PCI Express Gen II, 2-lane (4-channel), Differential Mux/Demux with Bypass

Features

- 8 Differential Channel SPST switch with Mux/DeMux option
- PCI Express Gen II performance
- Low Bit-to-Bit Skew: 10ps (between +/- signals)
- Low Crosstalk: -35dB @ 3.0 GHz
- Low Off Isolation: -26db @ 3.0 GHz
- V_{CC} Operating Range: +1.5V to +2.0V
- ESD Tolerance >2kV HBM
- Packaging (Pb-free & Green): 42-contact TQFN (ZH42)

Description

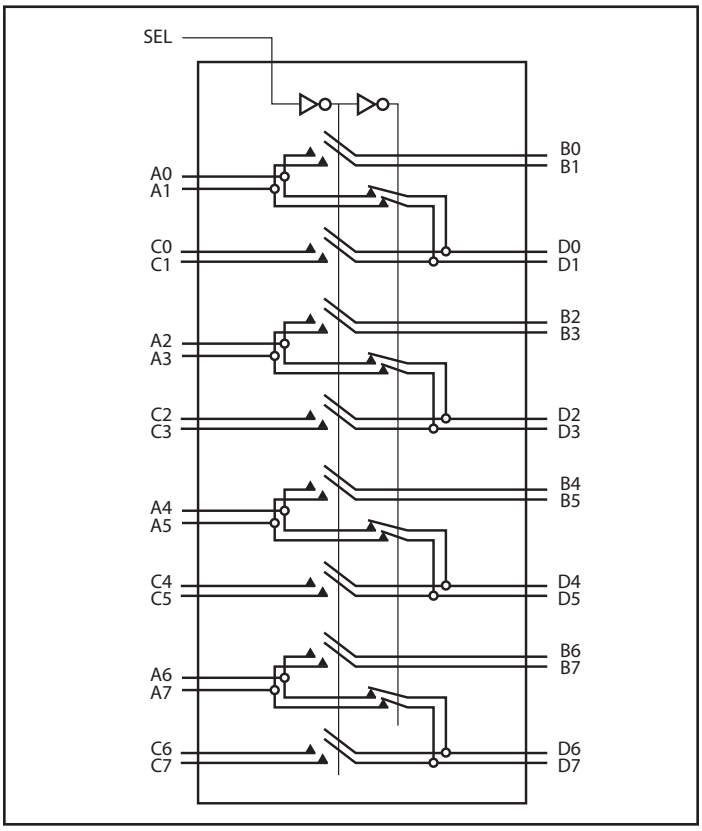
Pericom semiconductor's PI2PCIE2422 is an 8 to 4 channel differential multiplexer/demultiplexer featuring 8-channel pass-through. It supports two full PCI Express lanes at 5.0Gbps Gen II performance.

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 and Port C are in a high-impedance state. The mux/demux function is between Port A and Ports B or D as determined by the select input control.

