

PI3VDP3212

2-Lane DisplayPort™ Rev 1.2 Compliant Switch

Features

- Two-Lane, 1:2 Mux/Demux Supports RBR, HBR1, or HBR2
- One-Channel 1:2 Mux/Demux for DP_HPDP Signal
- One-Differential Channel 1:2 Mux/Demux for DP_Aux Signal with Support up to 720Mbps
- Insertion Loss for High-Speed Channels @ 2.7 GHz: -1.7dB
- -3dB Bandwidth for High-Speed Channels: 4.7GHz
- Return Loss for High-Speed Channels @ 2.7GHz: -16dB
- Low Bit-to-Bit Skew, 7ps max (between '+' and '-' bits)
- Low Crosstalk for High-Speed Channels: -25dB @ 5.4Gbps
- Low Off Isolation for High-Speed Channels: -25dB @ 5.4Gbps
- V_{DD} Operating Range: 3.3V ±10%
- ESD Tolerance: 2kV HBM
- Low Channel-to-Channel Skew, 35ps max
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. “Green” Device (Note 3)
- Packaging (Pb-free & Green):
 - 32 TQFN (ZL)

Truth Table

| \overline{OE} | SEL | AUX_SEL | Function |
|-----------------|------|---------|----------------------------------------|
| Low | Low | Low | Port A Active for all Channels |
| Low | Low | High | Port A for HS, Port B for HPD/AUX |
| Low | High | Low | Port B for HS, Port A for HPD/AUX |
| Low | High | High | Port B Active for all Channels |
| High | x | x | All I/Os are hi-z and IC is Power Down |

Description

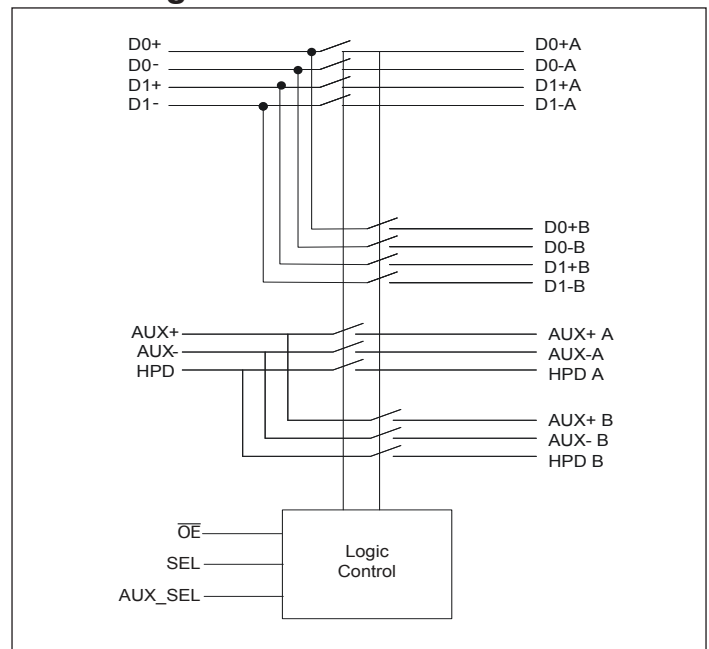
Diodes' PI3VDP3212 mux/demux is targeted for next generation digital video signals. This device can be used to connect a DisplayPort™ Source to two independent DisplayPort sinks or to connect two DisplayPort sources to a single DP display.

The newly released DisplayPort spec requires a data rate of 5.4Gbps. Diodes' solution is specifically designed around this standard and supports such signals.

Application

Routing of DisplayPort signals with low-signal attenuation between source and sink.

