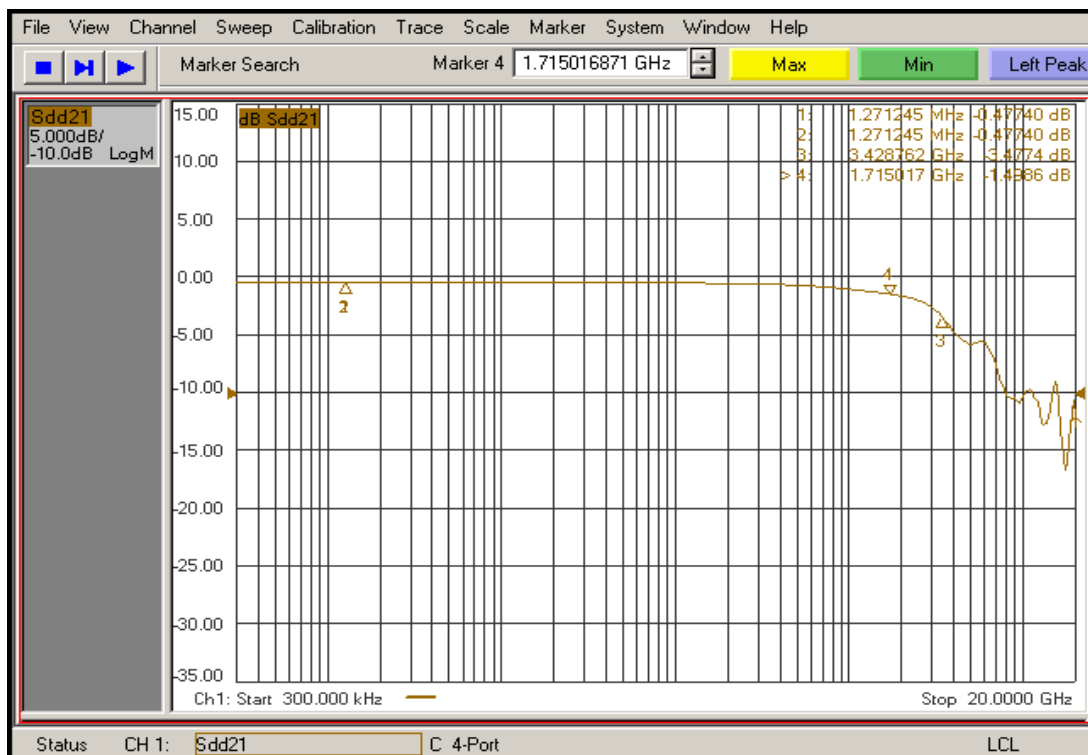
- Guaranteed by design. Typical values are at $V_{DD} = 1.8\text{V}, T_A = 25^\circ \text{C}$ ambient and maximum loading.



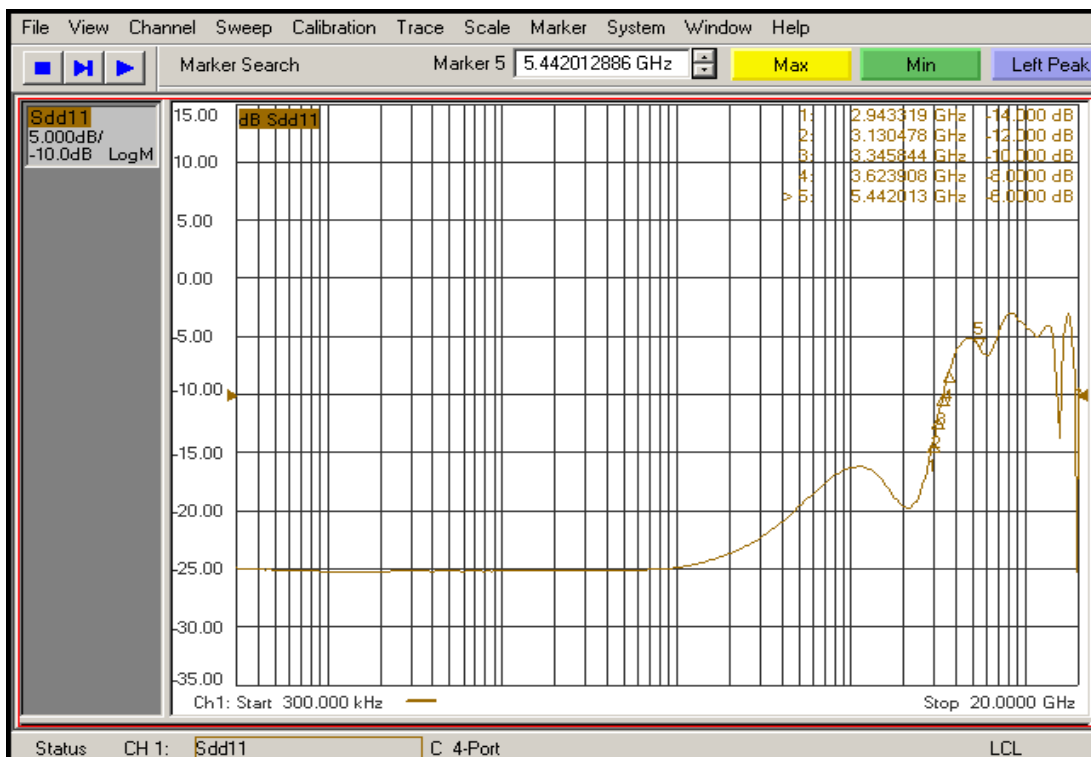
Crosstalk ($V_{DD} = 1.8V, 25^{\circ}C$)



