PI3PCIE3212

3.3V, PCI Express® 3.0, 1-Lane, 2-Channel, 8Gbps, 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
- 3dB Bandwidth: 8.1GHz
- Low Bit-to-Bit Skew, 10ps max
- Low channel-to-channel skew: 20ps max
- Low insertion loss: -1.7dB @4GHz (8.0Gbps)
- Low return loss: -13.5dB @4GHz (8.0Gbps)
- Low Crosstalk: -32dB@4GHz (8.0Gbps)
- Low Off Isolation: -21dB@4GHz (8.0Gbps)
- Supply Voltage: 3.3V ± 10%
- Low Current: 0.2mA typ.
- Packaging (Pb-free & Green):
  - – 20-contact QFN (2.5 × 4.5mm)

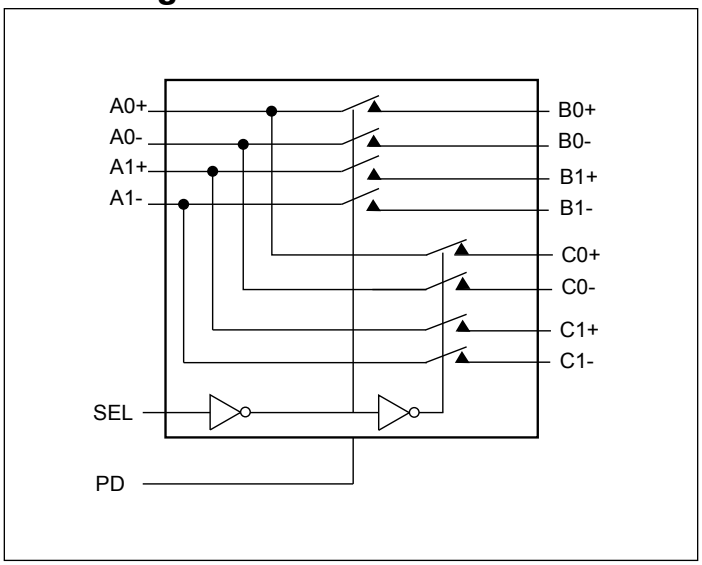
Description

Pericom Semiconductor's PI3PCIE3212 is a PCIe Gen3.0, 8Gbps, 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.

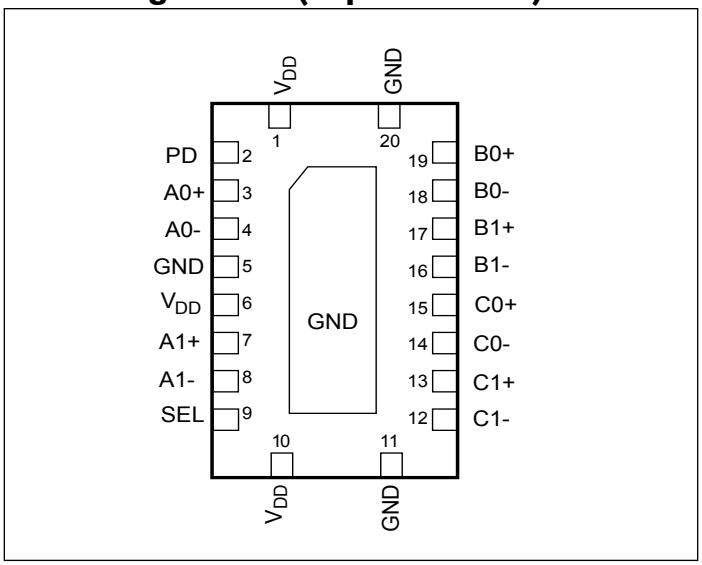
Application

Switch a PCI Express 3.0 lane output between two PCI Express lane inputs. Applications include NBs, PCs, servers, and other embedded devices. Routing of PCI Express 3.0, DP1.2, USB3.0, SAS2.0, SATA3.0, XAUI, RXAUI signals with low signal attenuation.

