

### PCI Express® 2.0, 2-lane, 2x2 Matrix Switch

#### Features

- 2-lane PCIe 2.0, 2x2 Matrix Switch
- 5.0Gbps PCI Express® 2.0 performance
- Low Bit-to-Bit Skew: 10ps (between +/- signals)
- Low Crosstalk: -26dB @ 2.5 GHz (5.0Gbps)
- Low Insertion Loss: -22dB @ 2.5 GHz (5.0Gbps)
- V<sub>DD</sub> Operating Range: +1.5V to +1.8V
- ESD Tolerance: 2kV HBM
- Packaging: 42-contact TQFN (ZH42)

#### Description

Pericom semiconductor's PI2PCIE2452 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® 2.0 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 PI2PCIE2452 is intended for redundancy applications in sensor, storage and telecom systems.

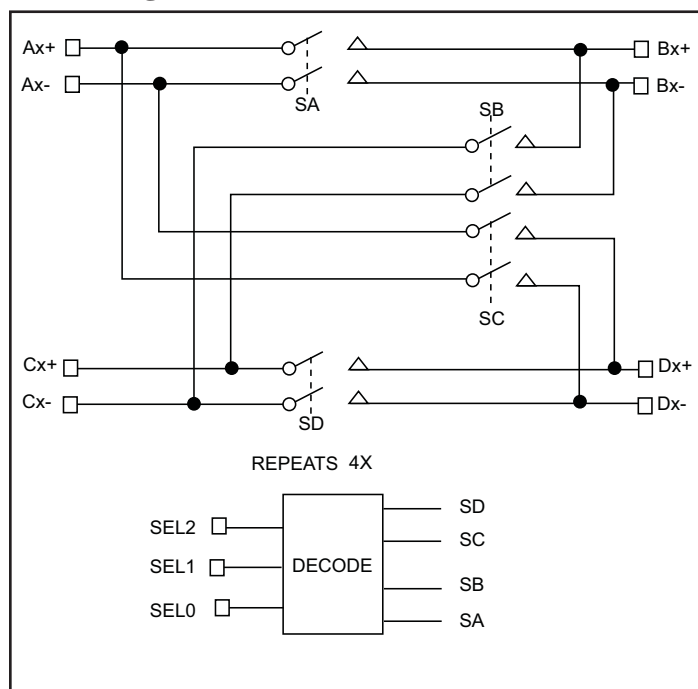
#### Truth Table<sup>(1)</sup>

| 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    |

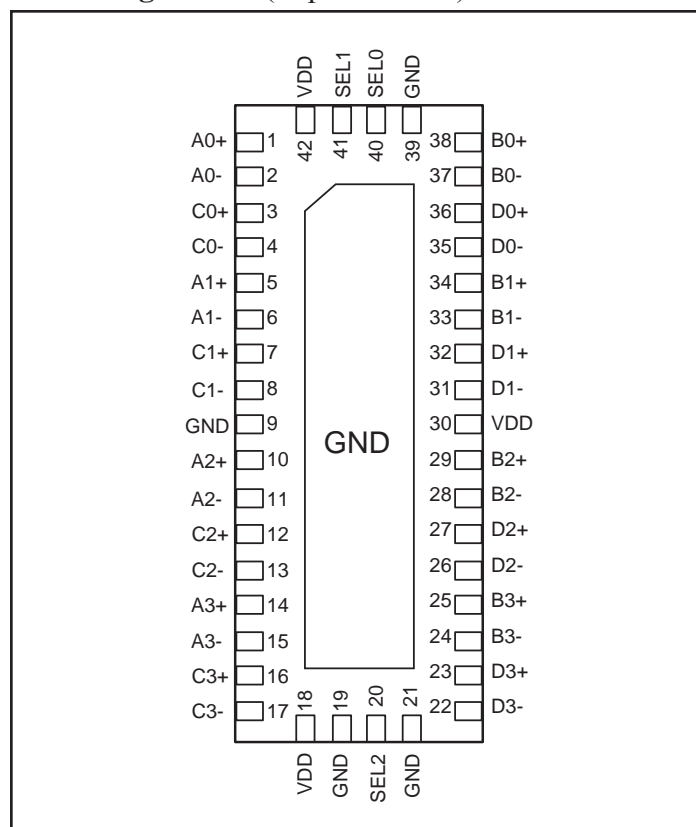
#### Note:

