



PI3PCIE3215

3.3V, PCI Express® 3.0, 1-Lane, 2:1 Mux/DeMux Switch w/ Single Enable

Features

- 2 Differential Channel, 2:1 Mux/DeMux
- PCI Express® 3.0 performance, 8.0Gbps
- Bi-directional operation
- Low Bit-to-Bit Skew, 10ps max
- Low channel-to-channel skew: 20ps max
- Low insertion loss: -1.8dB @4GHz (8.0Gbps)
- Return loss: -14dB @4GHz (8.0Gbps)
- Low Crosstalk: -35dB@4GHz (8.0Gbps)
- Low Off Isolation: -21dB@4GHz (8.0Gbps)
- V_{DD} Operating Range: 3.3V ± 10%
- ESD Tolerance: 1kV HBM
- Packaging (Pb-free & Green):
 - – 20-contact TQFN (2.5 × 4.5mm)

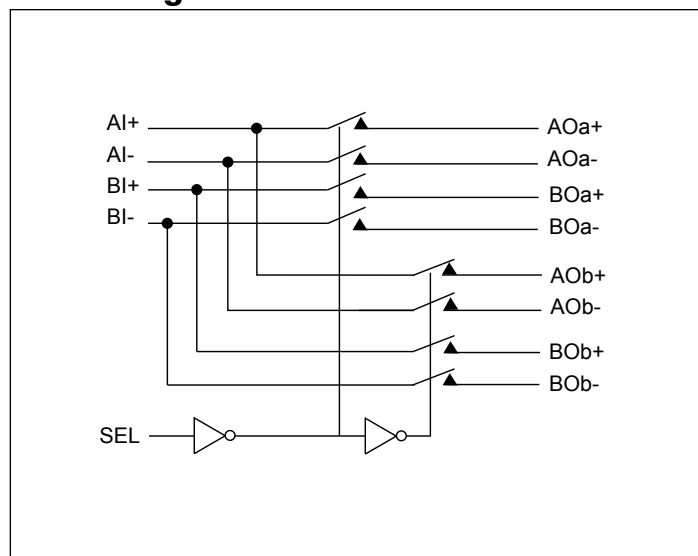
Description

Pericom Semiconductor's PI3PCIE3215 is a 4 to 2 differential, bi-directional channel multiplexer/demultiplexer switch. Due to its low bit-to-bit skew, high channel-to-channel noise isolation and bandwidth, this product is ideal for PCI Express® 3.0 signal switching at 8.0Gbps.

Application

Switch a PCI Express 3.0 lane output between two PCI Express lane inputs

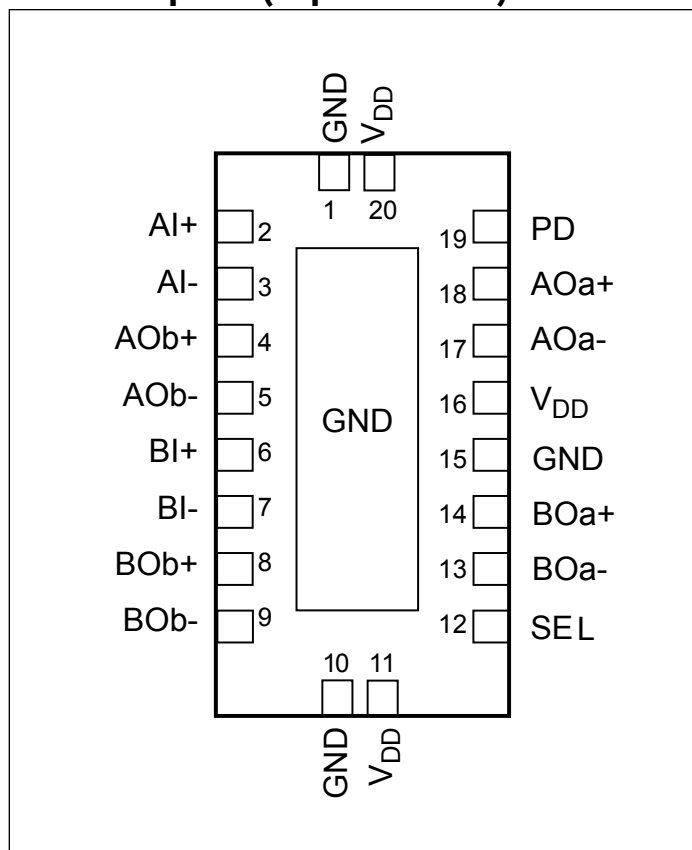
Block Diagram



Truth Table

Function	SEL
xIy to xOay	L
xIy to xOby	H

Pin Description (Top-side view)