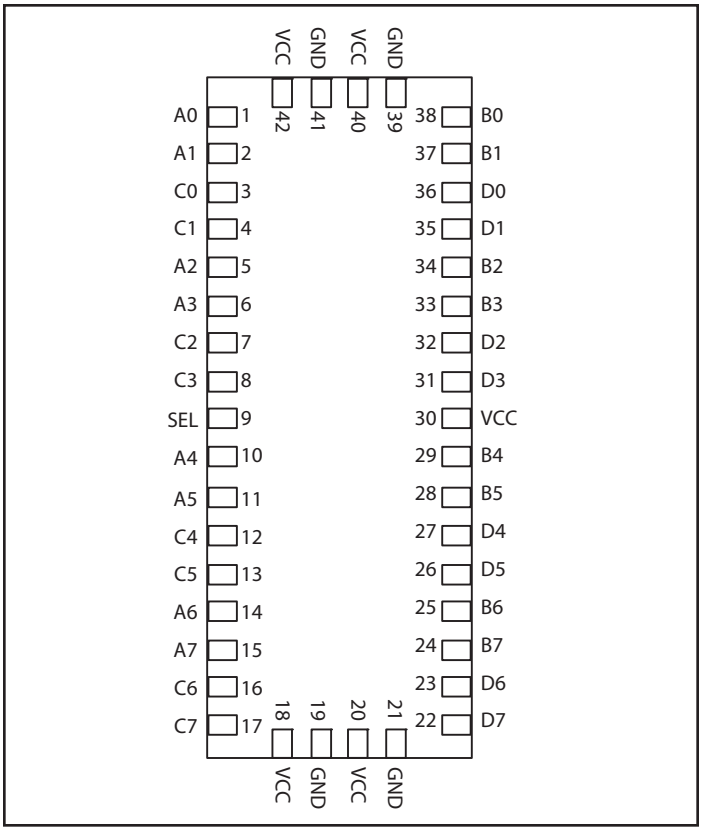
Truth Table

Function	SEL
Ax = Bx Cx = Dx	L
Ax = Dx B = C = Hi-Z	H

Block Diagram



Pin Diagram



Pin Description

Pin #	Pin Name	I/O	Description
1, 2	A0, A1	I/O	Signal I/O (typically a differential pair)
3, 4	C0, C1	I/O	Signal I/O (typically a differential pair)
5, 6	A2, A3	I/O	Signal I/O (typically a differential pair)
7, 8	C2, C3	I/O	Signal I/O (typically a differential pair)
10, 11	A4, A5	I/O	Signal I/O (typically a differential pair)
12, 13	C4, C5	I/O	Signal I/O (typically a differential pair)
14, 15	A6, A7	I/O	Signal I/O (typically a differential pair)
16, 17	C6, C7	I/O	Signal I/O (typically a differential pair)
22, 23	D7, D6	I/O	Signal I/O (typically a differential pair)
24, 25	B7, B6	I/O	Signal I/O (typically a differential pair)
26, 27	D5, D4	I/O	Signal I/O (typically a differential pair)
28,29	B5, B4	I/O	Signal I/O (typically a differential pair)
31, 32	D3, D2	I/O	Signal I/O (typically a differential pair)
33, 34	B3, B2	I/O	Signal I/O (typically a differential pair)
35, 36	D1, D0	I/O	Signal I/O (typically a differential pair)
37, 38	B1, B0	I/O	Signal I/O (typically a differential pair)
9	SEL	I	Operation mode Select (when SEL=0: A⟶B, C⟶D, when SEL=1: A⟶D, B & C=Hi-Z)
18, 20, 30, 40, 42	V_{CC}	Pwr	1.8V positive supply voltage
19, 21, 39, 41	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_{CC}
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.

DC Electrical Characteristics for Switching over Operating Range (T_A = –40°C to +85°C, V_{CC} = 1.5V to 2.0V)

Paramenter	Description	Test Conditions	Min	Typ(1)	Max	Units
V_{IH}	Input HIGH Voltage	Guaranteed HIGH level	0.65 x V_{CC}			V
V_{IL}	Input LOW Voltage	Guaranteed LOW level	–0.5		0.35 x V_{CC}	
V_{IK}	Clamp Diode Voltage	V_{CC} = Max., I_{IN} = –18mA		–0.7	–1.2	
I_{IH}	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC}			±5	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND			±5	
R_{ON}	On Resistance	V_{CC} = Min., V_{IN} = 1.3V, I_{IN} = 40mA			10	Ohm
$C_{ON(AB)}$	Capacitance on A/B, C/D	V_{IN} = 0, V_{CC} = 1.8V		3.0		pF

Note:
1. Typical values are at V_{CC} = 1.8V, T_A = 25°C ambient and maximum loading.

Power Supply Characteristics

Parameters	Description	Test Conditions(1)	Min.	Typ.(2)	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}		200		µA

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

Dynamic Electrical Characteristics Over the Operating Range (T_A= -40º to +85ºC, V_{CC} = 1.8V±10%, GND=0V)

Parameter	Description	Test Conditions	Min.	Typ.(1)	Max.	Units
X_{TALK}	Crosstalk	See Fig. 1 for Measurement Setup, f = 3.00 GHz f = 100 MHz		–35 –70		dB
O_{IRR}	OFF Isolation	See Fig. 2 for Measurement Setup, f = 3.00 GHz f = 100 MHz		–26 –60		
I_{LOSS}	Differential Insertion Loss	f = 3 GHz		-3		
BW	Bandwidth (-3dB)			3.4		GHz

Notes:
1. Guaranteed by design. Typical values are at V_{CC} = 1.8V, T_a = 25°C ambient and maximum loading.