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

#### Block Diagram



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



**Pin Description**

| Pin #                        | Pin Name             | I/O   | Description                                   |
|------------------------------|----------------------|-------|---|
| 1<br>2                       | A0+<br>A0-           | I/O   | Differential Signal I/O                       |
| 5<br>6                       | A1+<br>A1-           | I/O   | Differential Signal I/O                       |
| 10<br>11                     | A2+<br>A2-           | I/O   | Differential Signal I/O                       |
| 14<br>15                     | A3+<br>A3-           | I/O   | Differential Signal I/O                       |
| 38<br>37                     | B0+<br>B0-           | I/O   | Differential Signal I/O                       |
| 34<br>33                     | B1+<br>B1-           | I/O   | Differential Signal I/O                       |
| 29<br>28                     | B2+<br>B2-           | I/O   | Differential Signal I/O                       |
| 25<br>24                     | B3+<br>B3-           | I/O   | Differential Signal I/O                       |
| 3<br>4                       | C0+<br>C0-           | I/O   | Differential Signal I/O                       |
| 7<br>8                       | C1+<br>C1-           | I/O   | Differential Signal I/O                       |
| 12<br>13                     | C2+<br>C2-           | I/O   | Differential Signal I/O                       |
| 16<br>17                     | C3+<br>C3-           | I/O   | Differential Signal I/O                       |
| 36<br>35                     | D0+<br>D0-           | I/O   | Differential Signal I/O                       |
| 32<br>31                     | D1+<br>D1-           | I/O   | Differential Signal I/O                       |
| 27<br>26                     | D2+<br>D2-           | I/O   | Differential Signal I/O                       |
| 23<br>22                     | D3+<br>D3-           | I/O   | Differential Signal I/O                       |
| 9, 19, 21, 39,<br>Center Pad | GND                  | Power | Power ground                                  |
| 20<br>41<br>40               | SEL2<br>SEL1<br>SEL0 | I     | SELECT Inputs                                 |
| 18, 30, 42                   | V <sub>DD</sub>      | Power | Positive supply voltage, 1.5 V to 1.8V ± 0.1V |

### 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 <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.

### Power Supply Characteristics

| Parameters      | Description                    | Test Conditions <sup>(1)</sup>                                   | Min. | Typ. <sup>(2)</sup> | Max. | Units |
|-----------------|--------------------------------|--|------|---------------------|------|-------|
| I <sub>DD</sub> | Quiescent Power Supply Current | V <sub>DD</sub> = Max., V <sub>IN</sub> = GND or V <sub>DD</sub> |      | 200                 | 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<sub>DD</sub> = 1.8V, T<sub>A</sub> = 25°C ambient and maximum loading.

### DC Electrical Characteristics for Switching over Operating Range (T<sub>A</sub> = -40°C to +85°C, V<sub>DD</sub> = 1.5V to 1.8V)