Pin Number	Pin Name	Type	Description
2 3	AI+ AI-	Differential input	Differential input pair from PCIE signal source. Signal is passed through to the AOa+, AOa- pin respectively when SEL=0. Signal is passed through to the AOb+, AOb- pin respectively when SEL = 1.
18 17	AOa+ AOa-	Differential pass-through input	Differential analog pass-through output. Signal from AI+ and AI- is passed through AOa+ and AOa- respectively when SEL=0.
4 5	AOb+ AOb-	Differential pass-through input	Differential analog pass-through output. Signal from AI+ and AI- is passed through AOa+ and AOa- respectively when SEL=1.
6 7	BI+ BI-	Differential input	Differential input pair from PCIE signal source. Signal is passed through to the BOa+, BOa- pin respectively when SEL=0. Signal is passed through to the BOb+, BOb- pin respectively when SEL = 1.
14 13	BOa+ BOa-	Differential pass-through input	Differential analog pass-through output. Signal from BI+ and BI- is passed through BOa+ and BOa- respectively when SEL=0.
8 9	BOb+ BOb-	Differential pass-through input	Differential analog pass-through output. Signal from BI+ and BI- is passed through BOb+ and BOb- respectively when SEL=1.
1, 10, 15 (center pad)	GND	Ground input	Ground
19	PD	Input	Power Down. When PD = '1', all paths are switched off and supply current is very low. PD = '0' for normal operation.
12	SEL	Input	SEL controls the mux through a flow-through latch.
11, 16, 20	V _{DD}	Power supply	Power, 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
Channel DC Input Voltage	–0.5V to 1.5V
DC Output Current	120mA
Power Dissipation	0.5W
SEL DC Input Voltage	–0.5V to 4.6V

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.

Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V _{DD}	3.3V Power Supply		3.0	3.3	3.6	V
I _{DD}	Total current from V _{DD} 3.3V supply	SEL = OV or V _{DD} , PD = 0		0.13	1	mA
I _{DD_PD}	Power down current	PD = 1		20	40	μA
T _{CASE}	Case temperature range for operation within spec.		–40		85	Celsius

DC Electrical Characteristics (T_A = –40°C to +85°C, V_{DD} = 3.3V ± 10%)

Parameter	Description	Test Conditions	Min	Typ ⁽¹⁾	Max	Units
V _{IH}	Input high level, SEL, PD input		2.0		3.6	V
V _{IL}	Input Low Level, SEL, PD input		0		0.8	V
I _{IN}	Input Leakage Current, SEL, PD input	Measured with input at V _{IH} -SEL max and V _{IL} -SEL min	–10		10	uA
I _{IH}	Input High Current, xI, xO	V _{DD} = Max, V _{IN} = 1.5V	–10		10	uA
I _{IL}	Input Low Current, xI, xO	V _{DD} = Max, V _{IN} = 0V	–10		10	uA
I _{IH}	Input High Current, SEL, PD	V _{DD} = Max, V _{IN} = V _{DD}	–5		5	uA
I _{IL}	Input Low Current, SEL, PD	V _{DD} = Max, V _{IN} = 0V	–5		5	uA
I _{OZH}	HighZ High Current xOa, xOb	V _{DD} = Max, V _{IN} = 1.5V	–10		10	uA
I _{OZL}	HighZ Low Current xOa, xOb	V _{DD} = Max, V _{IN} = 0V	–10		10	uA

Note:

1. Typical values are at V_{DD} = 3.3V, T_A = 25°C ambient and maximum loading.


Dynamic Electrical Characteristics for xI+/-, xOy+/-

Parameter	Description	Test Conditions	Min.	Typ.(1)	Max.	Units
DDIL	Differential Insertion Loss	f=1.2GHz f=2.5GHz f=4.0GHz f=5.0GHz f=7.5GHz		-0.8 -1.0 -1.8 -2.3 -2.8		dB
DDIL _{OFF}	Differential Off Isolation	f= 0 to 4.0GHz		-23		
DDRL	Differential Return Loss	f= 0 to 2.8GHz f= 2.8 to 5.0GHz f= 5.0 to 8.0GHz		-30 -9.1 -5.9		
DDNEXT	Near End Crosstalk	f= 0 to 2.8GHz f= 2.8 to 5.0GHz f= 5.0 to 8.0GHz		-37 -35 -32		
BW	Bandwidth -3dB			8.1		GHz