Block Diagram



Pin Configuration (Top-side view)



Truth Table

Function	SEL	PD
A to B	L	L
A to C	H	L
All ports Hi-Z, IC Power Down	X	H

Pin Description

Pin #	Pin Name	I/O	Description
2	PD	I	Power Down. When PD = '1', all paths are switched off and supply current is very low. PD = '0' for normal operation.
3 4	A0+ A0-	I/O	Signal I/O, Channel 0, Port A
9	SEL	I	Operation mode Select (when SEL=0: A→B, when SEL=1: A→C)
1, 6, 10	V_{DD}	Pwr	3.3V ± 10% Positive Supply Voltage
7 8	A1+ A1–	I/O	Signal I/O, Channel 1, Port A
5, 11, 20, Center Pad	GND	Pwr	Power ground
13 12	C1+ C1-	I/O	Signal I/O, Channel 1, Port C
15 14	C0+ C0-	I/O	Signal I/O, Channel 0, Port C
17 16	B1+ B1–	I/O	Signal I/O, Channel 1, Port B
19 18	B0+ B0–	I/O	Signal I/O, Channel 0, Port B

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/PD 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.

Electrical Characteristics

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}		0.2	1	mA
I_{DD_PD}	Power down current	PD = 1		20	40	µA
$V_{I/O}$-DIF	Differential Voltage (differential pins)				1.6	V_{ppd}
$V_{I/O-CM}$	Common Mode Voltage (differential pins)		0		0.8	V
T_{CASE}	Case temperature range for operation within spec.		-40		85	Celsius

DC Electrical Characteristics for Switching over Operating Range

Parameters	Description	Test Conditions[1]	Min	Typ[1]	Max	Units
V_{IH} - SEL, PD	Input HIGH Voltage, SEL, PD Input		2		3.6	V
V_{IL} - SEL, PD	Input LOW Voltage, SEL, PD Input		0		0.8	
V_{IK}	Clamp Diode Voltage	V_{DD} = Max., I_{IN} = –18mA		–0.7	–1.2	
I_{IH}	Input HIGH Current, SEL, PD	V_{DD} = Max., V_{IN} = V_{DD}			±5	µA
I_{IL}	Input LOW Current, SEL, PD	V_{DD} = Max., V_{IN} = 0V			±5	
I_{IH}	Input HIGH Current, A_X, B_X, C_X	V_{DD} = Max., V_{IN} = 1.5V	–10		+10	µA
I_{IL}	Input LOW Current, A_X, B_X, C_X	V_{DD} = Max., V_{IN} = 0V	–10		+10	
I_{OZH}	HighZ HIGH Current, B_X, C_X	V_{DD} = Max., V_{IN} = 1.5V	–10		+10	µA
I_{OZL}	HighZ LOW Current, B_X, C_X	V_{DD} = Max., V_{IN} = 0V	–10		+10	µA

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

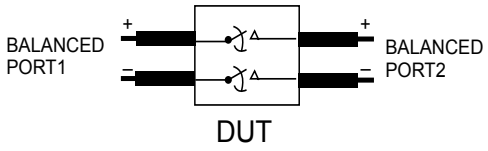
Switching Characteristics

Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
t_{PZH}, t_{PZL}	Line Enable Time - SEL to A_N, B_N, C_N			25	30	ns
t_{PHZ}, t_{PLZ}	Line Disable Time - SEL to A_N, B_N, C_N			5	25	
t_{PLH}	Propagation Delay, LOW to HIGH		17		36	ps
t_{PHL}	Propagation Delay, HIGH to LOW		21		39	ps
t_{b-b}	Bit-to-bit skew within the same differential pair			5	10	ps
t_{ch-ch}	Channel-to-channel skew				20	ps

