A product Line of
Diodes Incorporated

PI2USB4122

USB 3.0, 4:1 Mux/DeMux Switch

Features

- 2 Differential Channel, 4:1 Mux/DeMux
- USB 3.0 performance, 5.0 Gbps
- Low Bit-to-Bit Skew, 7ps Max.
- Low Crosstalk: -23dB@3GHz
- Low Off Isolation: -23dB@3GHz
- V_{DD} Operating Range: +1.8V+/-10%
- ESD Tolerance 2kV HBM on data I/O
- Packaging (Pb-free & Green):
  – 42 contact TQFN

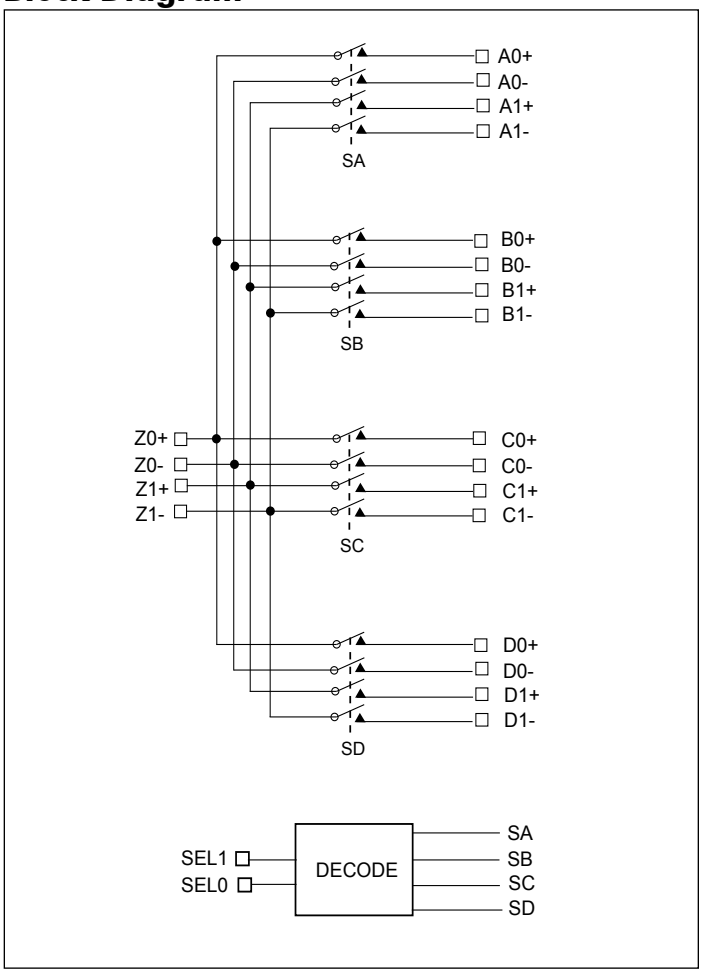
Description

Diodes' PI2USB4122 is a 4 to 1 differential channel multiplexer/demultiplexer switch. Due to its low bit-to-bit skew, high channel-to-channel noise isolation and high bandwidth, this product is ideal for USB 3.0 switching to 5.0 Gbps.

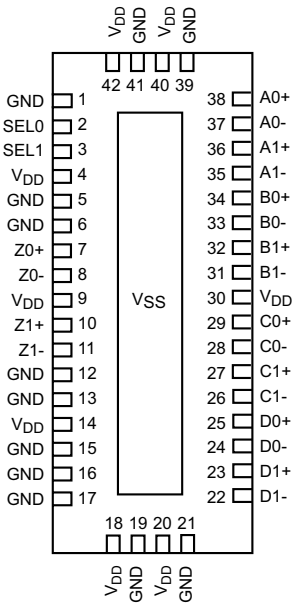
Application

Switching USB 3.0 signals for Mux or DeMux.