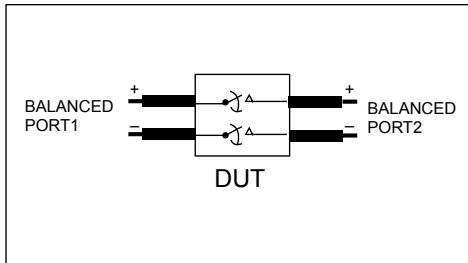
Differential Off Isolation ($V_{DD} = 1.8V, T_A = 25^{\circ}C$)



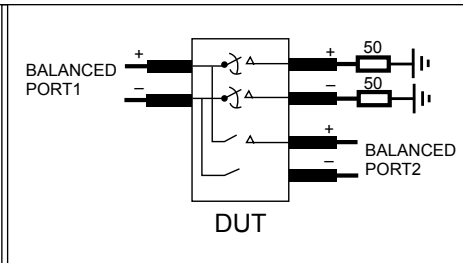
Insertion Loss ($V_{DD} = 1.8V, 25^{\circ}C$)



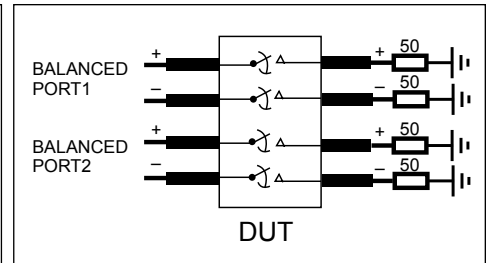
Differential Return Loss ($V_{DD} = 1.8V, 25^{\circ}C$)



Diff. Insertion Loss and Return Test Circuit

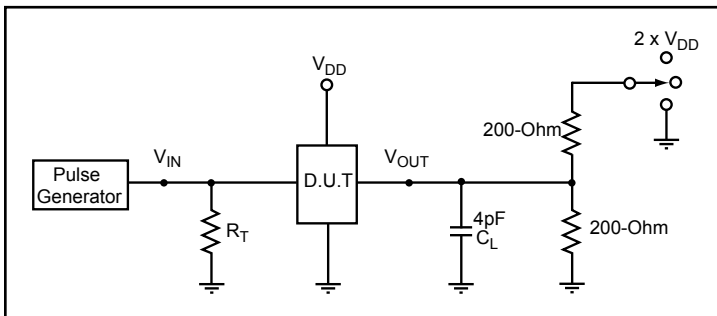


Diff. Off Isolation Test Circuit



Diff. Near End Xtalk Test Circuit

Test Circuit for Electrical Characteristics⁽¹⁻⁵⁾



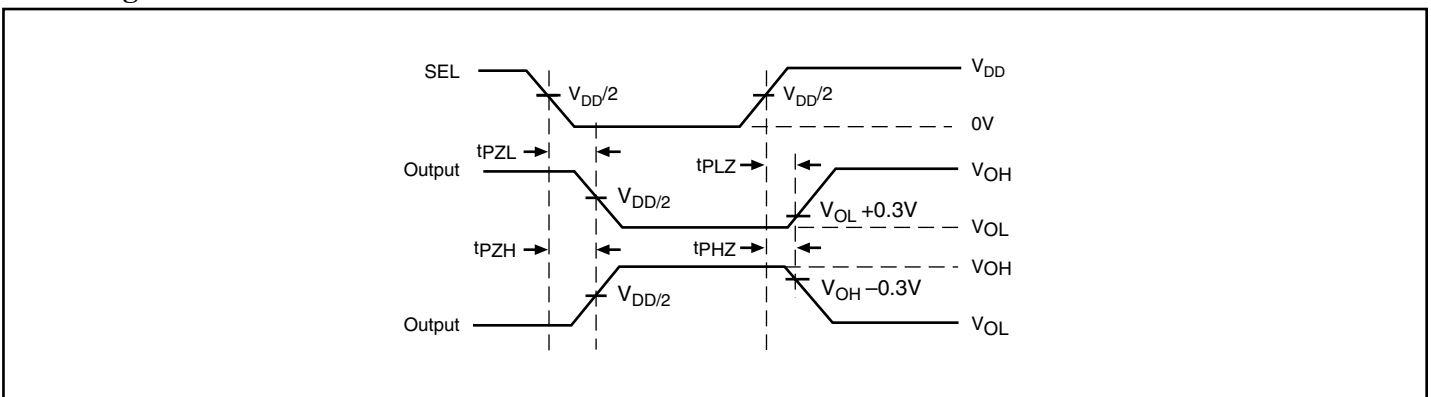
Notes:

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

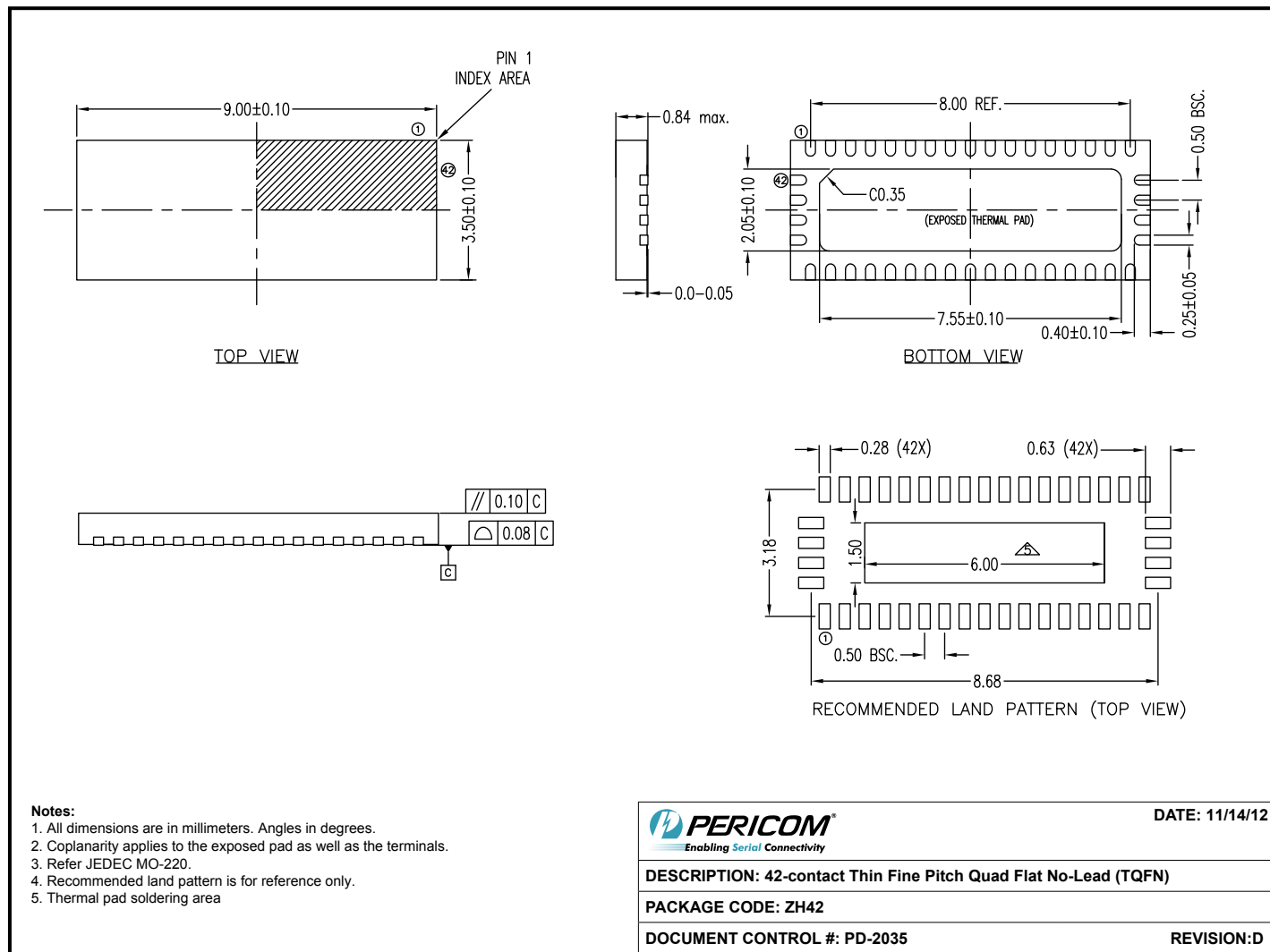
Switch Positions

| 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:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Lead-free and green
- X suffix = tape and reel

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