PI3USB302

3.3V, USB 3.0, 1-Port, 2:1 Mux/DeMux Switch

Features

- 2 Differential Channel, 2:1 Mux/DeMux
- USB3.0 SuperSpeed switch
- Bi-directional operation
- Low Bit-to-Bit Skew, 10ps max
- Low channel-to-channel skew: 20ps max
- Low insertion loss: 1dB @2.5GHz (5.0Gbps)
- Low Crosstalk: 33dB@2.5GHz (5.0Gbps)
- Low Off Isolation: 27dB@2.5GHz (5.0Gbps)
- V_{DD} Operating Range: 3.3V+/-10%
- ESD Tolerance: 1kV
- Packaging (Pb-free & Green):
  - – 20-contact TQFN (2.5 × 4.5mm)

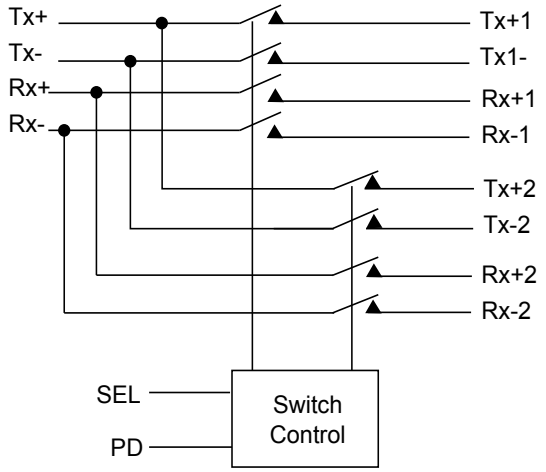
Description

Pericom Semiconductor's PI3USB302 is a 2-differential channel bi-directional multiplexer/demultiplexer switch. Due to its low bit-to-bit skew, high channel-to-channel noise isolation and bandwidth, this product is ideal for USB3.0 signal switching at 5.0Gbps.

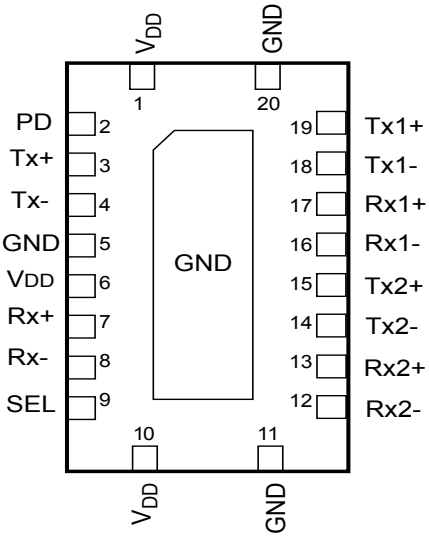
Application

Routing USB3.0 SuperSpeed signals

Block Diagram



Pin Description (Top-side view)



Truth Table

Function	SEL	PD
port 1 is active	L	L
port 2 is active	H	L
Both Ports Hi-z, IC power down	x	H

Pin Description

Pin #	Pin Name	I/O	Description
2	PD	I	Power Down input. see truth table on page 1 for functionality
3	Tx+	I/O	Signal I/O, Transmit differential pair from common port
4	Tx-	I/O	
7 8	Rx+ Rx-	I/O	Signal I/O, Receive differential pair from common port
9	SEL	I	Operation mode Select (when SEL=0: port 1 is active, when SEL=1: port 2 is active
14 15	Tx2- Tx2+	I/O	Signal I/O, Transmit differential pair, port 2
12	Rx2-	I/O	Signal I/O, Receive differential pair, port 2
13	Rx2+	I/O	
17 16	Rx1+ Rx1-	I/O	Signal I/O, Receive differential pair, port 1
19 18	Tx1+ Tx1-	I/O	Signal I/O, Transmit differential pair, port 1
6, 10, 1	V_{DD}	Pwr	3.3V ±10% Positive Supply Voltage
5, 11, 20, 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 +4.6V
Channel DC Input Voltage	–0.5V to 1.5V
SEL/PD DC Input Voltage	–0.5V to 4.6V
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.