Block Diagram



Pin Description



Truth Table

SEL1	SEL0	FUNCTION
0	0	Z to A
0	1	Z to B
1	0	Z to C
1	1	Z to D

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_{DD}
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(1)	Min.	Typ.(2)	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{DD} = Max, V_{IN} = GND or V_{DD}		200	300	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_{DD} = 1.8V, T_A = 25°C ambient and maximum loading.

DC Electrical Characteristics for Switching over Operating Range

(T_A = –40°C to +85°C, V_{DD} = 1.8V+/-10%)

Parameter	Description	Test Conditions	Min.	Typ.(2)	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed HIGH level	0.65 x V_{DD}	-	-	V
V_{IL}	Input LOW Voltage	Guaranteed LOW level	-	-	0.35 x V_{DD}	
V_{IK}	Clamp Diode Voltage	V_{DD} = Max., I_{IN} = –18mA	-	-0.7	-1.2	
I_{IH}	Input HIGH Current	V_{DD} = Max., V_{IN} = V_{DD}	-	-	±5	µA
I_{IL}	Input LOW Current	V_{DD} = Max., V_{IN} = GND	-	-	±5	

Switching Characteristics (TA= -40° to +85°C, VDD = 1.8V+/-10%)

Parameter	Description	Min.	Typ.(2)	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	-	10	
t_{b-b}	Bit-to-bit skew within the same differential pair		7		ps
t_{ch-ch}	Channel-to-channel skew		35		ps

Notes:

1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.

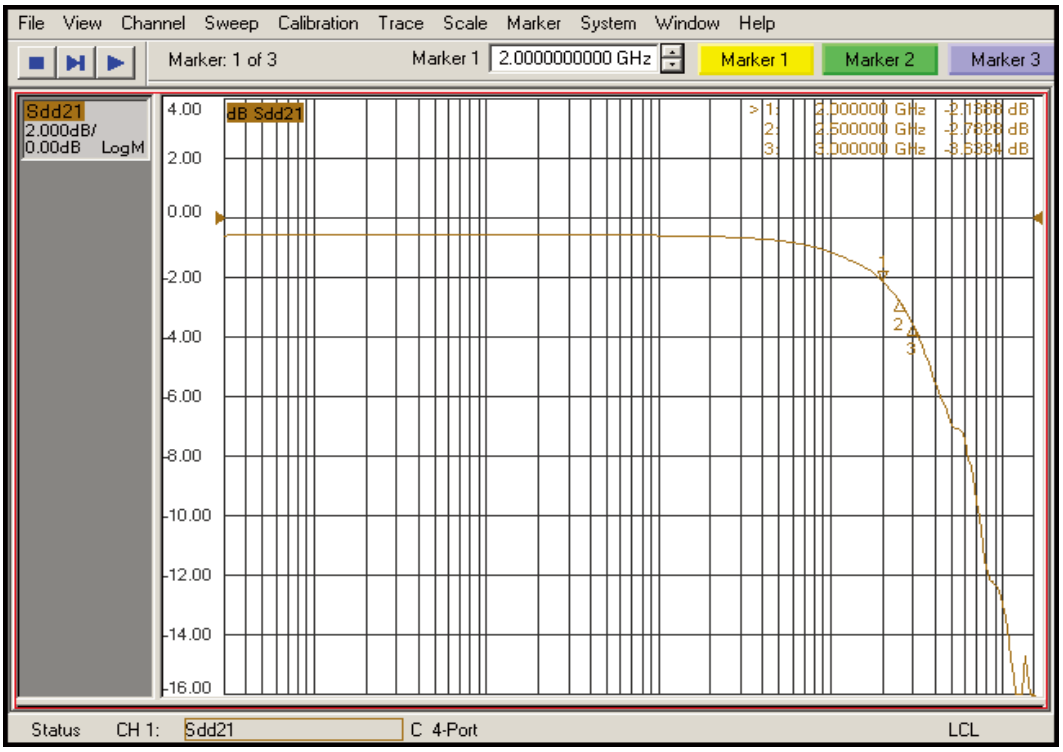
Dynamic Electrical Characteristics Over the Operating Range

(TA= -40° to +85°C, VDD = 1.8V+/-10%)