| Parameter         | Description   | Test Conditions   | Min                    | Typ <sup>(1)</sup> | Max                    | Units |
|-------------------|---|---|------------------------|--------------------|------------------------|-------|
| V <sub>IH</sub>   | Input HIGH Voltage, Control Inputs                    | Guaranteed HIGH level   | 0.65 x V <sub>DD</sub> |                    |                        | V     |
| V <sub>IL</sub>   | Input LOW Voltage, Control Inputs                     | Guaranteed LOW level  | -0.5                   |                    | 0.35 x V <sub>DD</sub> |       |
| V <sub>IK</sub>   | Clamp Diode Voltage, Control Inputs                   | V <sub>DD</sub> = Max., I <sub>IN</sub> = -18mA   |                        | -0.7               | -1.2                   |       |
| I <sub>IH</sub>   | Input HIGH Current, Control Inputs                    | V <sub>DD</sub> = Max., V <sub>IN</sub> = V <sub>DD</sub>   |                        |                    | ±5                     | μA    |
| I <sub>IL</sub>   | Input LOW Current, Control Inputs                     | V <sub>DD</sub> = Max., V <sub>IN</sub> = GND   |                        |                    | ±5                     |       |
| V <sub>I DC</sub> | DC Signal Voltage Range, Channel I/O (Ax, Bx, Cx, Dx) | V <sub>O</sub> /V <sub>I</sub> >95%, R <sub>L</sub> = 10K-Ohms<br>V <sub>O</sub> /V <sub>I</sub> >80%, R <sub>L</sub> = 50-Ohms | -0.4<br>-0.3           |                    | 2.5<br>1.2             | V     |
| R <sub>ON</sub>   | Channel On Resistance                                 | V <sub>DD</sub> = Min., V <sub>IN</sub> = 1.3V, I <sub>IN</sub> = 40mA  |                        |                    | 10                     | Ohm   |
| C <sub>ON</sub>   | Channel On Capacitance                                | V <sub>IN</sub> = 0, V <sub>DD</sub> = 1.8V   |                        | 2.5                | 3.0                    | pF    |

**Note:**

- Typical values are at V<sub>DD</sub> = 1.8V, T<sub>A</sub> = 25°C ambient and maximum loading.

### Switching Characteristics (T<sub>A</sub> = -40° to +85°C, V<sub>DD</sub> = 1.5V to 1.8V)

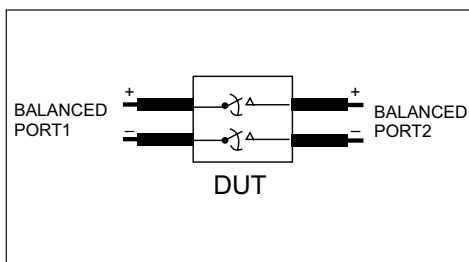
| Parameter                           | Description   | Min. | Typ. | Max. | Units |
|-------------------------------------|---|------|------|------|-------|
| t <sub>PZH</sub> , t <sub>PZL</sub> | Line Enable Time - SEL <sub>x</sub> to A <sub>N</sub> , B <sub>N</sub>  | 0.5  |      | 11   | ns    |
| t <sub>PHZ</sub> , t <sub>PLZ</sub> | Line Disable Time - SEL <sub>x</sub> to A <sub>N</sub> , B <sub>N</sub> | 0.5  |      | 11   |       |
| t <sub>b-b</sub>                    | Bit-to-bit skew within same differential pair                           |      |      | 5    | ps    |
| t <sub>ch-tch</sub>                 | Channel-to-channel timing skew  |      |      | 40   |       |