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 = 0V or V_{DD},		0.2	1	mA
I_{DD_PD}	Power down current	PD = 1		20	40	uA
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
$V_{IH\text{-}SEL, PD}$	Input HIGH Voltage, SEL, PD Input		2		3.6	V
$V_{IL\text{-}SEL, PD}$	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 Input	V_{DD} = Max., V_{IN} = V_{DD}	-5		+5	µA
I_{IL}	Input LOW Current, SEL, PD Input	V_{DD} = Max., V_{IN} = 0V	-5		+5	
I_{IH}	Input High Current, T_X, R_X	V_{DD} = Max, V_{IN} = 1.5V	-10		+10	
I_{IL}	Input LOW Current, T_X, R_X	V_{DD} = Max, V_{IN} = 0V	-10		+10	
I_{OZH}	High Z HIGH Current, T_X, R_X	V_{DD} = Max, V_{IN} = 1.5V	-10		+10	µA
I_{OZL}	High Z LOW Current, T_X, R_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			25	30	ns
t_{PHZ}, t_{PLZ}	Line Disable Time			5	25	
$t_{b\text{-}b}$	Bit-to-bit skew within the same differential pair			5	10	ps
$t_{ch\text{-}ch}$	Channel-to-channel skew				20	

Dynamic Electrical Characteristics

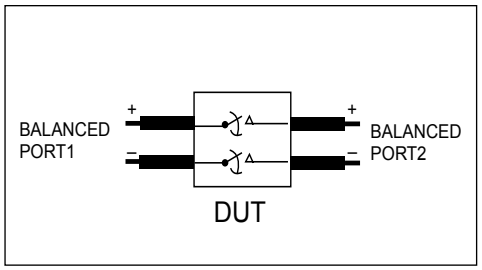
Parameter	Description	Test Conditions	Min.	Typ.(1)	Max.	Units
$DDIL^{2,3}$	Differential Insertion Loss (V_{IN} = -10dBm, DC = 0V)	f= 100MHz f= 1.25GHz f= 2.5GHz f=4.0GHz f=5.0GHz		-0.4 -0.6 -1.0 -1.7 -2.1		dB
$DDIL_{OFF}^{2,3}$	Differential Off Isolation	f= 100MHz f= 1.25GHz f= 2.5GHz f=4.0GHz		-59 -37 -27 -21		dB
$DDRL^{2}$	Differential Return Loss	f= 100MHz f= 1.25GHz f= 2.5GHz f= 4.0GHz		-27 -23.3 -23.3 -13.5		dB
$DDNEXT^{2,3}$	Near End Crosstalk	f= 100MHz f= 1.25GHz f= 2.5GHz f= 4.0GHz		-57 -38 -33 -32		dB

Notes:

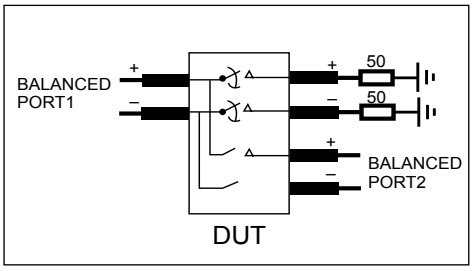
1.Guaranteed by design. Typical values are at V_{DD} = 3.3V , T_A = 25°C ambient and maximum loading.

2. S parameters are measured with our evaluation board made with Rogers (R04350) material. Trace width is 30 mil, length 540 mil, trace impedence is 50 Ohm (+/- 5%) and total insertion loss of the trace is 0.5dB@4GHz.

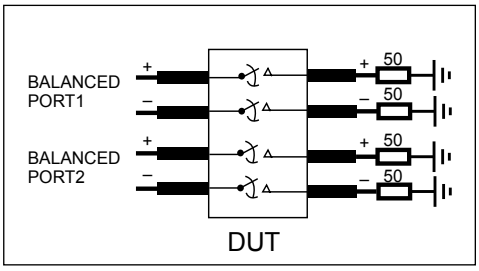
3. Measurement done with fixture deembedding.