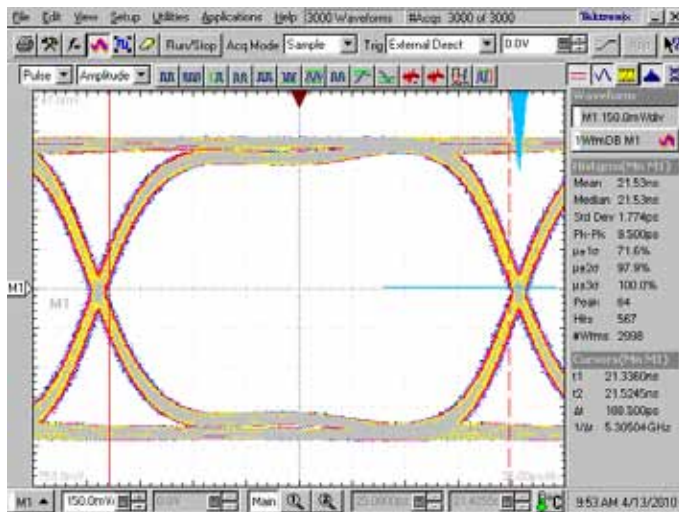
Switching Characteristics

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Units
t _{PZH} , t _{PZL}	Line Enable Time - SEL to xI+/-, xOy+/-	See "Test Circuit for Electrical Characteristics"		25	30	ns
t _{PHZ} , t _{PLZ}	Line Disable Time - SEL to xI+/-, xOy+/-	See "Test Circuit for Electrical Characteristics"		5	25	ns
t _{b-b}	Bit-to-bit skew within the same differential pair	See "Test Circuit for Electrical Characteristics"		5	10	ps
t _{ch-ch}	Channel-to-channel skew	See "Test Circuit for Electrical Characteristics"		10	20	ps