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

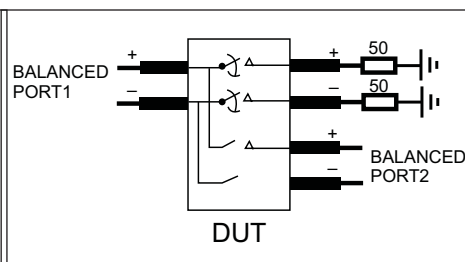
| Parameter         | Description                   | Test Conditions  | Min. | Typ. <sup>(1)</sup> | Max. | Units |
|-------------------|-------------------------------|--|------|---------------------|------|-------|
| BW                | Bandwidth (-3dB)              |  |      | 3.4                 |      | GHz   |
| R <sub>LOSS</sub> | Return Loss                   | f = 2.5 GHz  |      | -15                 |      | dB    |
| X <sub>TALK</sub> | Crosstalk                     | f = 2.5 GHz  |      | -26                 |      |       |
|                   |                               | f = 100 MHz  |      | -68                 |      |       |
| O <sub>IRR</sub>  | OFF Isolation                 | f = 2.5 GHz  |      | -22                 |      |       |
|                   |                               | f = 100 MHz  |      | -52                 |      |       |
| I <sub>LOSS</sub> | Differential Insertion Loss   | f = 2.5 GHz  |      | -2.2                |      |       |
| V <sub>IF</sub>   | Max Signal Frequency Range    | Insertion loss 1.5dB, V <sub>IN</sub> =0.6Vpp, DC=0V   | 1.5  |                     |      | GHz   |
|                   |                               | Insertion loss 1.5dB, V <sub>IN</sub> =0.6Vpp, DC=0.9V | 1.5  |                     |      |       |
|                   |                               | Insertion loss 3dB, V <sub>IN</sub> =0.6Vpp, DC=0V     | 2.8  |                     |      |       |
|                   |                               | Insertion loss 3dB, V <sub>IN</sub> =0.6Vpp, DC=0.9V   | 2.8  |                     |      |       |
| P-1dB             | 1 dB Compression Input Signal | R <sub>L</sub> = 50, f=625MHz, sin wave, DC=0V         | 1.2  |                     |      | Vpp   |
|                   |                               | R <sub>L</sub> = 50, f=625MHz, sin wave, DC=0.45V      | 2.0  |                     |      |       |
|                   |                               | R <sub>L</sub> = 50, f=625MHz, sin wave, DC=0.9V       | 2.4  |                     |      |       |

**Notes:**

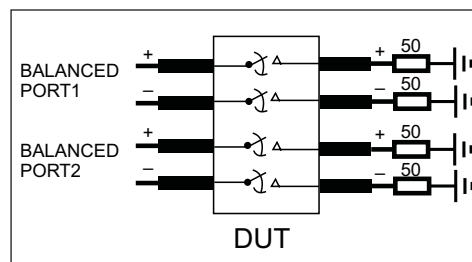
1. Guaranteed by design. Typical values are at  $V_{DD} = 1.8\text{V}$ ,  $T_a = 25^\circ\text{C}$  ambient and maximum loading.



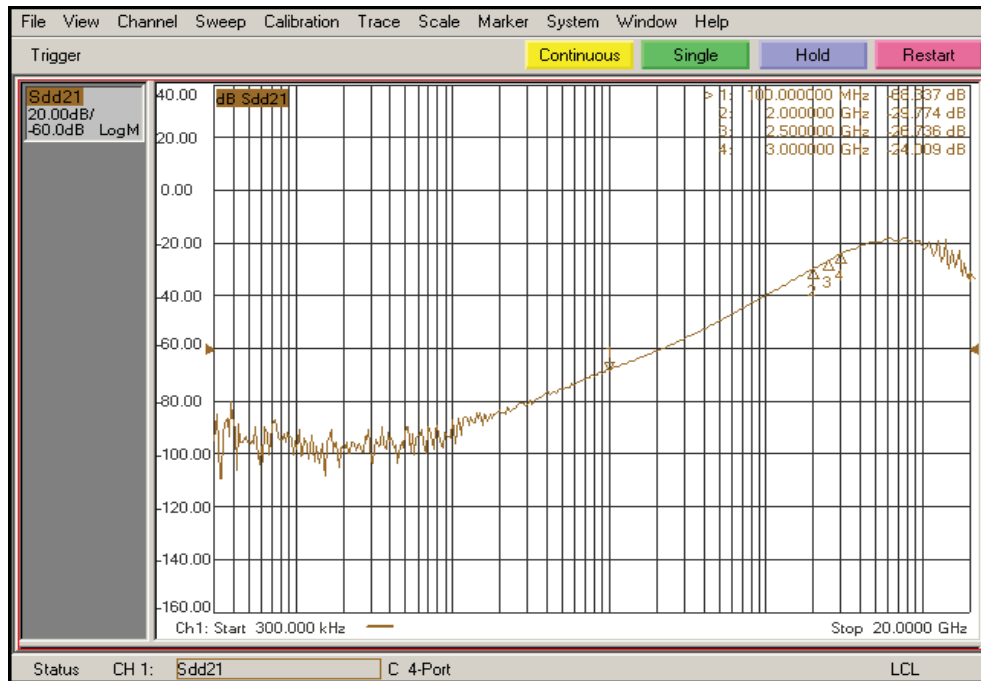
**Diff. Insertion Loss and Return Test Circuit**