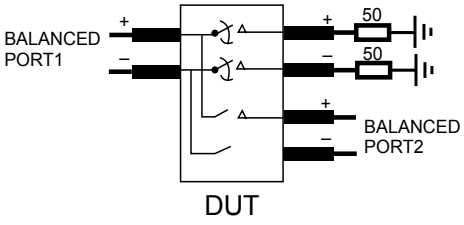
Dynamic Electrical Characteristics

Parameter	Description	Test Conditions	Min.	Typ.[1]	Max.	Units
$DDIL^{2,3}$	Differential Insertion Loss (V_{IN} = -10dBm, DC = 0V)	f = 100MHz f = 100MHz-1.25GHz f = 1.25GHz-2.5GHz f = 2.5GHz-4GHz f = 5GHz		-0.4 -0.6 -1.0 -1.7 -2.1		dB
$DDIL_{OFF}^{2,3}$	Differential Off Isolation	f = 100MHz f = 100MHz-1.25GHz f = 1.25GHz-2.5GHz f = 2.5GHz-4GHz		-59 -37 -27 -21		dB
$DDRL^{2}$	Differential Return Loss	f = 100MHz f = 100MHz-1.25GHz f = 1.25GHz-2.5GHz f = 2.5GHz-4GHz		-27 -23.3 -23.3 -13.5		dB
$DDNEXT^{2,3}$	Near End Crosstalk	f = 100MHz f = 100MHz-1.25GHz f = 1.25GHz-2.5GHz f = 2.5GHz-4GHz		-57 -38 -33 -32		dB
BW	-3dB Bandwidth			8.1		GHz

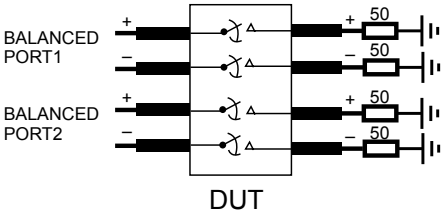
Notes:
1. Guaranteed by design. Typical values are at V_{DD} = 3.3V , T_A = 25°C ambient and maximum loading.
2. S parameters are measured with our evaluation board made with Rogers (R04350) material. Trace width is 30 mil, length 540 mil, trace impedance is 50 Ohm (+/-5%) and total insertion loss of the trace is 0.5dB@4GHz.
3. Measurement done with fixture deembedding.