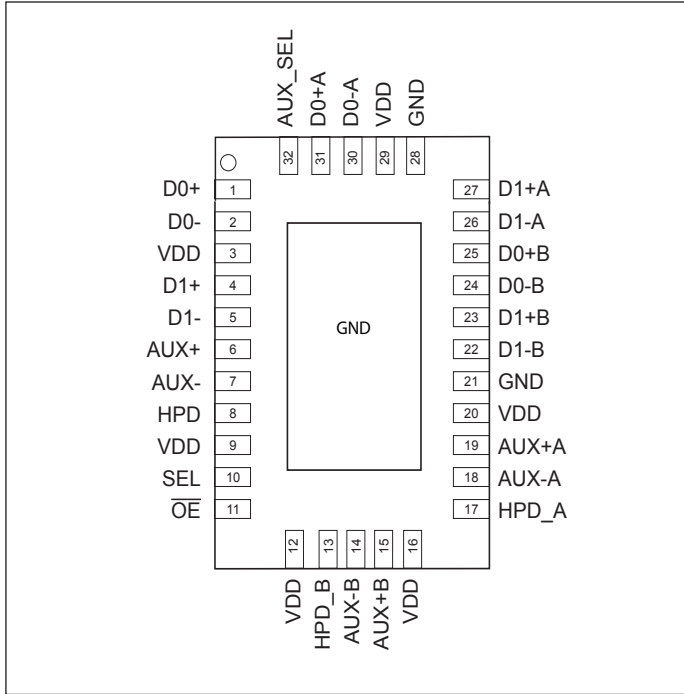
Block Diagram



Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignment



Pin Description

| Pin# | Pin Name | Type | Description |
|------|-----------------|------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | D0+ | I/O | Positive differential signal 0 for COM port |
| 2 | D0- | I/O | Negative differential signal 0 for COM port |
| 4 | D1+ | I/O | Positive differential signal 1 for COM port |
| 5 | D1- | I/O | Negative differential signal 1 for COM port |
| 6 | AUX+ | I/O | Positive differential signal for AUX COM port |
| 7 | AUX- | I/O | Negative differential signal for AUX COM port |
| 8 | HPD | I/O | HPD for COM port |
| 10 | SEL | I | Switch logic control. If HIGH, path B is selected for high-speed channels only. If LOW, path A is selected for high-speed channels only. |
| 11 | \overline{OE} | I | Output enable. If \overline{OE} is low, IC is enabled. If \overline{OE} is high, IC is powered down and all I/Os are hi-z. |
| 13 | HPD_B | I/O | HPD for port B |
| 14 | AUX-B | I/O | Negative differential signal for AUX, port B |
| 15 | AUX+B | I/O | Positive differential signal for AUX, port B |
| 17 | HPD_A | I/O | HPD for port A |
| 18 | AUX-A | I/O | Negative differential signal for AUX, port A |
| 19 | AUX+A | I/O | Positive differential signal for AUX, port A |

Pin Description Cont.

| Pin# | Pin Name | Type | Description |
|----------------------|----------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| 22 | D1-B | I/O | Negative differential signal 1 for port B |
| 23 | D1+B | I/O | Positive differential signal 1 for port B |
| 24 | D0-B | I/O | Negative differential signal 0 for port B |
| 25 | D0+B | I/O | Positive differential signal 0 for port B |
| 26 | D1-A | I/O | Negative differential signal 1 for port A |
| 27 | D1+A | I/O | Positive differential signal 1 for port A |
| 21, 28 | GND | Ground | Ground |
| 3, 9, 12, 16, 20, 29 | VDD | Power | 3.3V ±10% power supply |
| 30 | D0-A | I/O | Negative differential signal 0 for port A |
| 31 | D0+A | I/O | Positive differential signal 0 for port A |
| 32 | AUX_SEL | I | Switches only the AUX and HPD channels from port A vs. port B. If High, path B is selected. If LOW, path A is selected. |

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 +4.2V |
| 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.

DC Electrical Characteristics for Switching over Operating Range

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

| Parameter | Description | Test Conditions ⁽¹⁾ | Min | Typ ⁽¹⁾ | Max | Units |
|---------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|--------------------|------|-------|
| V _{IH} | Input HIGH Voltage | Guaranteed HIGH level | 1.5 | — | — | V |
| V _{IL} | Input LOW Voltage | Guaranteed LOW level | — | — | 0.75 | |
| V _{IK} | Clamp Diode Voltage, Dx | V _{DD} = Max., I _{IN} = -18mA | — | -1.6 | -1.8 | |
| 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 | |
| I _{OFF_SB} | I/O Leakage when Part is off for Sideband Signals Only (DDC, AUX, HPD) | V _{DD} = 0V, V _{INPUT} = 0V to 3.6V | — | — | 20 | |
| R _{ON_HS} | On Resistance between Input to Output for High-Speed Signals | V _{DD} = 3.3V, V _{input} = 0V to 2V, I _{INPUT} = 20mA | — | 10 | — | Ω |
| R _{ON_AUX} | On Resistance between Input to Output for Sideband Signals (AUX) | V _{DD} = 3.3V, V _{input} = 0 to 3.3V, I _{INPUT} = 20mA | — | 7 | — | Ω |
| Aux _{ss} | Signal Swing Tolerance in Aux Path | V _{DD} = 3.0V | -0.5 | — | 3.6 | V |
| HPD _I | Input Voltage Tolerance on HPD Path | — | — | — | 5.5 | V |
| HPD _O | Output Voltage on HPD Path | HPD input from 0V to 5.25V | — | — | 3.6 | V |