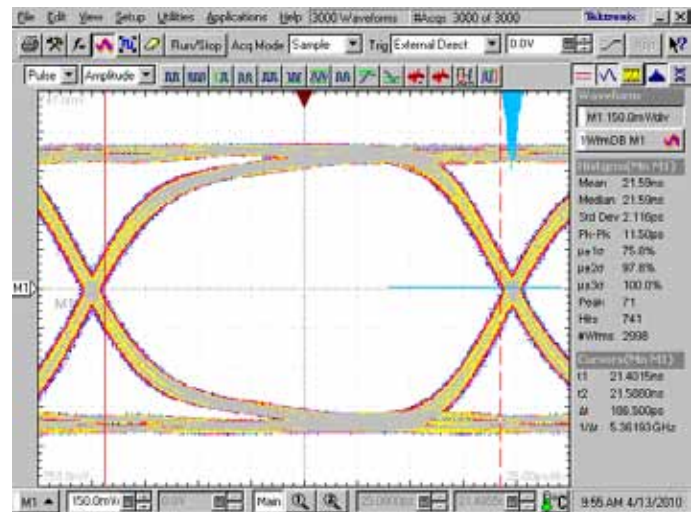


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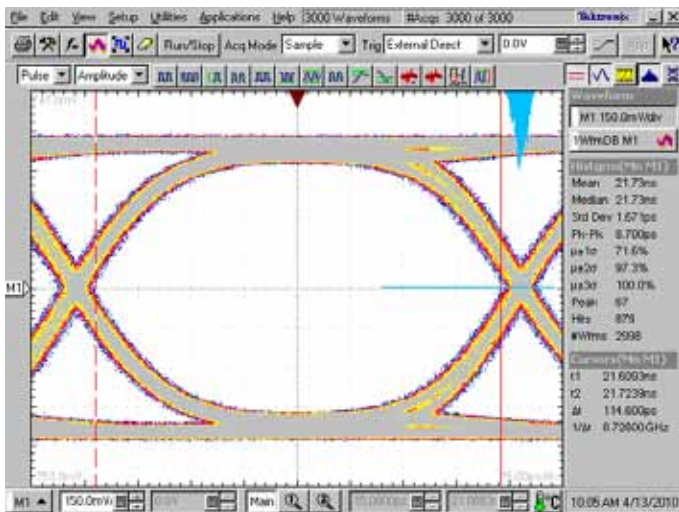
3.3V, PCI Express® 3.0, 1-Lane,
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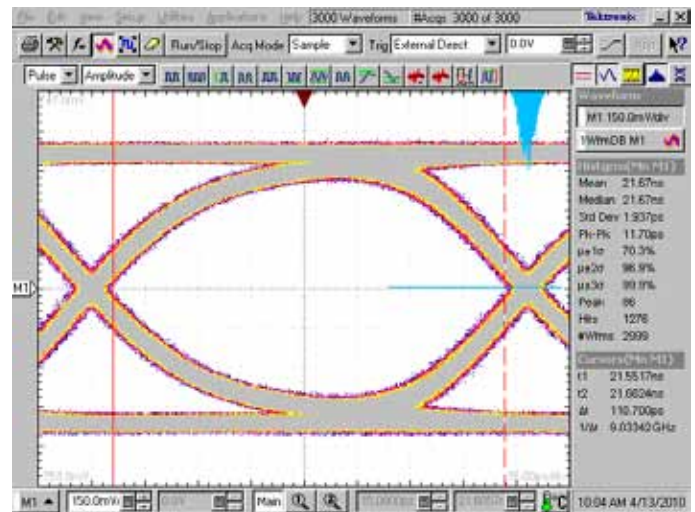
5.0 Gbps RX signal eye without PI3PCIE3215