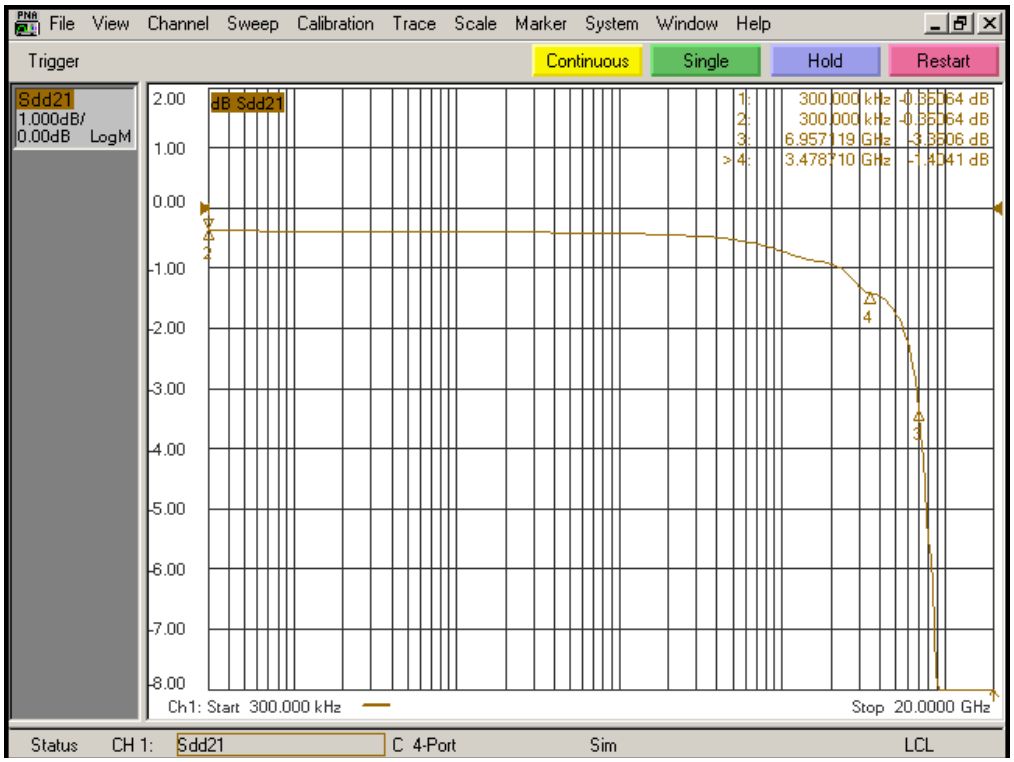
Diff. Insertion Loss and Return Test Circuit