Power Supply Characteristics (T_A = -40°C to +85°C)

| Parameter | Description | Test Conditions ⁽¹⁾ | Min | Typ ⁽¹⁾ | Max | Units |
|-----------------|--------------------------------|------------------------------------------------------------------|-----|--------------------|-----|-------|
| I _{CC} | Quiescent Power Supply Current | V _{DD} = 3.3V, V _{IN} = GND or V _{DD} | — | 320 | 500 | µA |

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Dynamic Electrical Characteristics over Operating Range

(TA = -40°C to +85°C, VDD = 3.3V ±10%)

| Parameter | Description | Test Conditions | Typ. | Max | Units | |
|------------|----------------------------------------------------|------------------------------------|-------------|-------|-------|----|
| XTALK | Crosstalk on High-Speed Channels | See Figure 1 for Measurement Setup | f = 2.7GHz | -25dB | | |
| | | | f = 1.35GHz | -32dB | | |
| OIRR | OFF Isolation on High-Speed Channels | See Figure 2 for Measurement Setup | f = 2.7GHz | -22dB | — | dB |
| | | | f = 1.35GHz | -30dB | | |
| ILOSS | Differential Insertion Loss on High-Speed Channels | @ 5.4Gbps (see Figure 3) | -1.7 | — | dB | |
| Rloss | Differential Return Loss on High-Speed Channels | @ 2.7GHz | -16 | — | dB | |
| BW_Dx± | Bandwidth -3dB for Main High-Speed Path (Dx±) | See Figure 3 | 4.7 | — | GHz | |
| BW_AUX/HPD | -3dB BW for AUX and HPD Signals | See Figure 3 | 1.5 | — | GHz | |
| Tsw a-b | Switching Time from Port A to Port B | — | — | 1 | µs | |
| Tsw b-a | Switching Time from Port B to Port A | — | — | 1 | µs | |
| Tstartup | Vdd Valid to Channel Enable | — | — | 10 | µs | |
| Twakeup | Enabling Output by Changing OE from Low to High | — | — | 10 | µs | |

Note:

1. For maximum or minimum conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at VDD = 3.3V, TA = 25°C ambient and maximum loading.

Switching Characteristics (TA = -40°C to +85°C, VDD = 3.3V ±10%)

| Parameter | Description | Min. | Typ. | Max. | Units |
|-----------|---------------------------------------------------|------|------|------|-------|
| Tpd | Propagation Delay (Input pin to Output pin) | — | 80 | — | ps |
| tb-b | Bit-to-Bit Skew Within the Same Differential Pair | — | 5 | — | ps |
| tch-ch | Channel-to-Channel Skew | — | — | 50 | ps |

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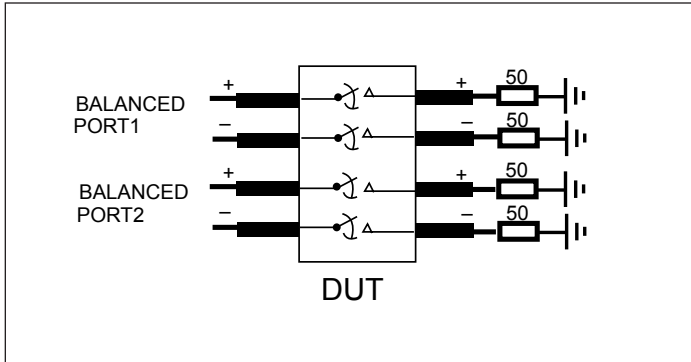