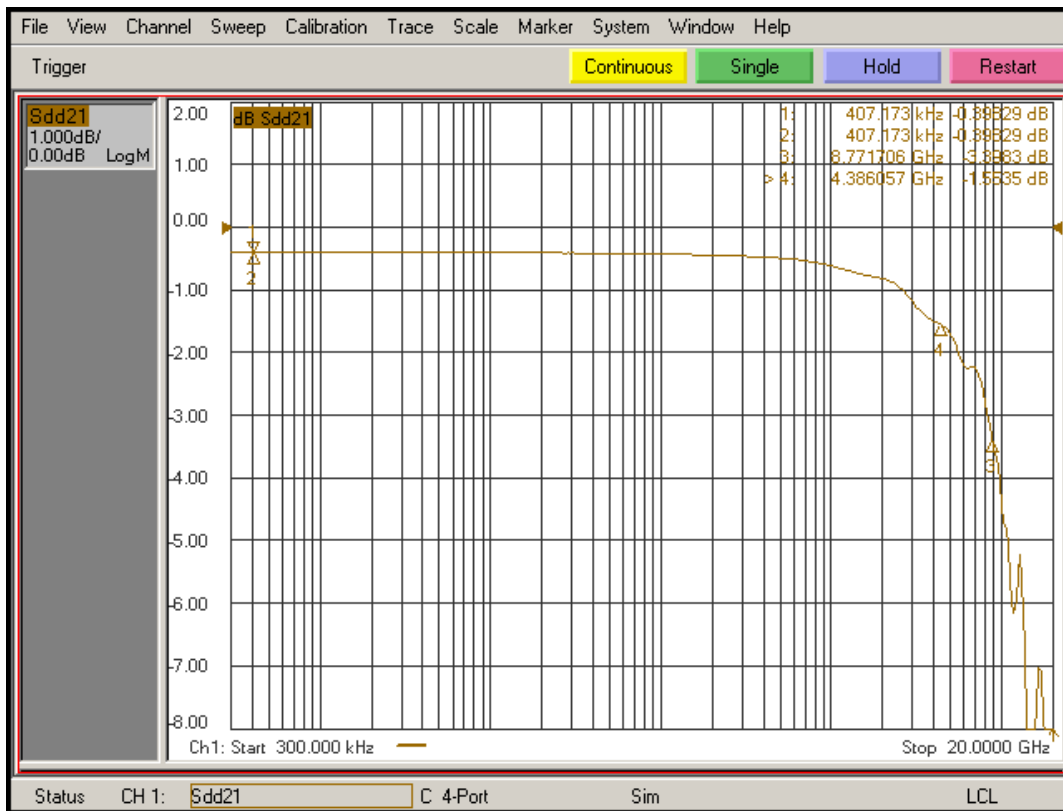
5.0 Gbps RX signal eye with PI3PCIE3215



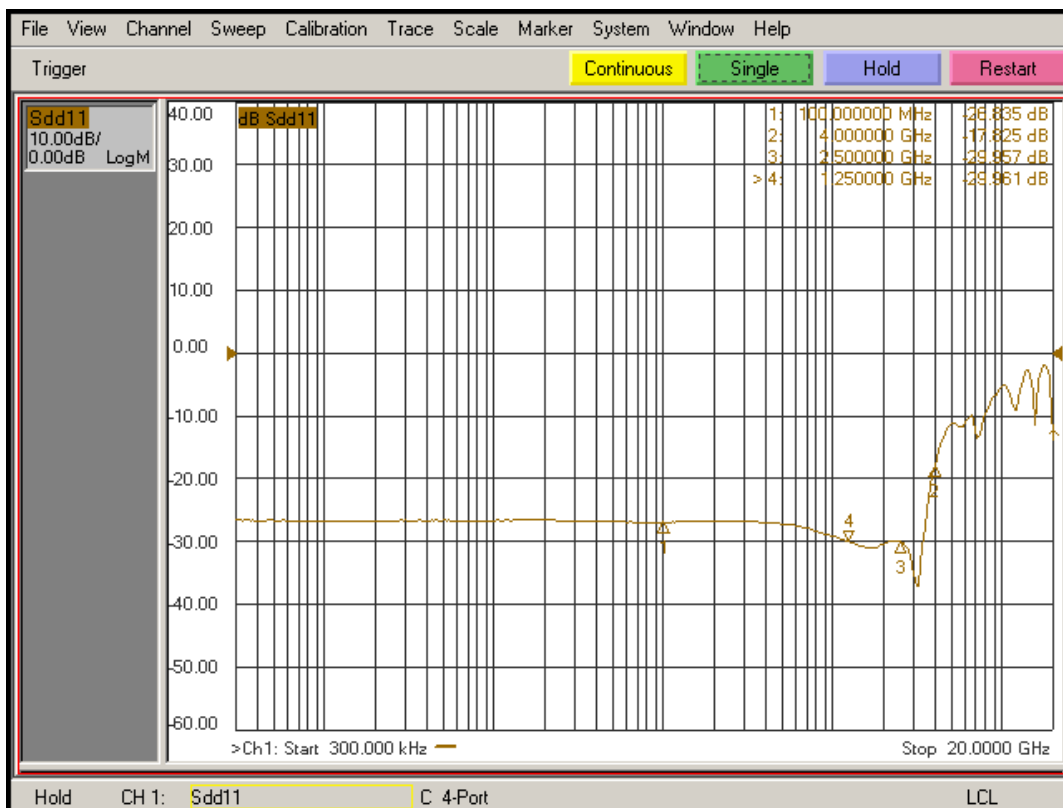
8.0 Gbps RX signal eye without PI3PCIE3215