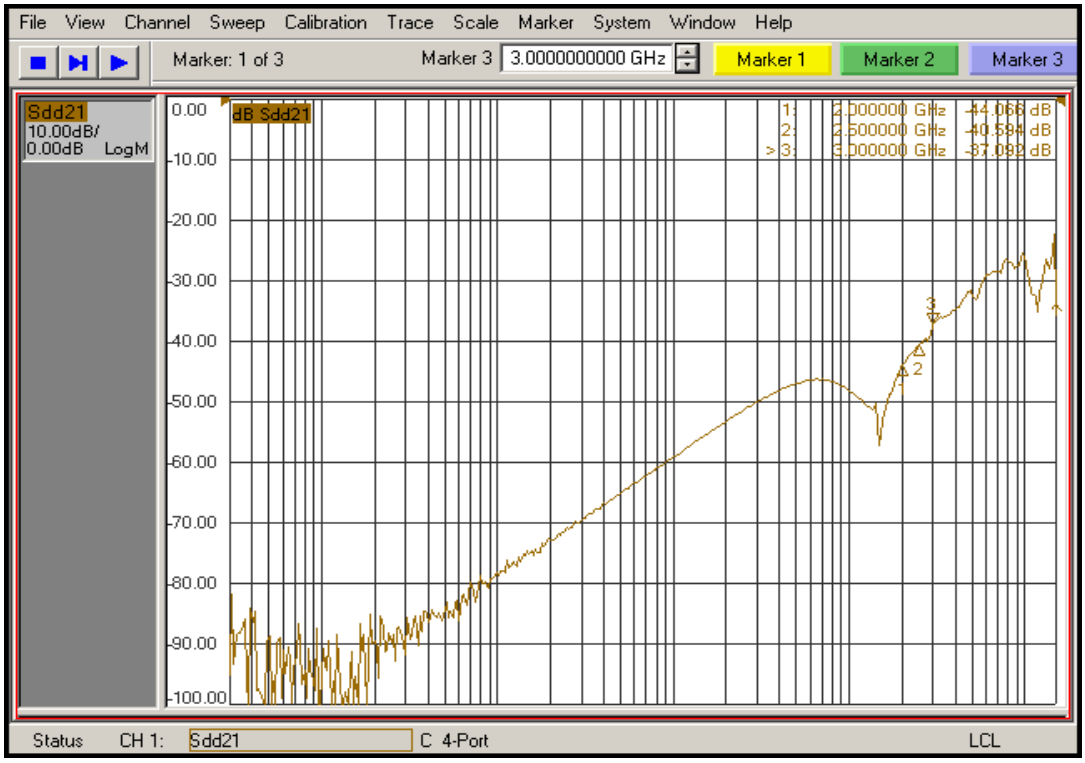
Parameter	Description	Test Conditions(1)	Min.	Typ.(2)	Max.	Units
X_{TALK}	Crosstalk	f = 2.5 GHz		-40		dB
O_{IRR}	OFF Isolation	f = 2.5 GHz		-25		dB
I_{LOSS}	Differential Insertion Loss	f= 2.5 GHz		-3.0		dB
BW	Bandwidth -3dB			2.6		GHz

Notes:

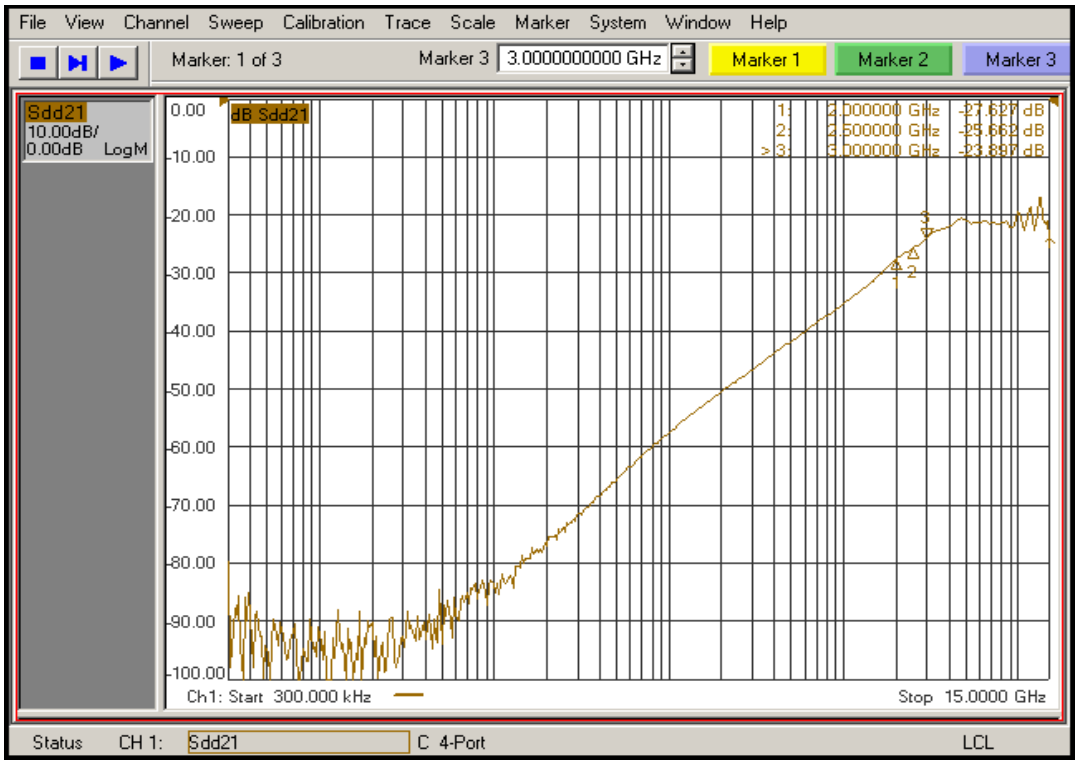
1. Guaranteed by design.
2. Typical values are at V_{DD} = 1.8V, T_A = 25°C ambient and maximum loading.