Fig 1. Crosstalk Setup

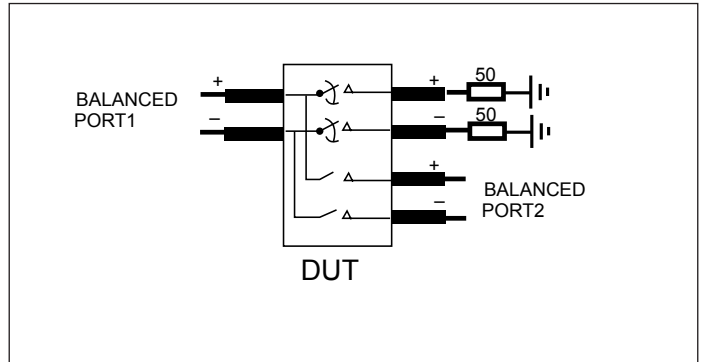


Fig 2. Off-Isolation Setup

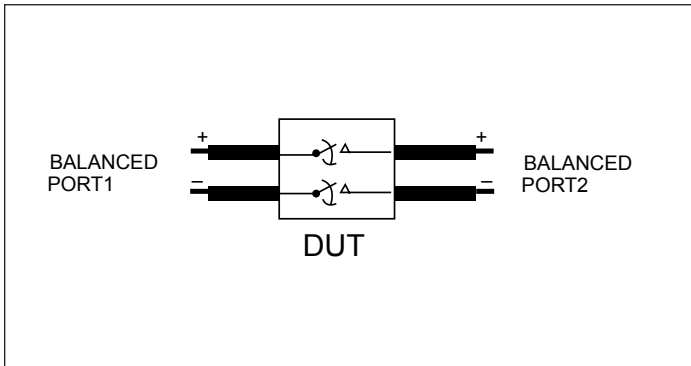


Fig 3. Differential Insertion Loss Setup

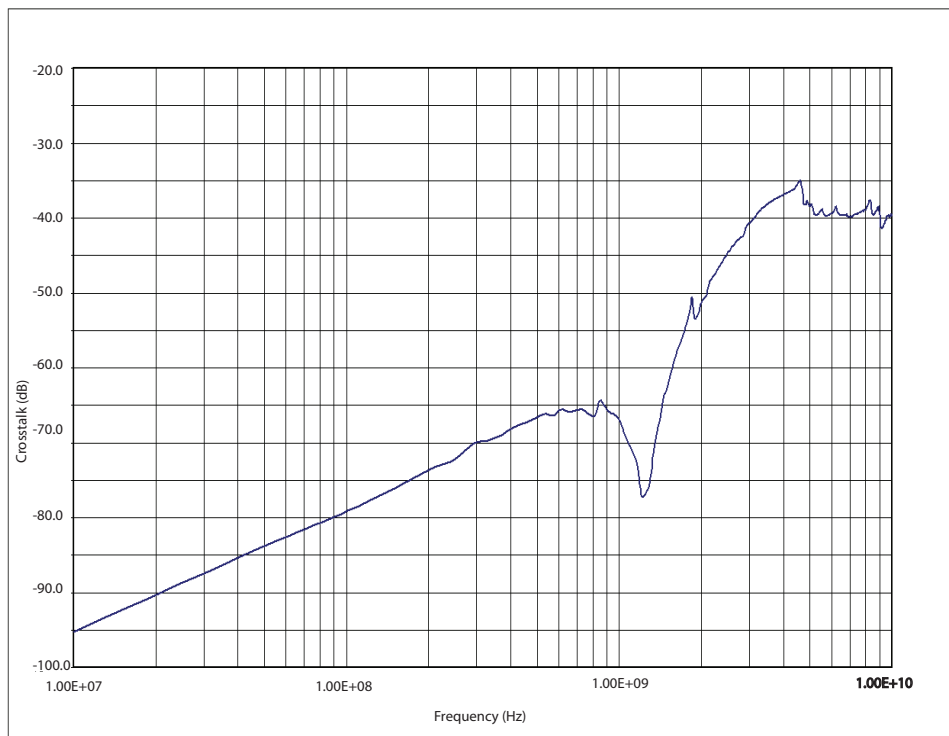


Fig 4. Xtalk for High-Speed Channels (D0 and D1)