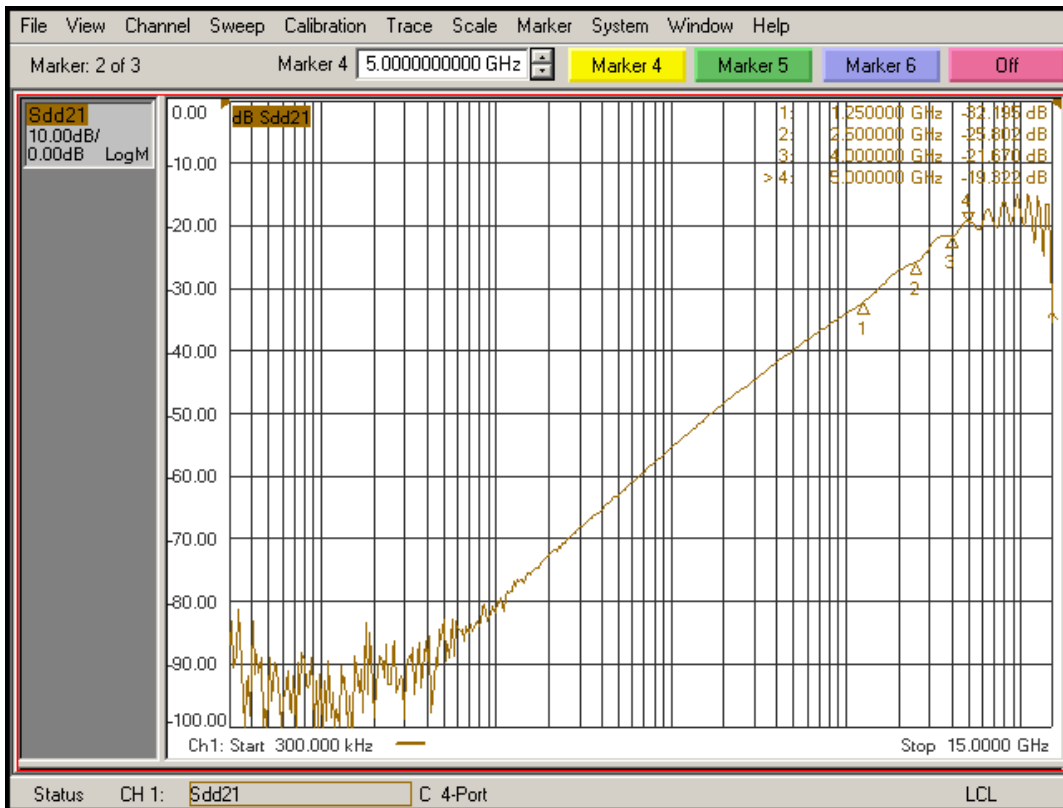
8.0 Gbps RX signal eye with PI3PCIE3215



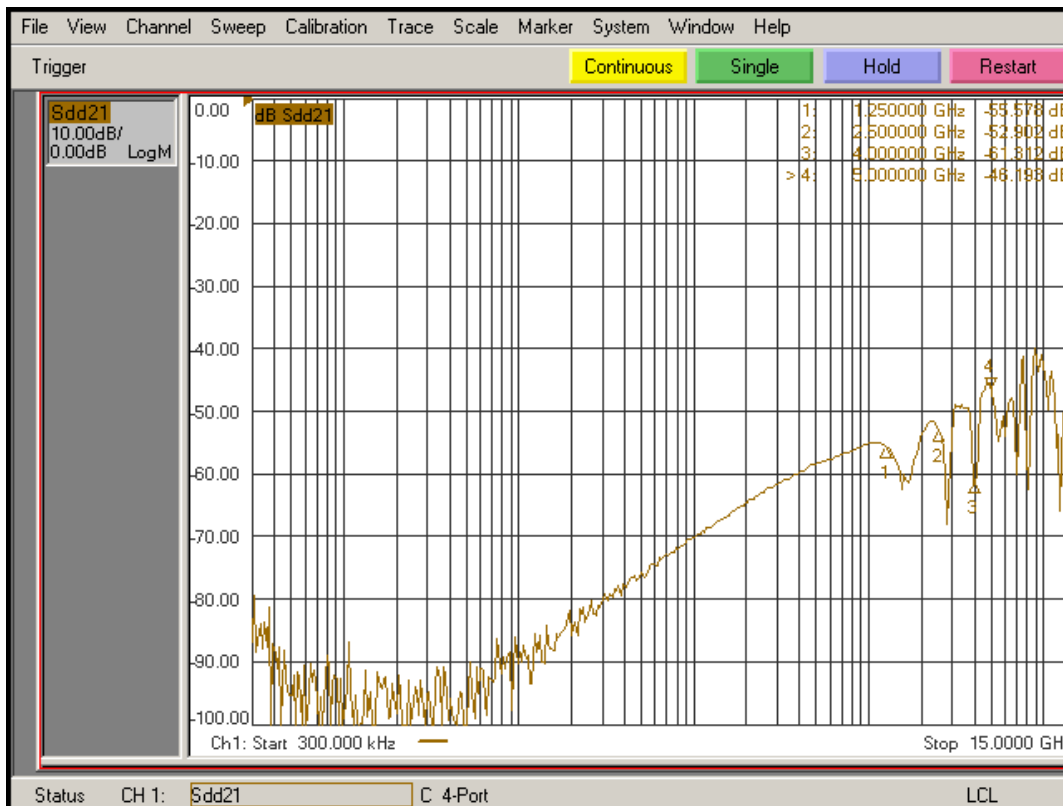
Differential Insertion Loss



Differential Return Loss



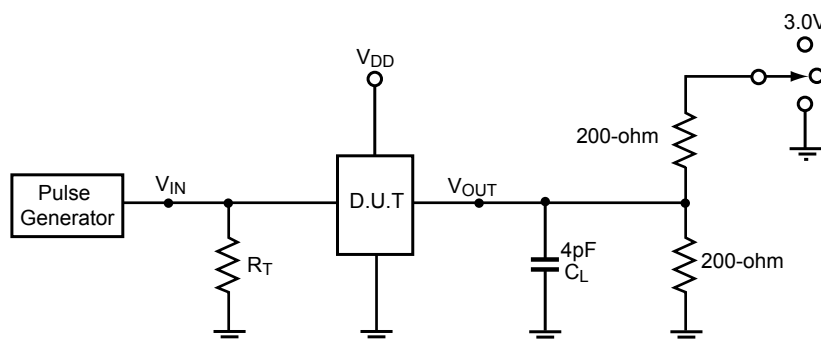
Differential Off Isolation



Differential Crosstalk