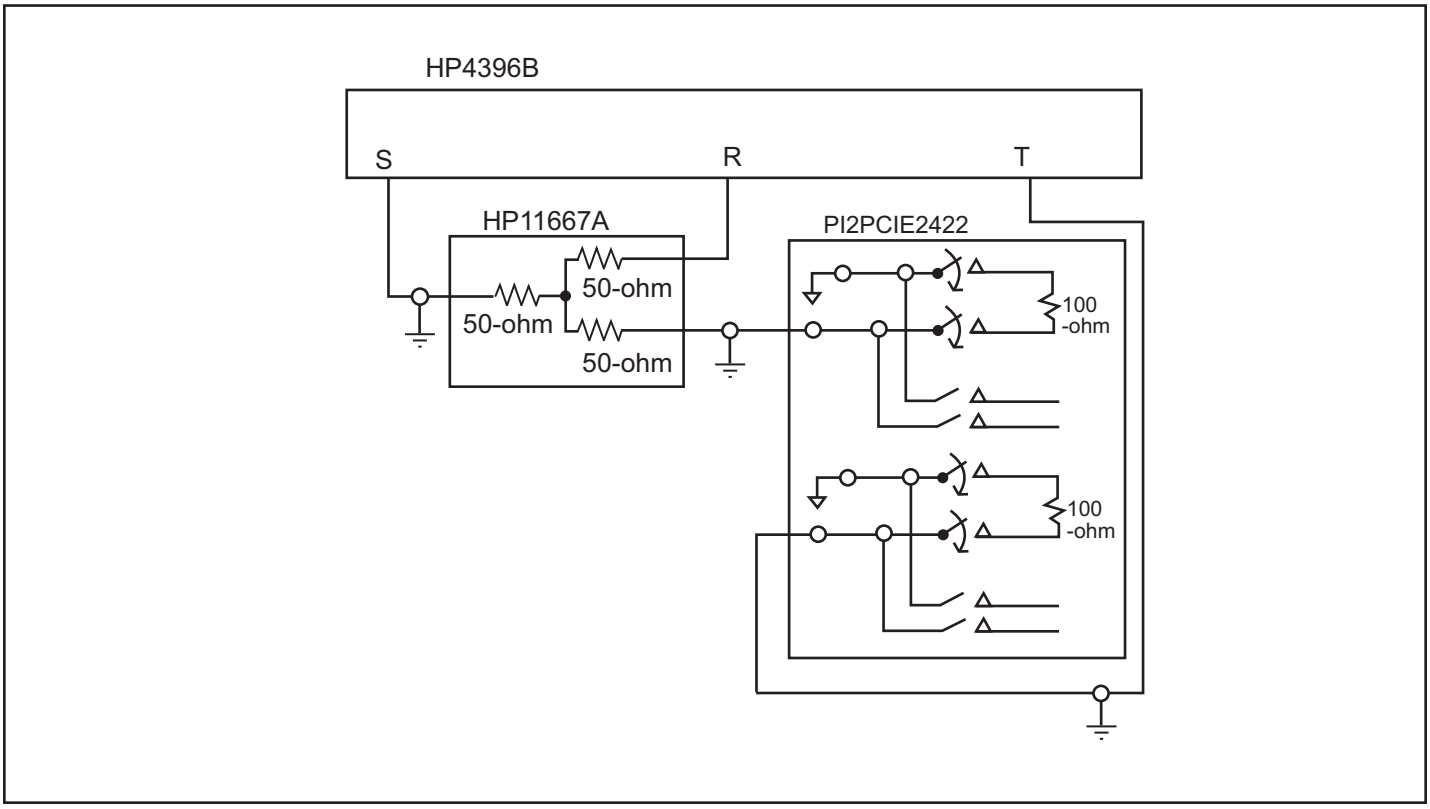


Fig 1: Crosstalk Setup

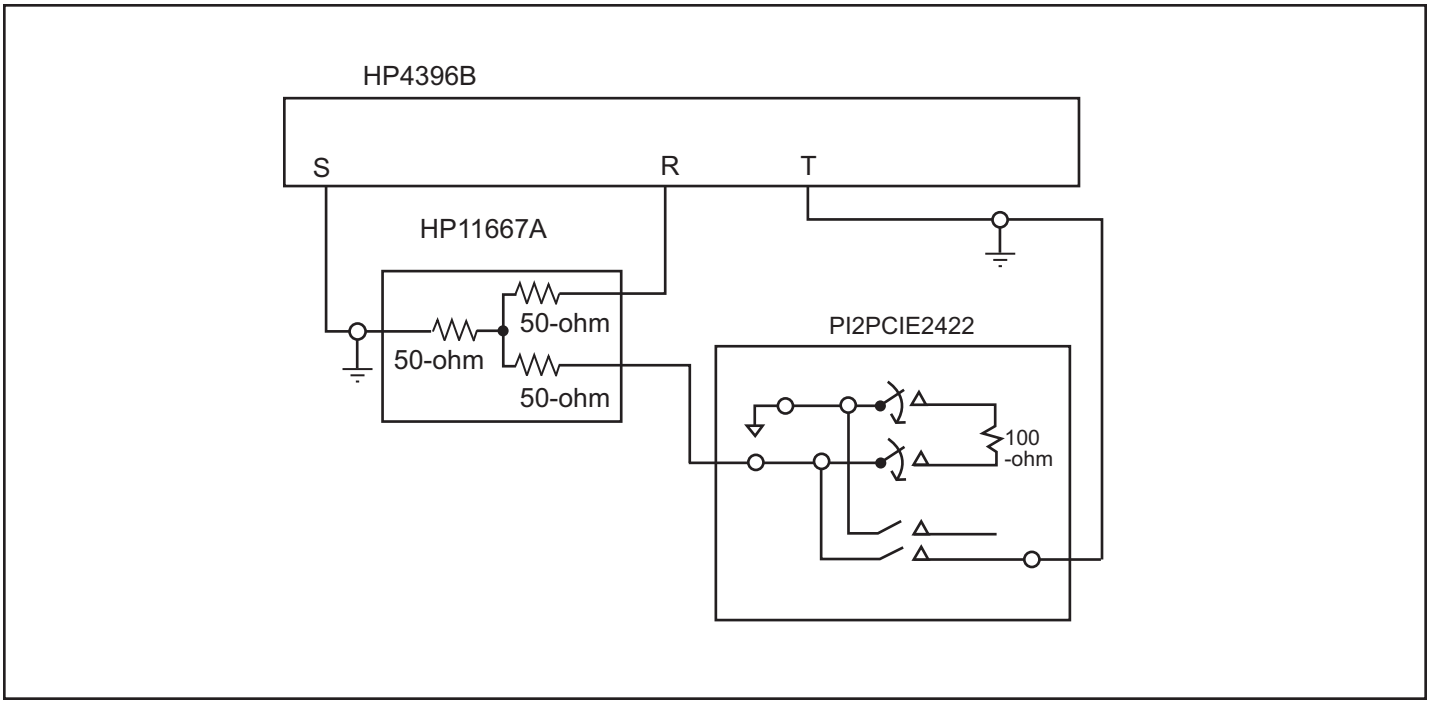