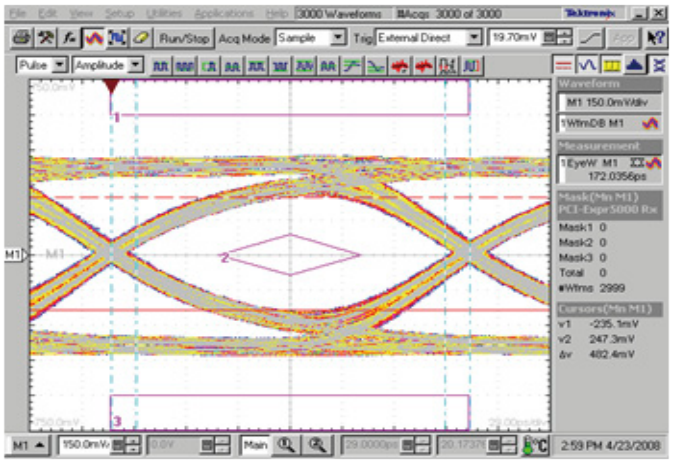
Insertion Loss



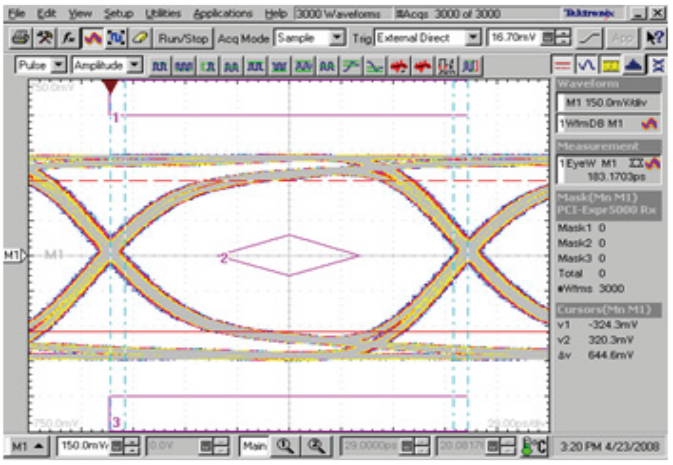
Crosstalk



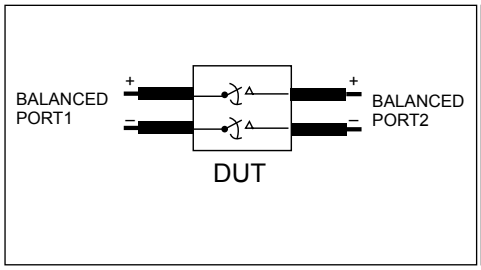
Off Isolation



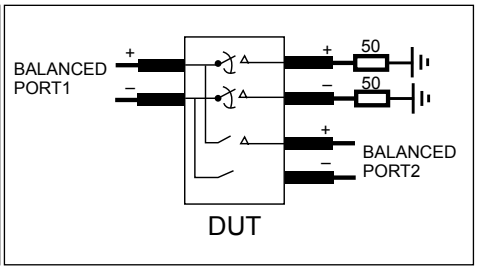
Signal Eye with Switch



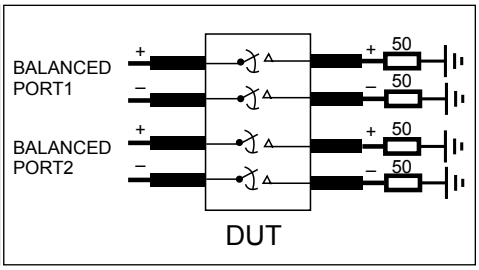
Signal Eye without Switch



Diff. Insertion Loss and Return Test Circuit

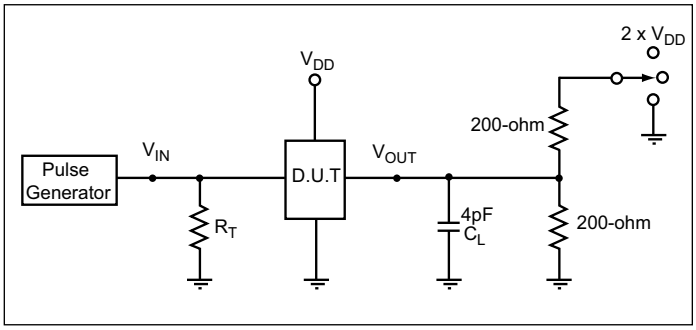


Diff. Off Isolation Test Circuit



Diff. Near End Xtalk Test Circuit

Test Circuit for Electrical Characteristics(1-5)



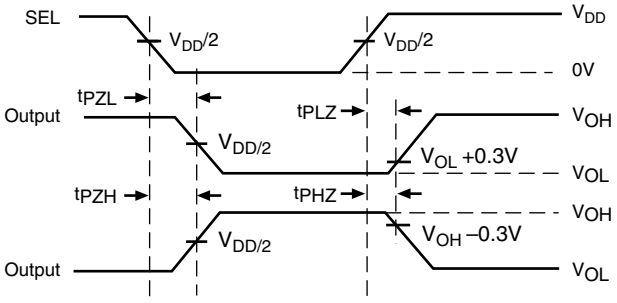
Notes:

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 ≤ 2.5ns, t_F ≤ 2.5ns.
5. The outputs are measured one at a time with one transition per measurement.