Diff. Insertion Loss and Return Test Circuit

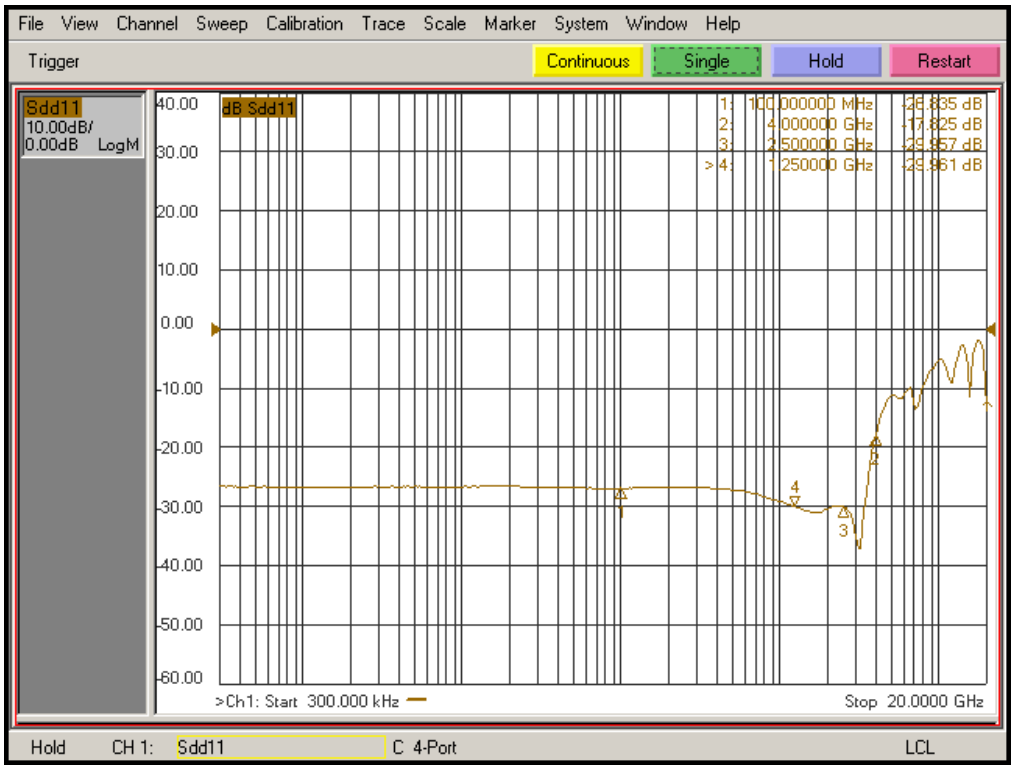


Diff. Off Isolation Test Circuit

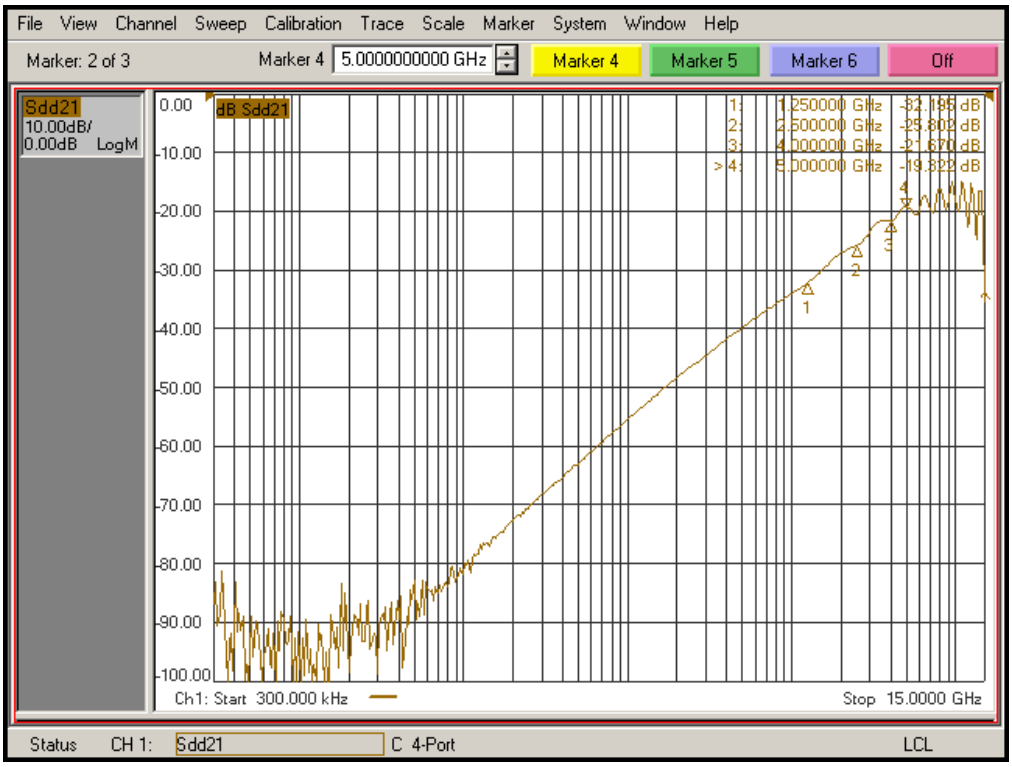


Diff. Near End Xtalk Test Circuit

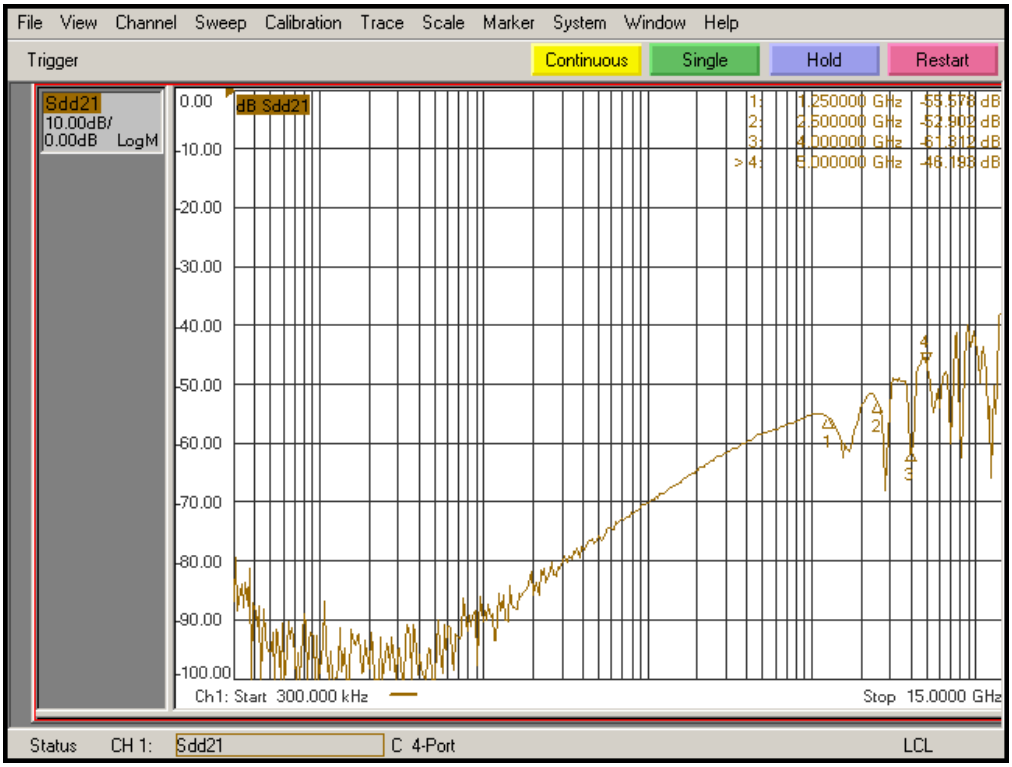
Differential Insertion Loss