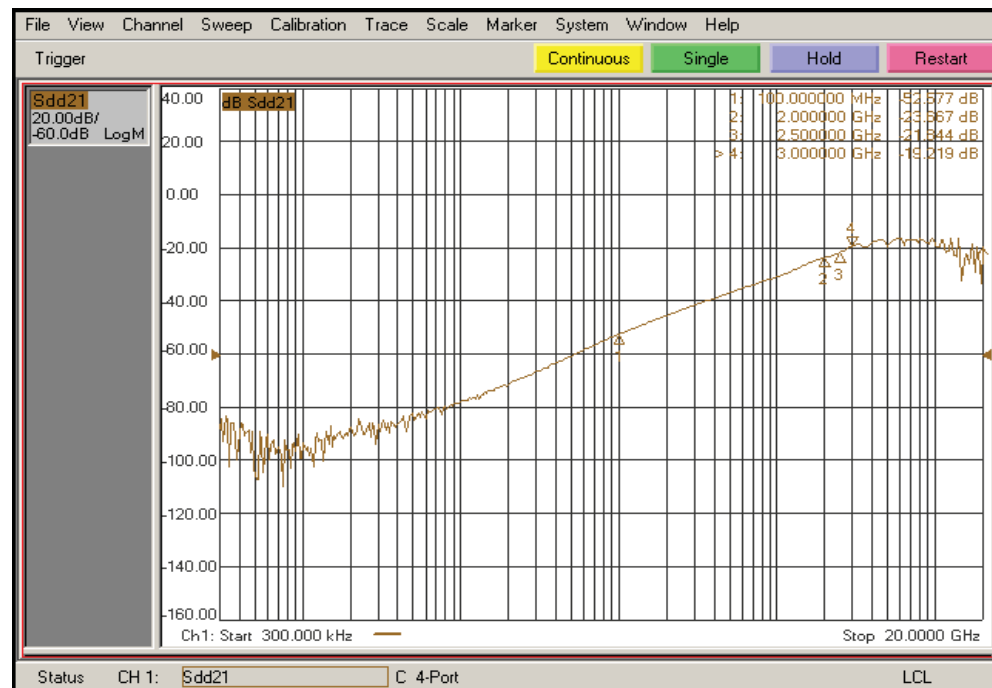
**Diff. Off Isolation Test Circuit**



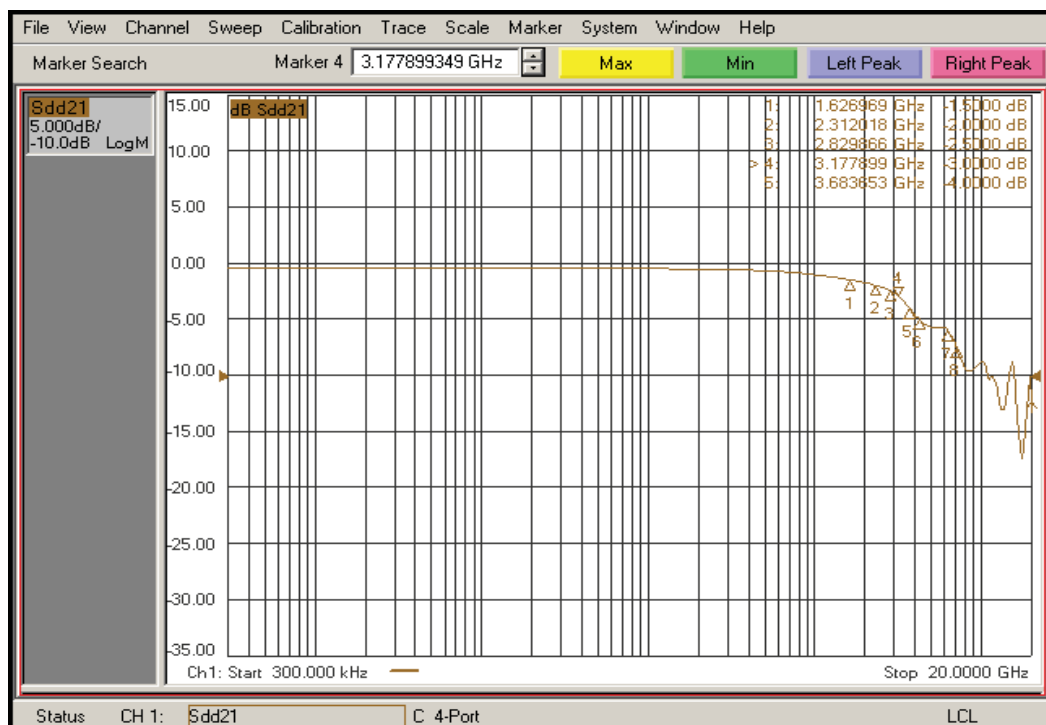
**Diff. Near End Xtalk