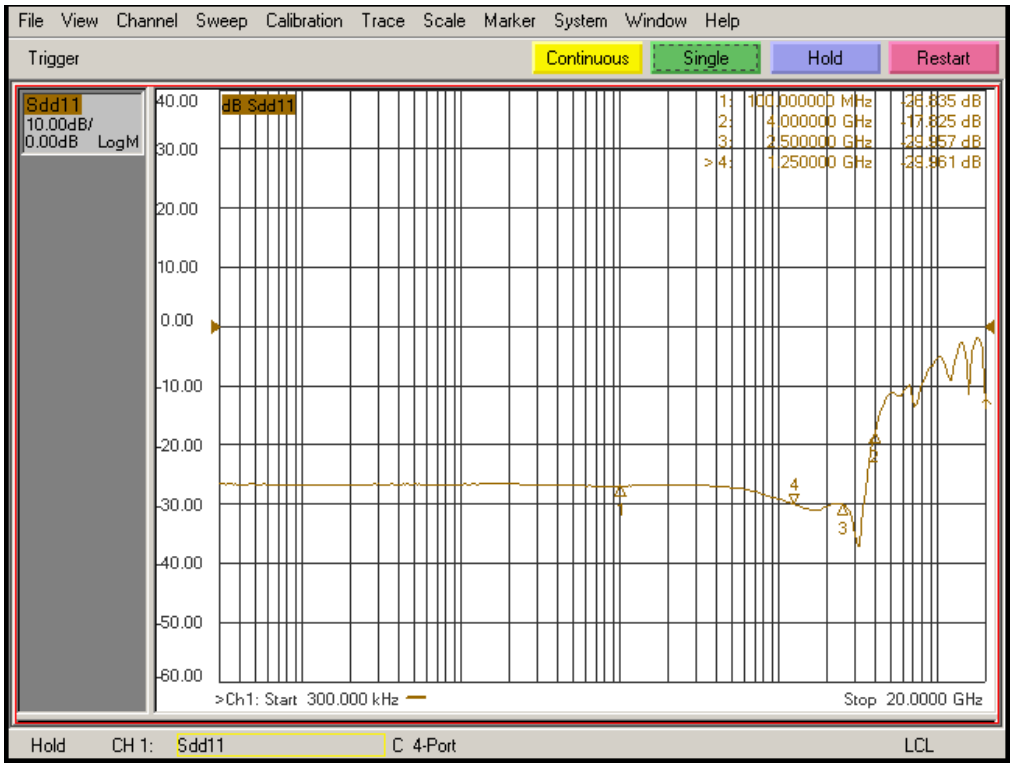
Diff. Off Isolation Test Circuit



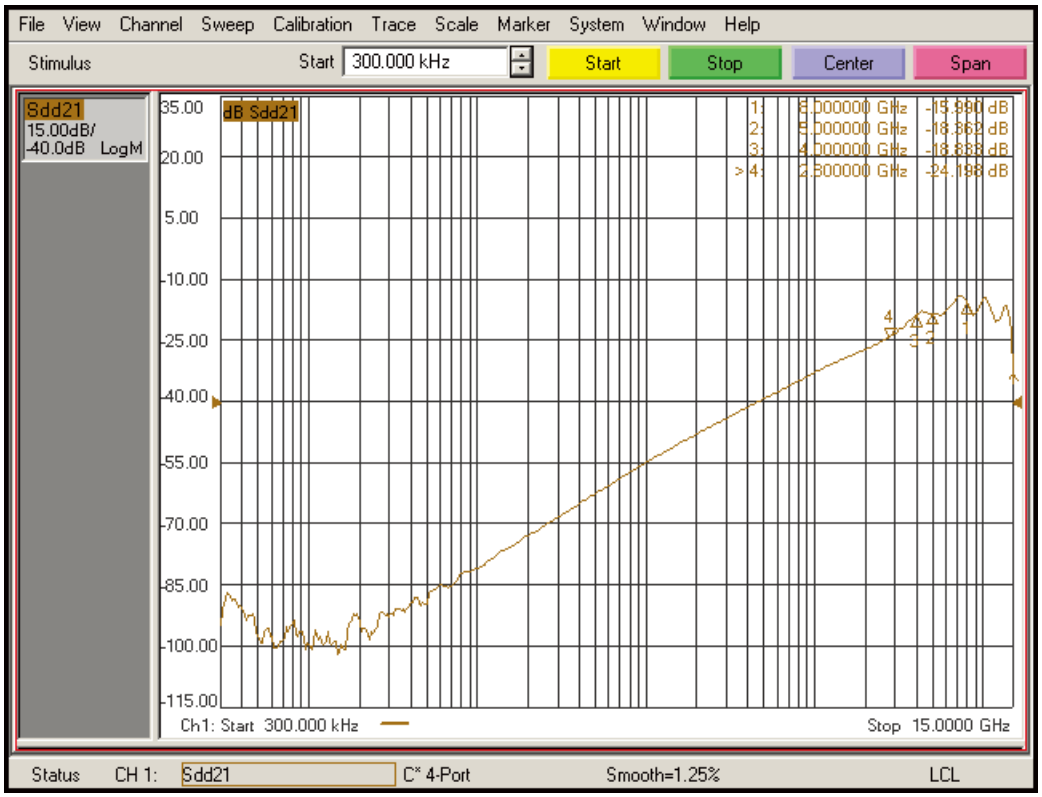
Diff. Near End Xtalk Test Circuit



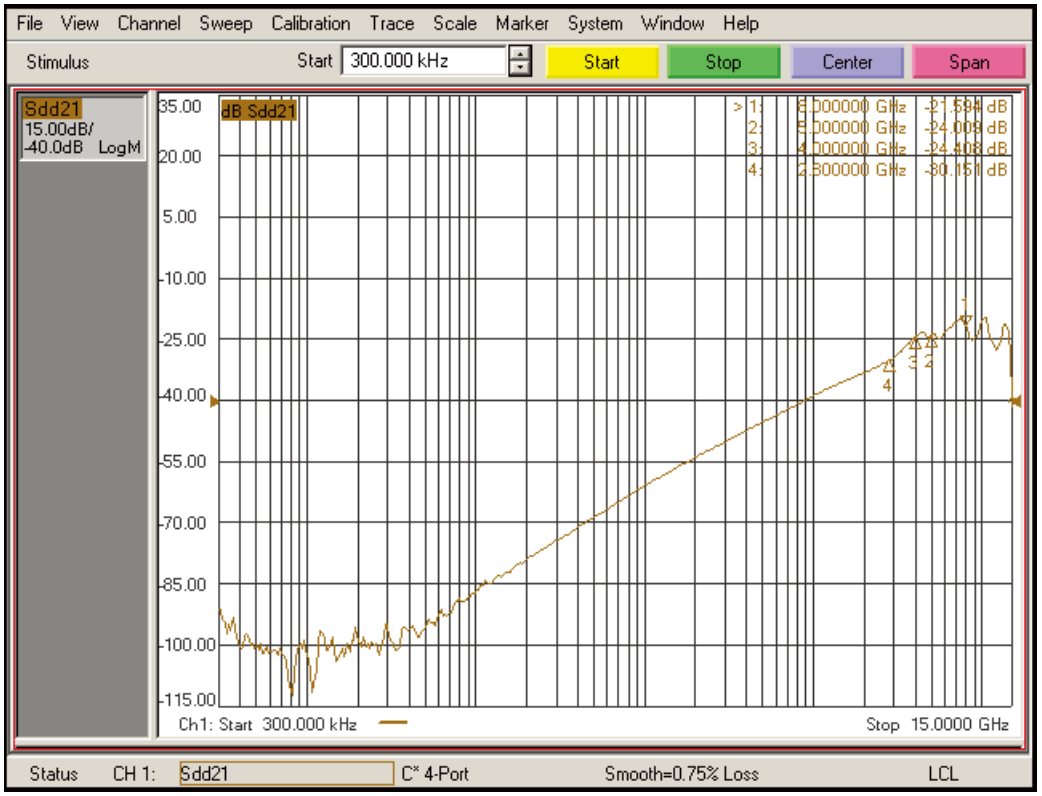
Differential Insertion Loss