Fig 2: Off-isolation setup

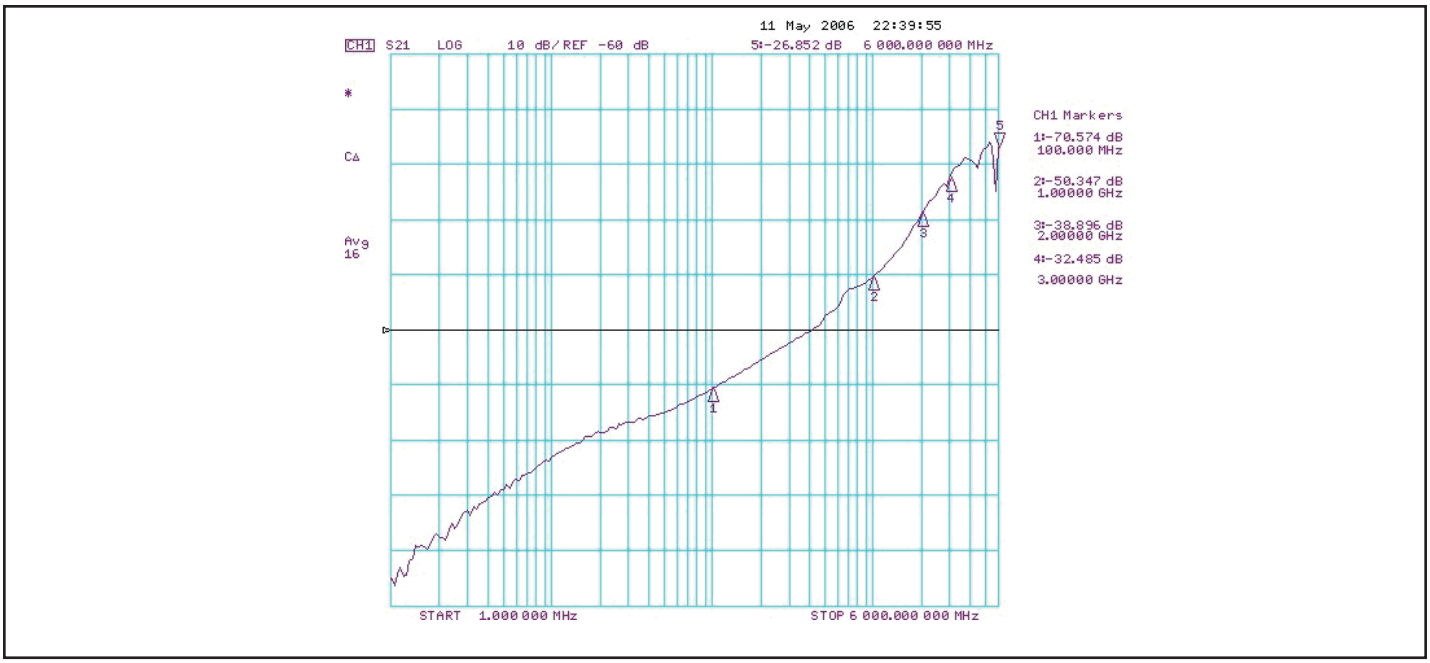


Fig 3: Typical Crosstalk Plot from 1MHz to 