Test Circuit**



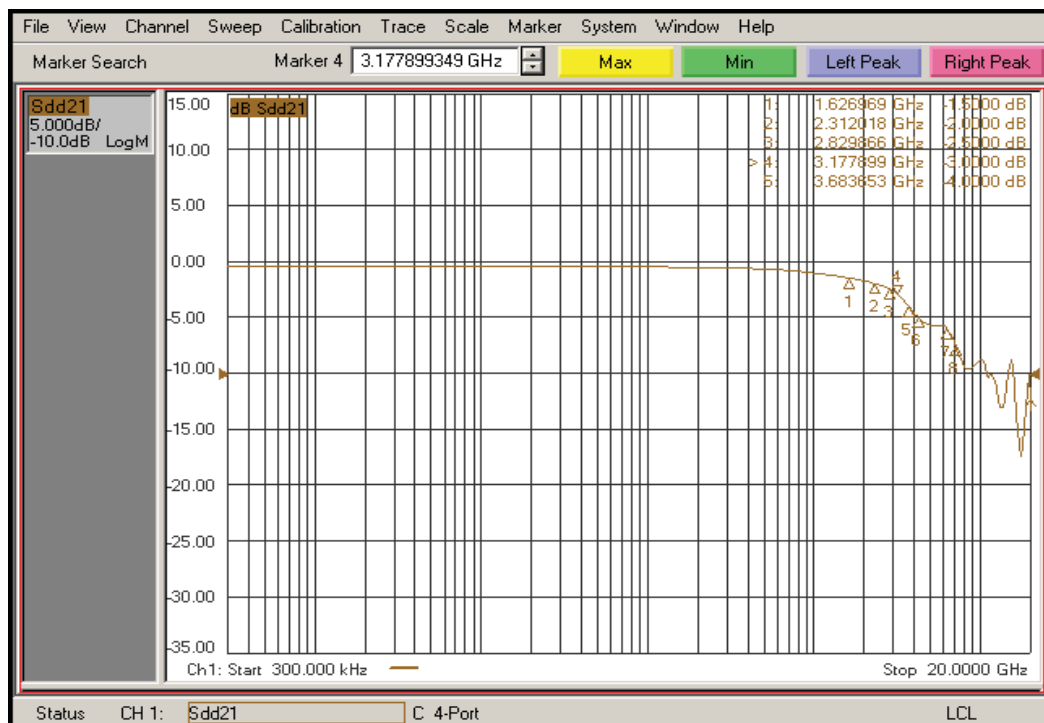
Differential Crosstalk Plot from 1MHz to 6.0GHz,  $V_{DD}=1.8V$ ,  $T_A=25^{\circ}C$