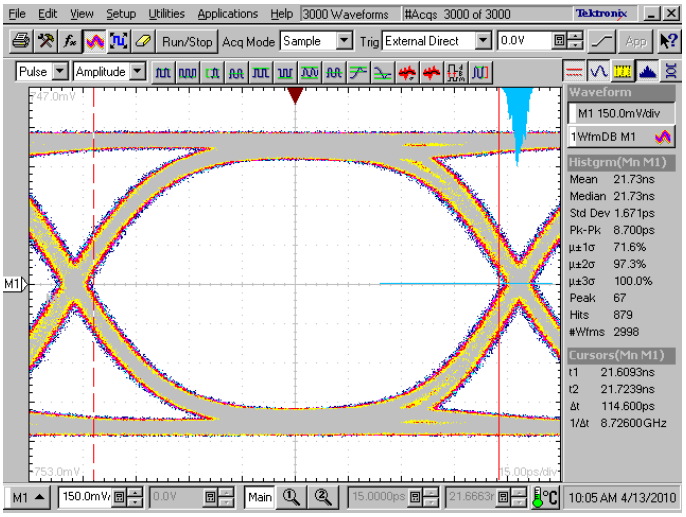
Differential Return Loss



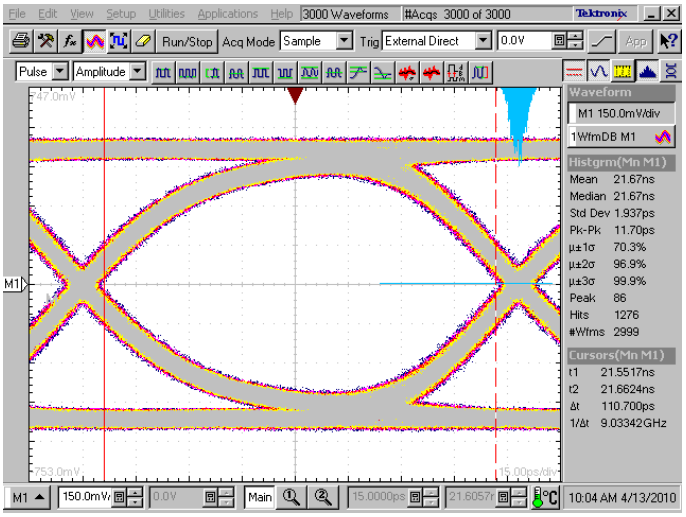
Differential Off Isolation



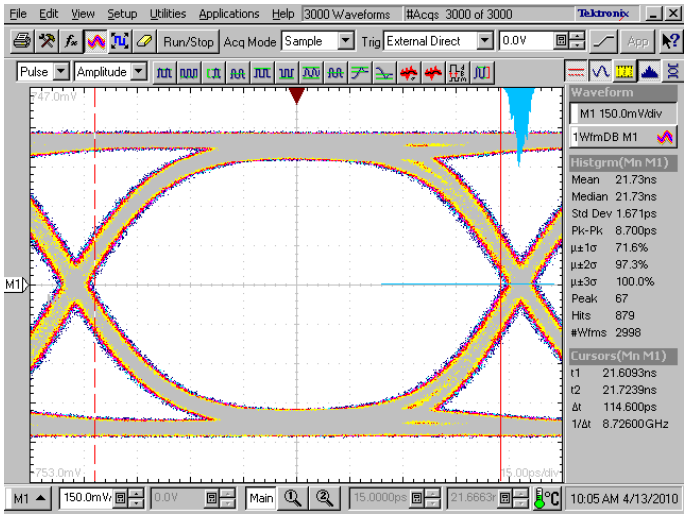
Differential Crosstalk



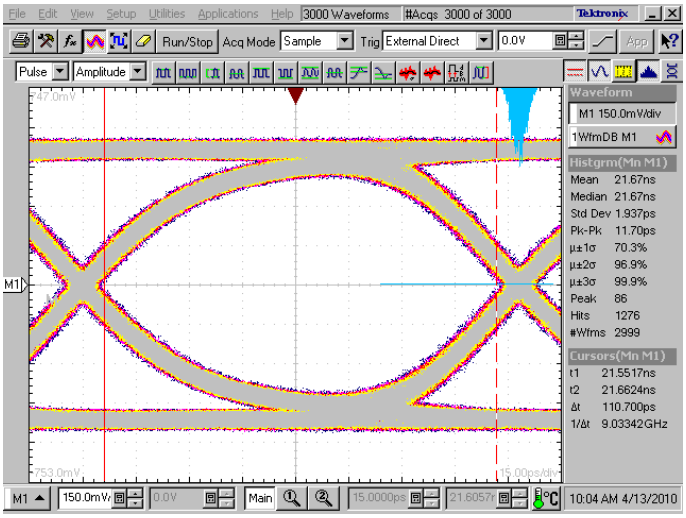
5.0 Gbps RX signal eye without PI3PCIE3212



5.0 Gbps RX signal eye with PI3PCIE3212

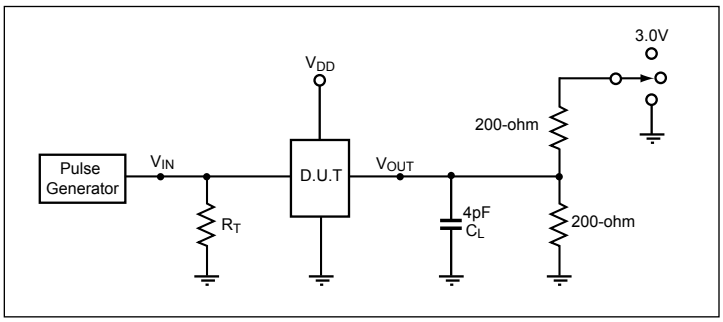


8.0 Gbps RX signal eye without PI3PCIE3212



8.0 Gbps RX signal eye with PI3PCIE3212

Test Circuit for Electrical Characteristics(1-5)