Differential Return Loss

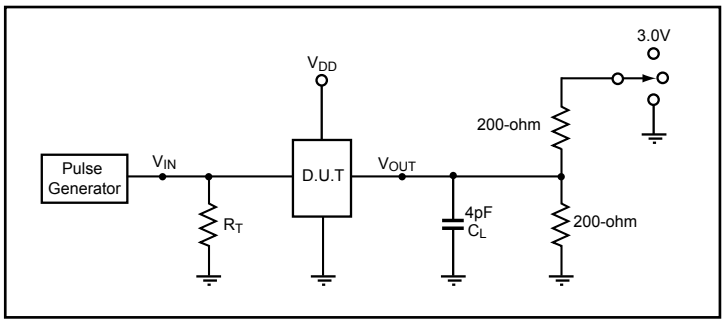


Differential Off Isolation



Differential Crosstalk

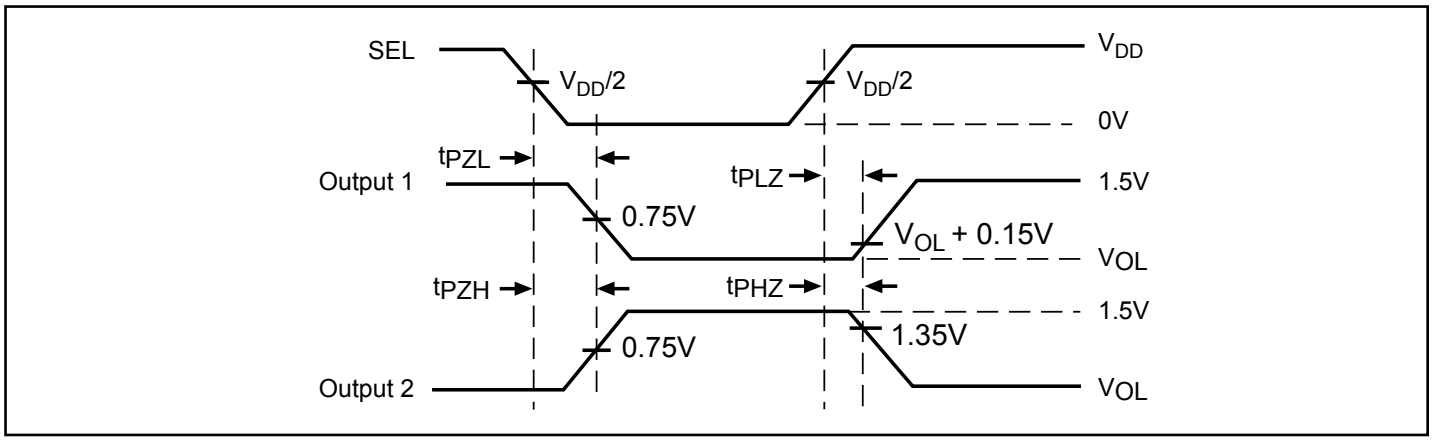
Test Circuit for Electrical Characteristics(1-5)