6.0GHz, Vcc=1.8V, 25°C

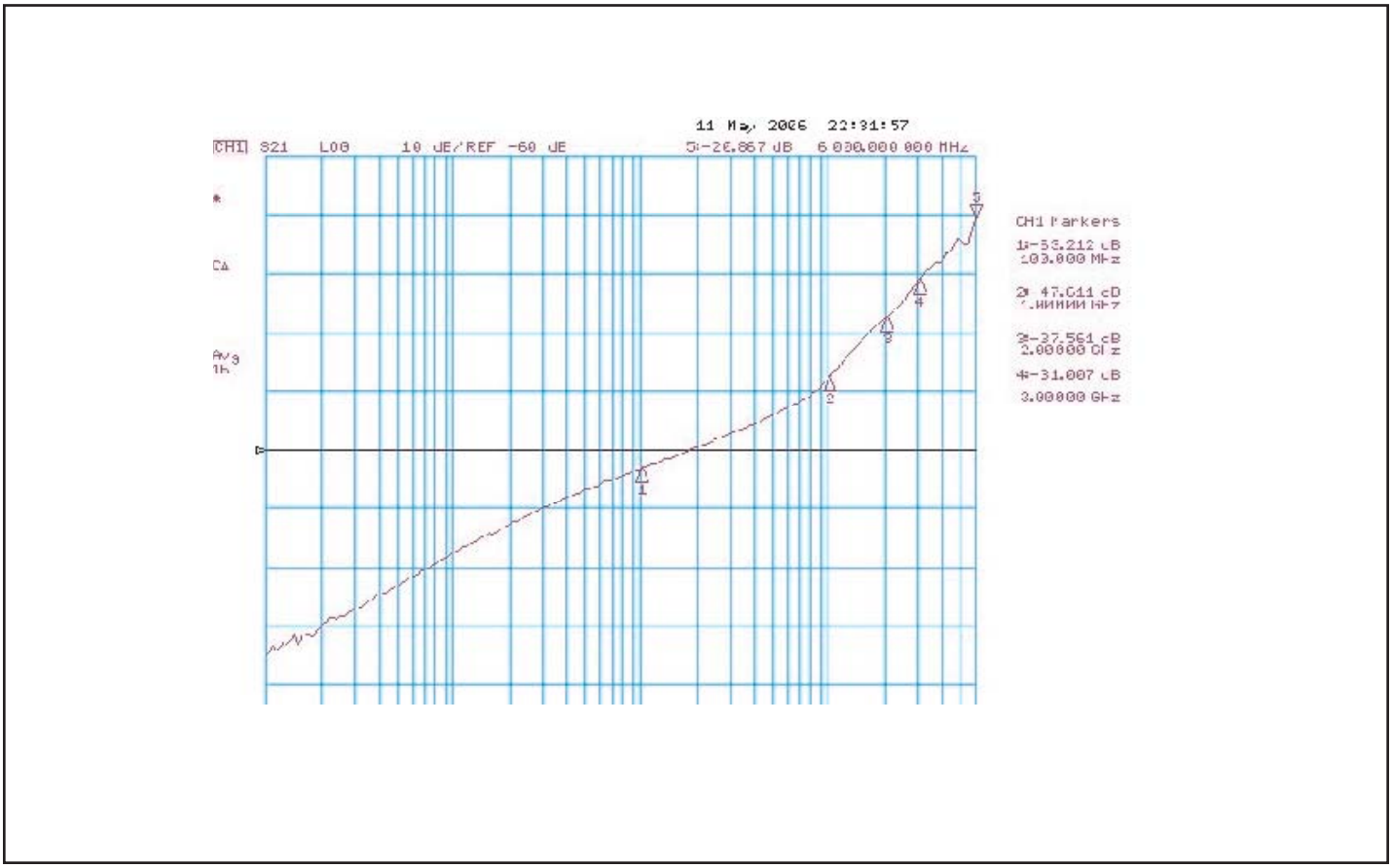


Fig 4: Typical Off Isolation Plot from 1 MHz to 6.0 