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

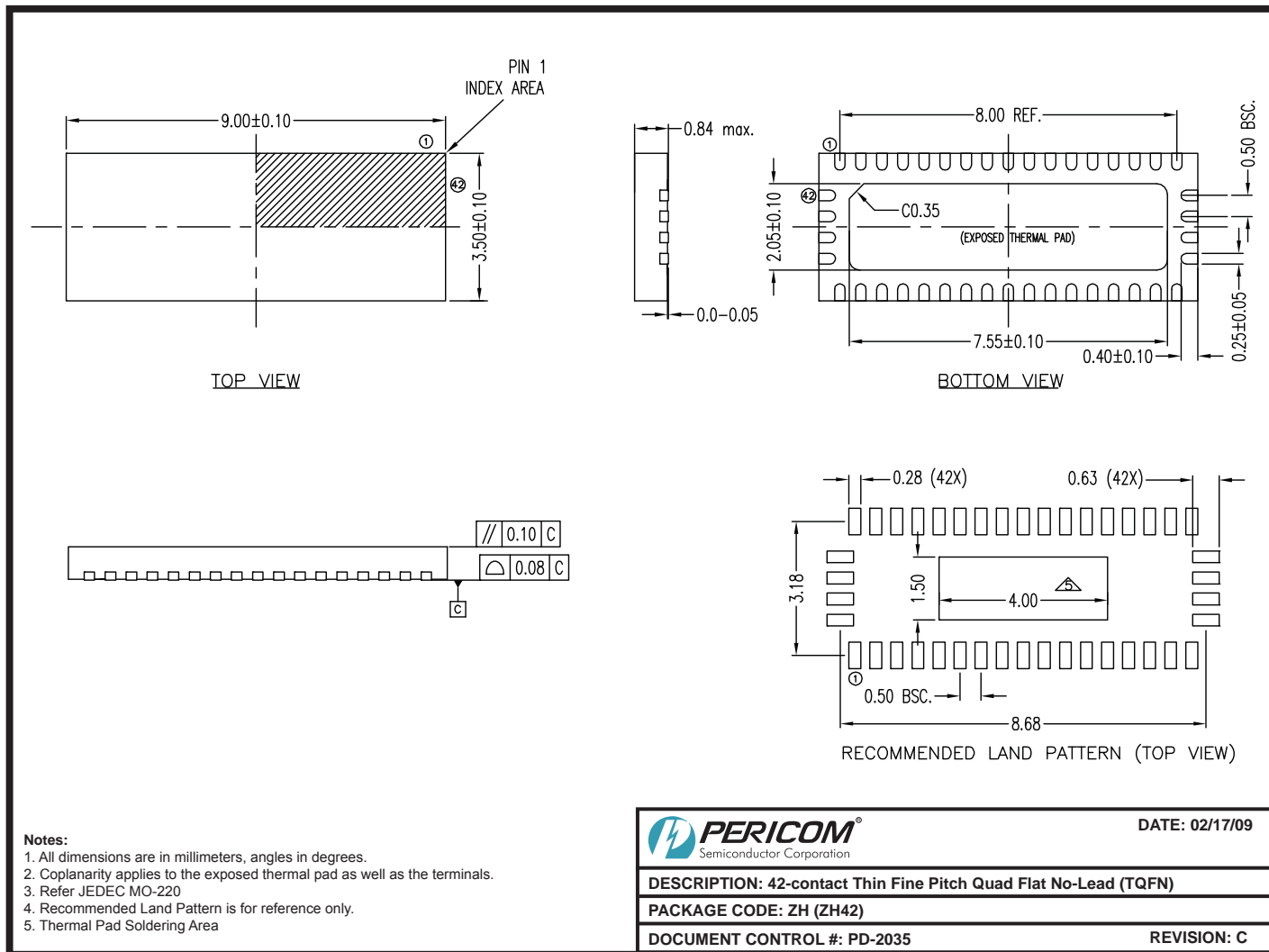


Insertion Loss Plot ( $V_{DD}=1.8V$ ,  $T_A = 25^\circ C$ )



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





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               |
|----------------|--------------|-----------------------------------|
| PI2PCIE2452ZHE | ZH           | Pb-free and 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 = Lead-free and green
- X suffix = tape and reel