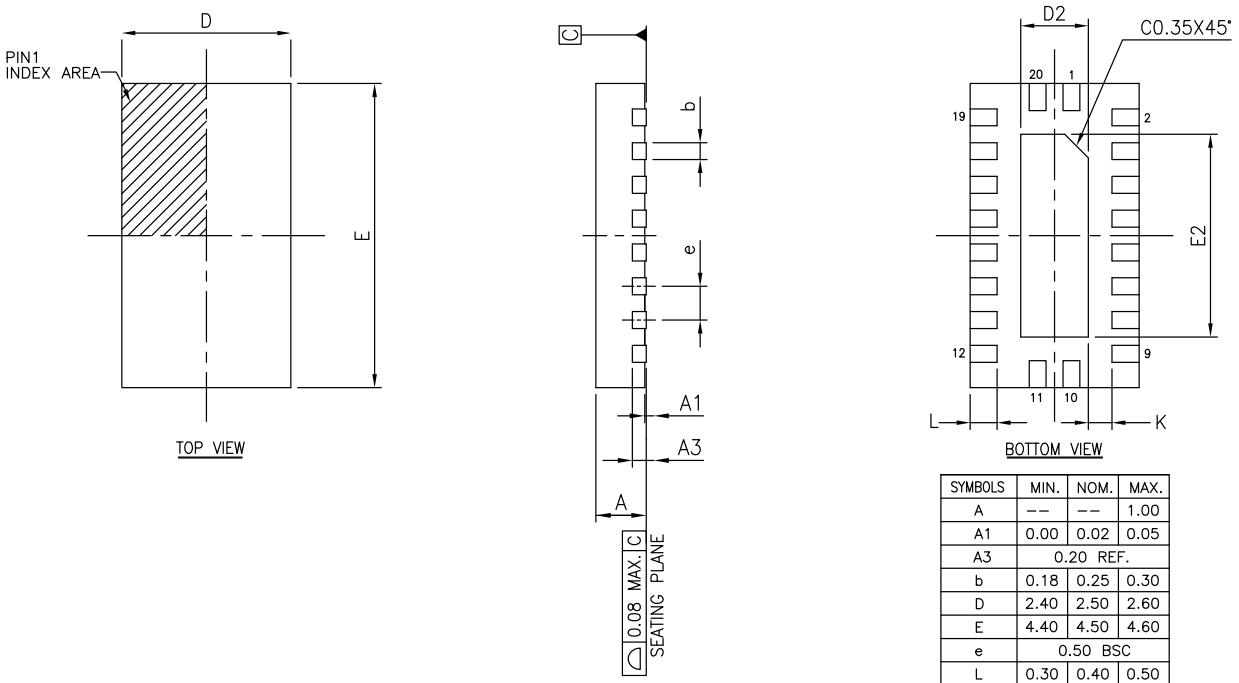
Switch Positions

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

Switching Waveforms



Voltage Waveforms Enable and Disable Times



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

Notes:
1. All dimensions are in mm.
2. Refer JEDEC MO-241.
3. Bilateral coplanarity zone applies to the exposed heat sink slug as well as the terminals.

PERICOM Enabling Serial Connectivity — **DATE: 09/17/11**

DESCRIPTION: 20-contact, Quad Flat No-Lead, QFN

PACKAGE CODE: ZB (ZB20)

DOCUMENT CONTROL #: PD-2104 **REVISION: -**

Note:

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

Ordering Information

Ordering Code	Package Code	Package Type
PI3USB302ZBE+DA	ZB	Pb-free & Green, 20-Contact TQFN, Gold Wire

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

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