GHz, V_{CC} = 1.8V, TA=25°C

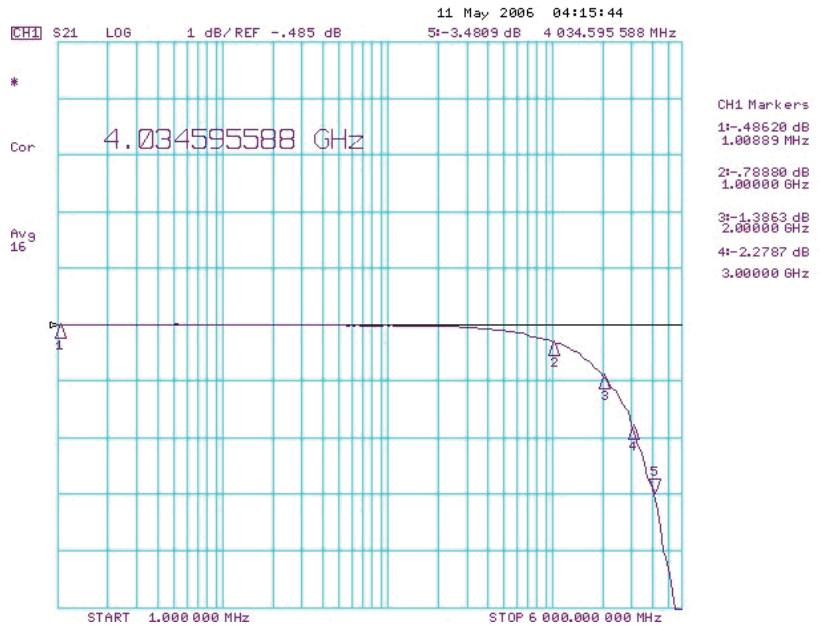
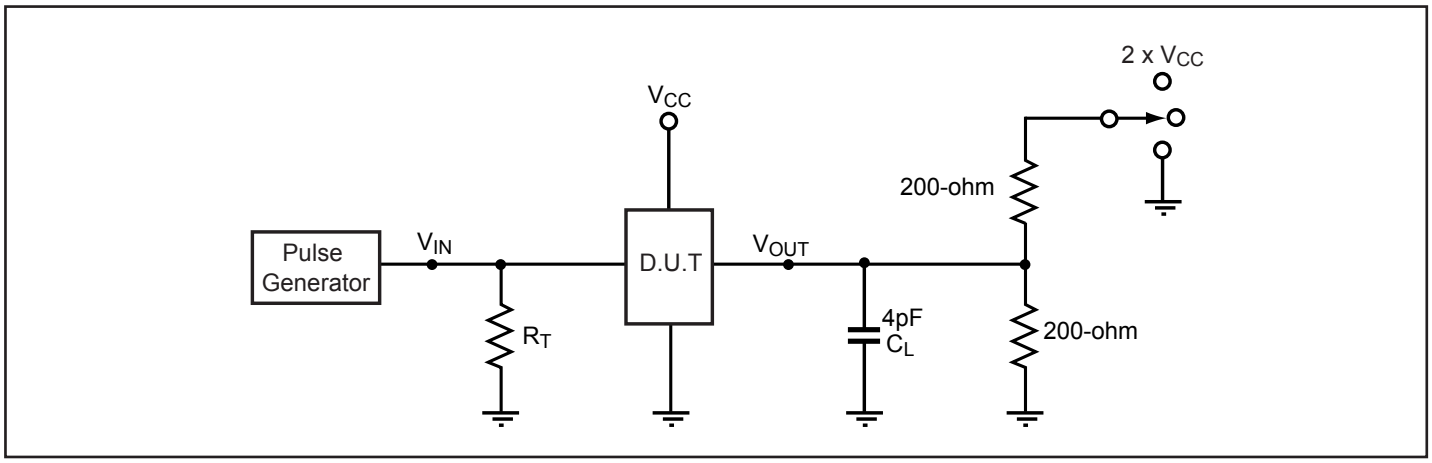