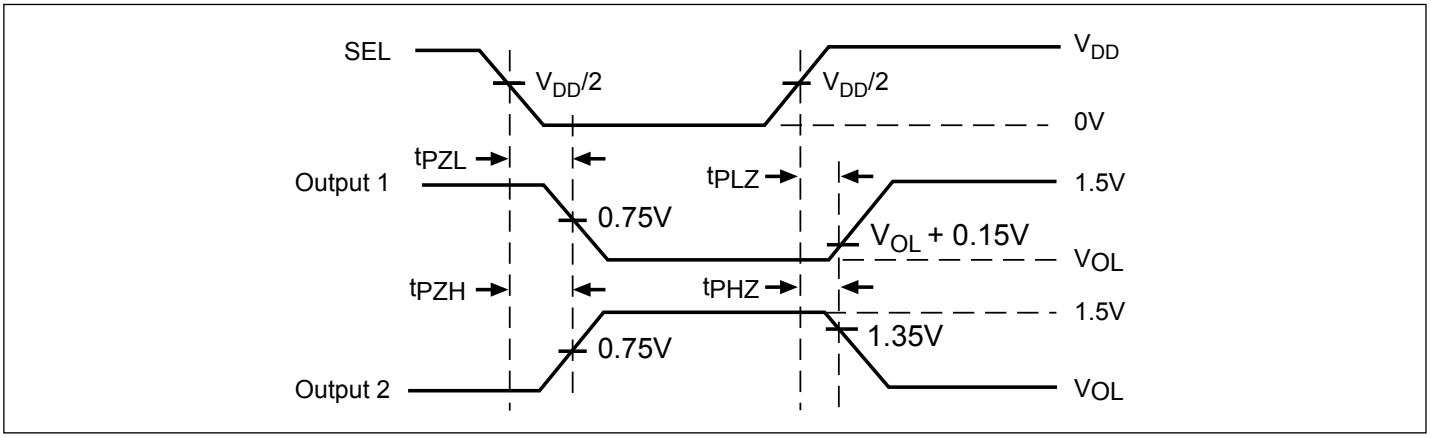


Notes:
1. C_L = Load capacitance: includes jig and probe capacitance.
2. R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator
3. Output 1 is for an output with internal conditions such that the output is low except when disabled by the output control. output 2 is for an output 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 ≤ MHz, Z_O = 50Ω, $t_R \leq 2.5$ns, $t_F \leq 2.5$ns.
5. The outputs are measured one at a time with one transition per measurement.

Switch Positions

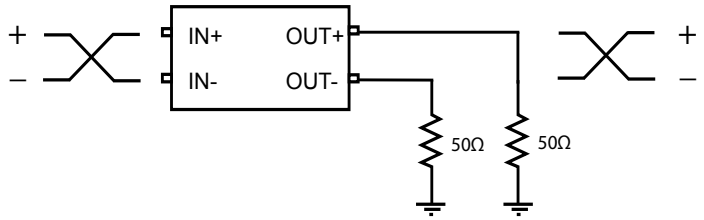
Test	Switch
t_{PLZ}, t_{PZL}	3.0V
t_{PHZ}, t_{PZH}	GND