Test Circuit for Electrical Characteristics(1-5)



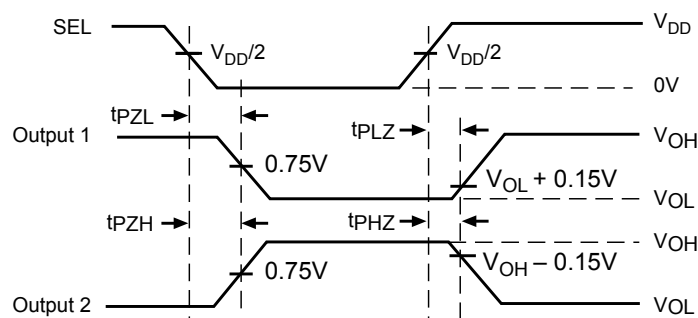
Notes:

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.

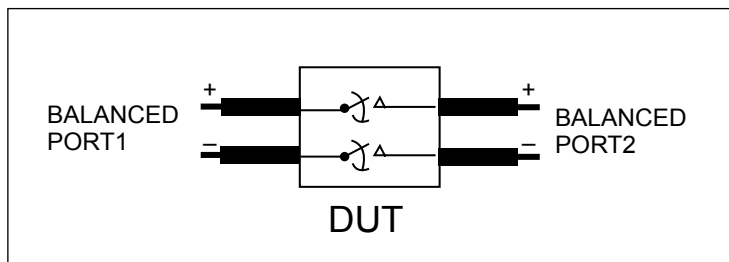
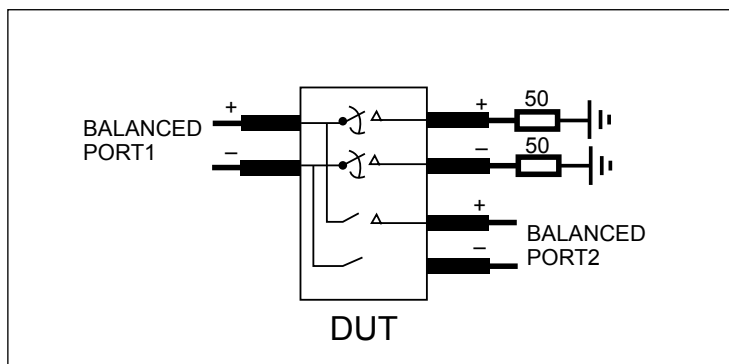
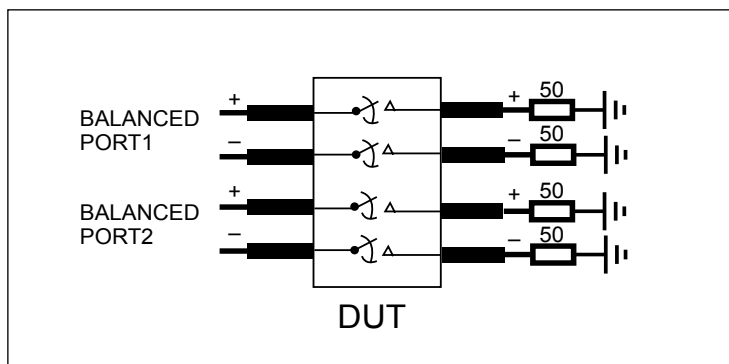
Switch Positions