Fig 5: Typical Insertion Loss Plot from 1MHz to 6.0GHz, Vcc=1.8V, 25C

Switching Characteristics (T_A= -40º to +85ºC, V_{CC} = 1.8V±10%)

Paramenter	Description	Min.	Typ.	Max.	Units
t_{PZH}, t_{PZL}	Line Enable Time - SEL to A_N, B_N	0.5		8.0	ns
t_{PHZ}, t_{PLZ}	Line Disable Time - SEL to A_N, B_N	0.5		8.0	
t_{b-b}	Bit-to-bit skew within same differential pair			4	ps
t_{ch}-t_{ch}	Channel-to-channel timing skew			35	

Test Circuit for Electrical Characteristics(1)

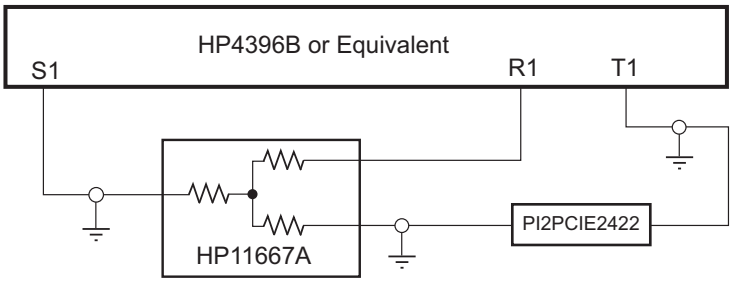


Notes:
1. C_L = Load capacitance: includes jig and probe capacitance.
2. R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator
3. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an 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.

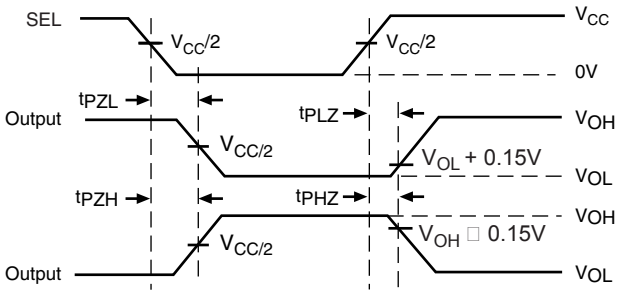
Switch Positions

Test	Switch
t_{PLZ}, t_{PZL} (output on B-side)	2 x V_{CC}
t_{PHZ}, t_{PZH} (output on B-side)	GND
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics



Switching Waveforms



Voltage Waveforms Enable and Disable Times

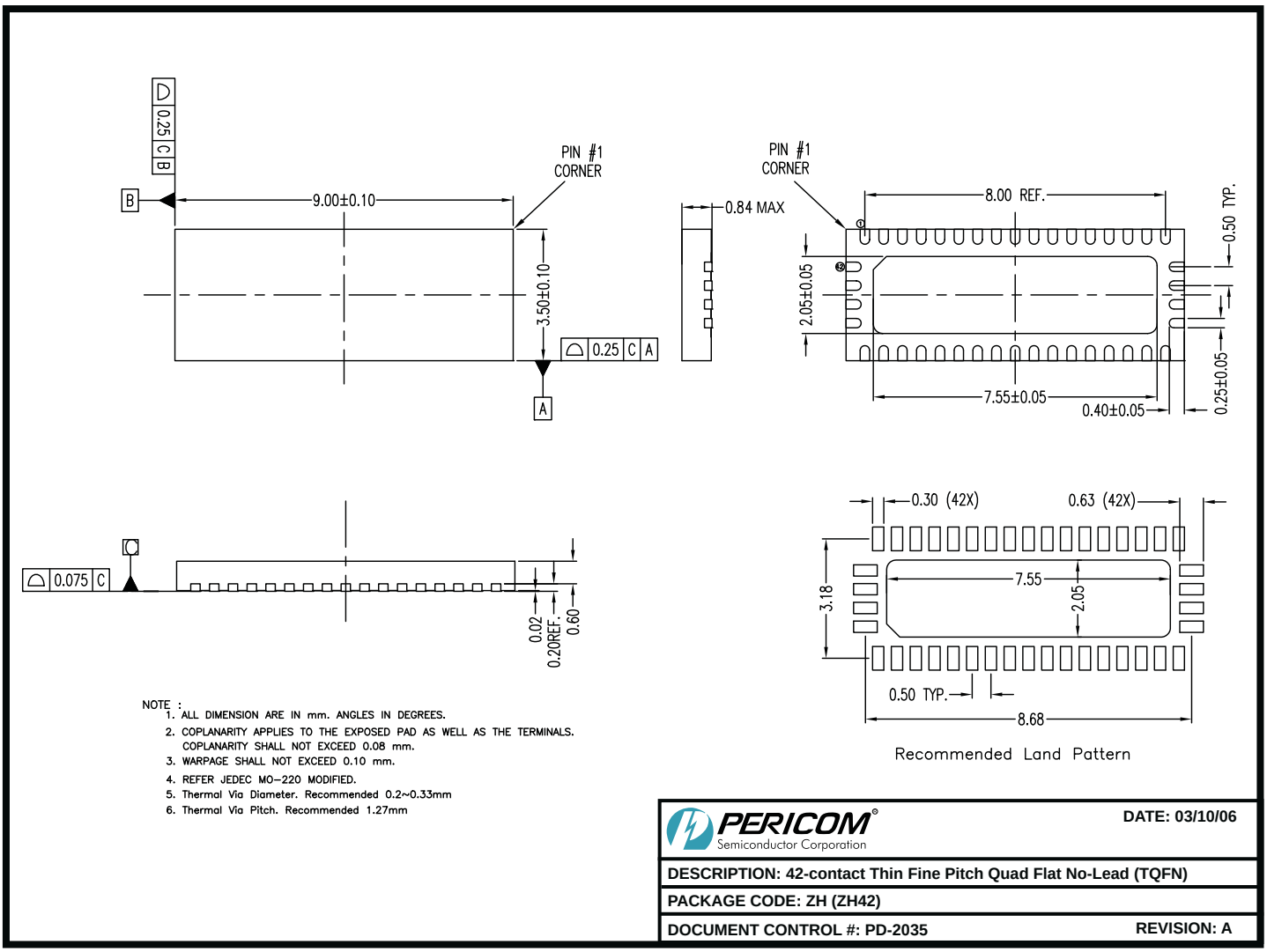
Applications Information

Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd

PCI Express Application Specific Measurements and Test Set-up

Figure 6: the test set-up for the PI2PCIE2422 eye test

Notes:
1. A modified PI2PCIE2422 application board with 16-inch differential trace is used for Eye management.
2. Agilent N4902B BERT is used to generate a K28.5 pattern at 5 Gbps with 500mV single-end swing.
3. To create the P12PCIE2422-free test condition, the PI2PCIE2422 chip is removed and a wire is connected between the trace and output
   probe.
4. An Agilent Infinuum 54855A is used and Serial Data Analysis software is ran to capture the Eye.



Ordering Information

Ordering Code	Package Code	Package Description
PI2PCIE2422ZHE	ZH	Pb-free and Green 42-contact TQFN

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

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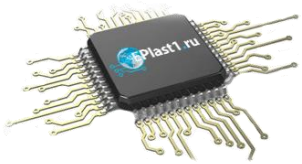

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