Switching Waveforms

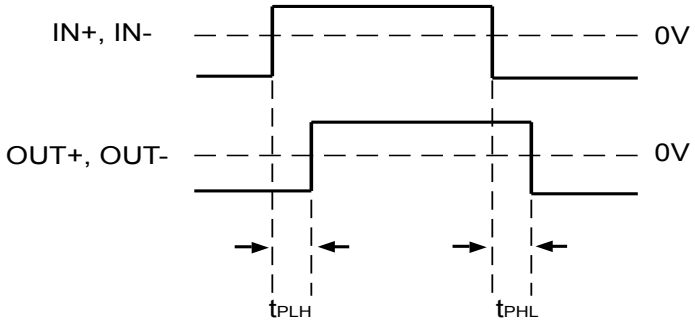


Voltage Waveforms Enable and Disable Times

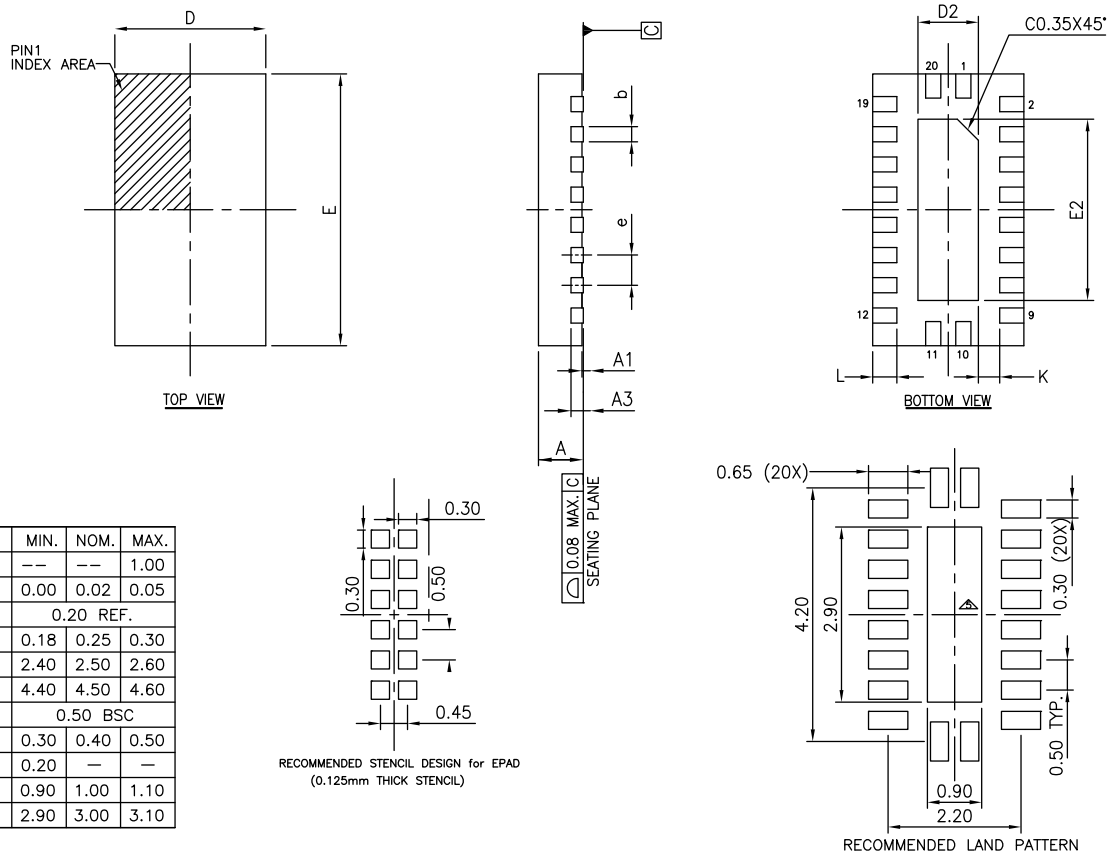
Test Circuit for Propagation Delay



Differential Input/Output Signal Waveform



Packaging Mechanical: 20-Contact TQFN (ZB)



SYMBOLS	MIN.	NOM.	MAX.
A	--	--	1.00
A1	0.00	0.02	0.05
A3		0.20 REF.	
b	0.18	0.25	0.30
D	2.40	2.50	2.60
E	4.40	4.50	4.60
e		0.50 BSC	
L	0.30	0.40	0.50
K	0.20	—	—
D2	0.90	1.00	1.10
E2	2.90	3.00	3.10

NOTE :
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY APPLIES TO THE EXPOSED THERMAL PAD AS WELL AS THE TERMINALS.
3. REFER JEDEC MO-241
4. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.
5. THERMAL PAD SOLDERING AREA (MESH STENCIL DESIGN IS RECOMMENDED).

PERICOM Enabling Serial Connectivity

DATE: 10/20/14

DESCRIPTION: 20-Contact, Very Thin Quad Flat No-Lead (TQFN)

PACKAGE CODE: ZB (ZB20)

DOCUMENT CONTROL #: PD-2104 REVISION: B

14-0265

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

Ordering Information

Ordering Code	Package Code	Package Type
PI3PCIE3212ZBE	ZB	20-contact, Very Thin Quad Flat No-Lead (TQFN)

Notes:
- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free and Green
- Adding an X suffix = Tape/Reel