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

Switching Waveforms

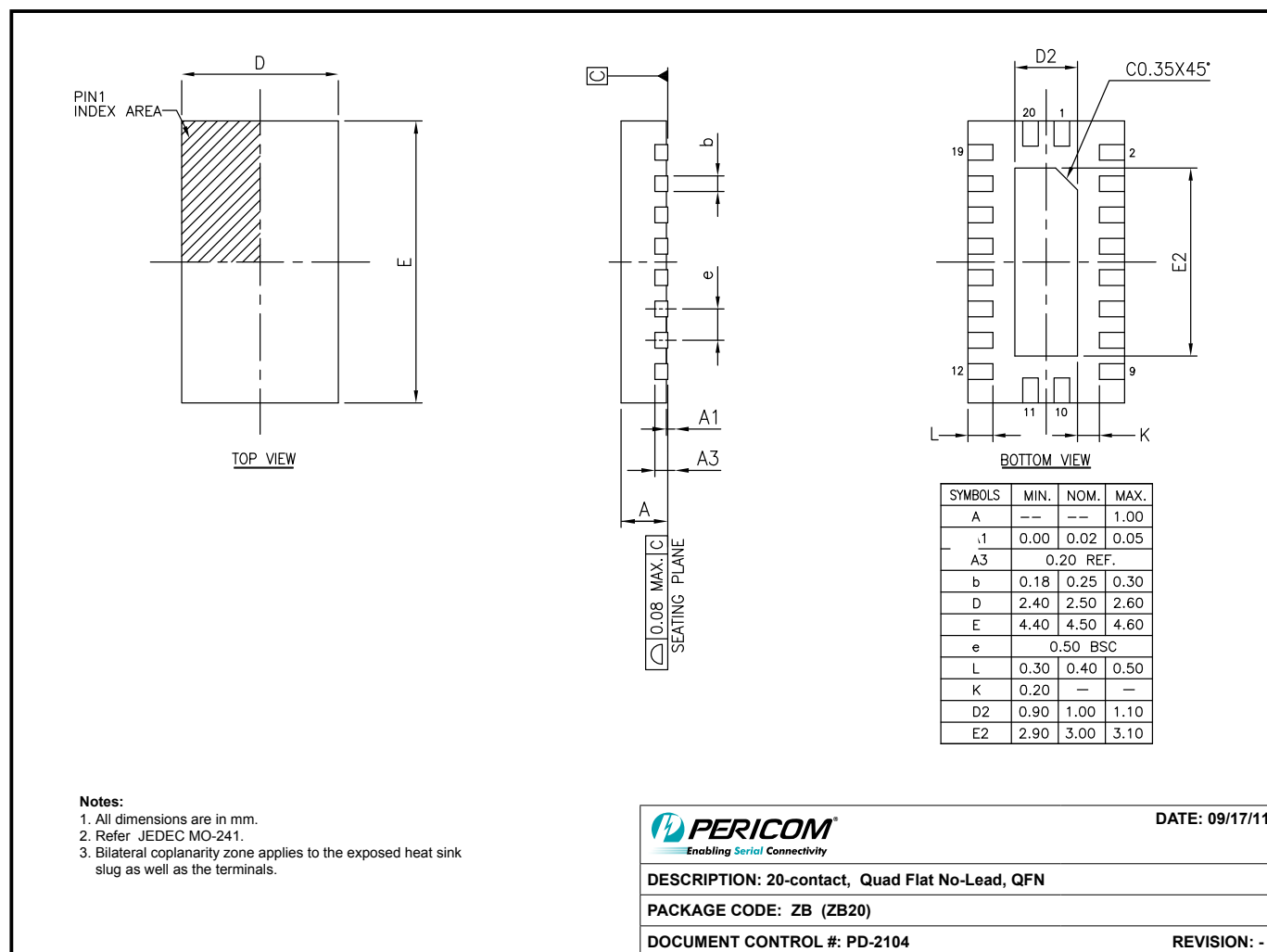


Voltage Waveforms Enable and Disable Times

**Differential Insertion Loss and Return Test Circuit****Differential Off Isolation Test Circuit****Differential Near End Xtalk Test Circuit**



Packaging Information



Note:

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

Ordering Information

Ordering Code	Package Code	Package Description
PI3PCIE3215ZBE	ZB	Pb-free & Green, 20-contact QFN

Notes:

- Thermal characteristics can be found on the company web site at 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