Switch Positions

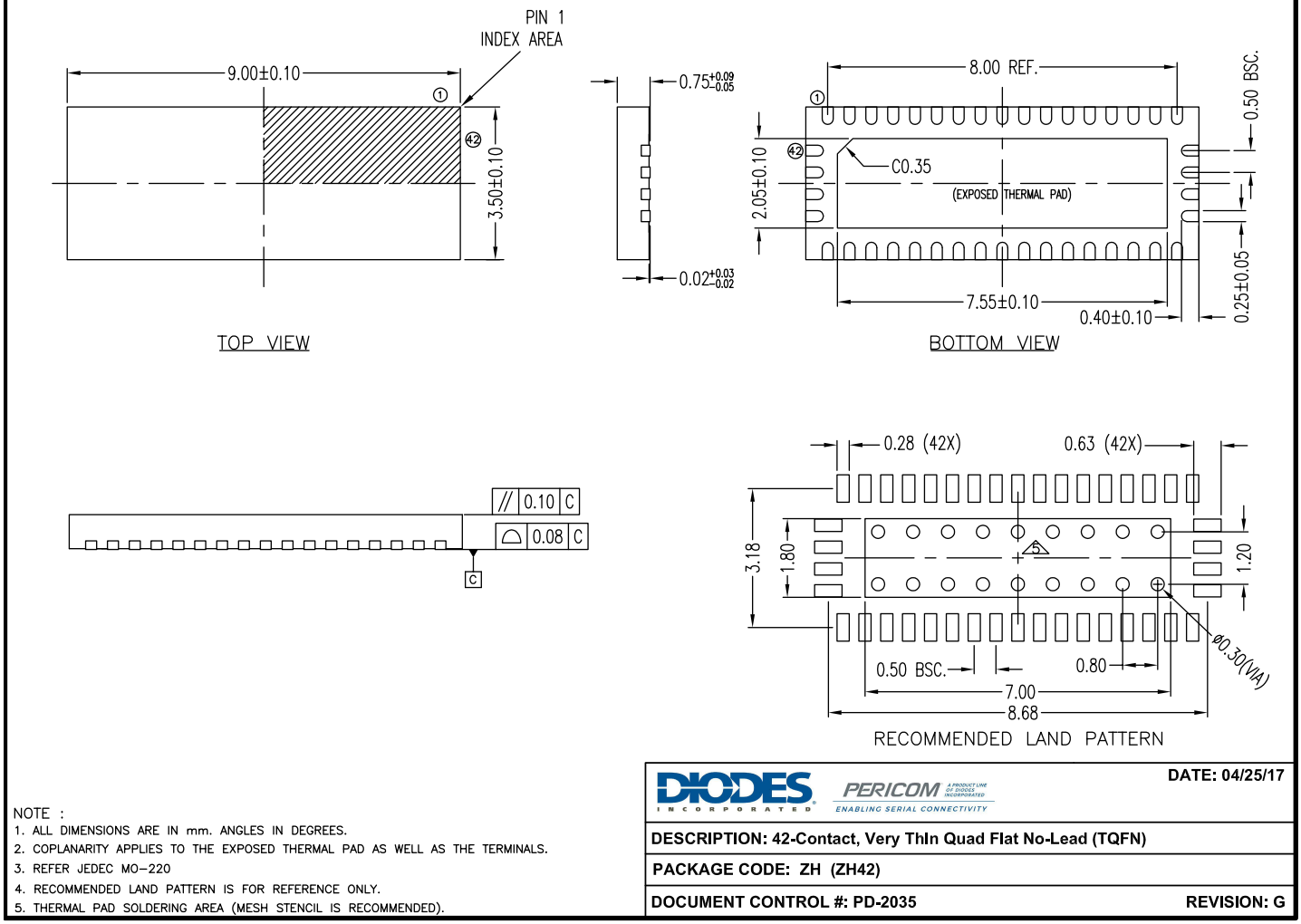
Test	Switch
t_{PLZ}, t_{PZL}	2 x V_{DD}
t_{PHZ}, t_{PZH}	GND
Prop Delay	Open

Switching Waveforms



Voltage Waveforms Enable and Disable Times

Package Mechanical: 42-TQFN (ZH)



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For latest package info.

please check: http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/

Ordering Information

Ordering Code	Package Code	Package Type
PI2USB4122ZHEX	ZH	42-Contact, Very Thin Quad Flat No-Lead (TQFN)

Notes:

- Thermal characteristics can be found on the company web site at www.diodes.com/design/support/packaging/
- E = Pb-free and Green
- X suffix = Tape/Reel

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