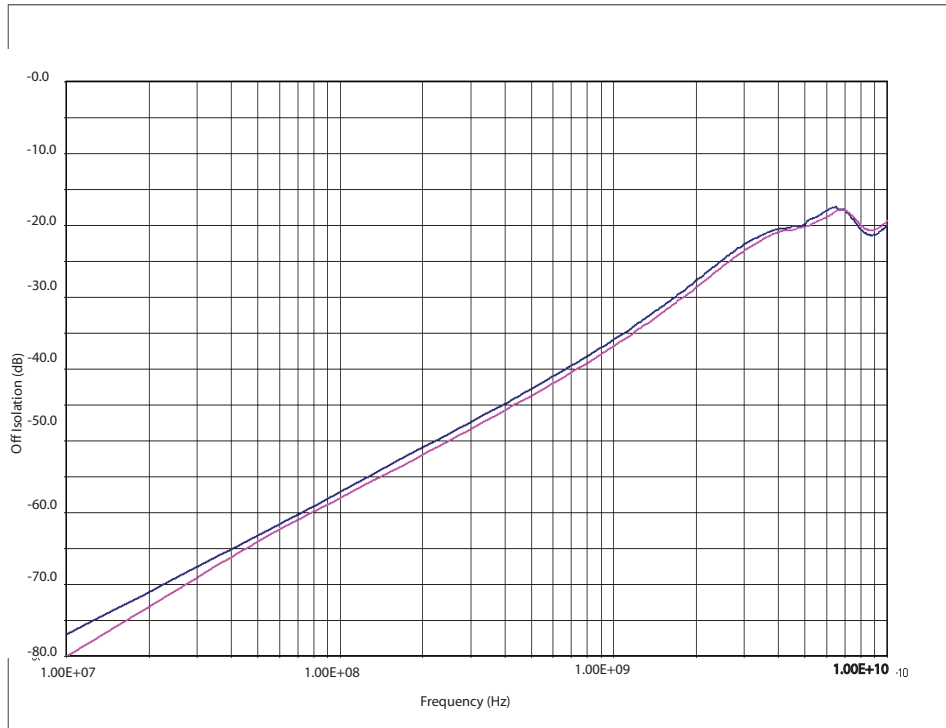


Fig 5. Off Isolation for High-Speed Channels (D0 and D1); Red is for Path B and Blue is for Path A

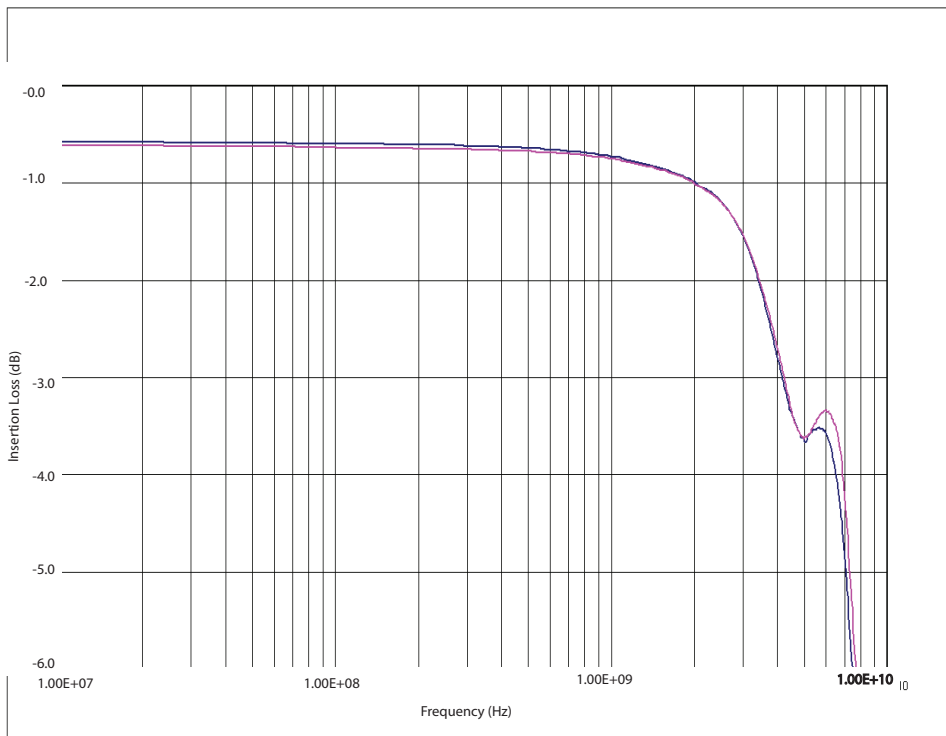
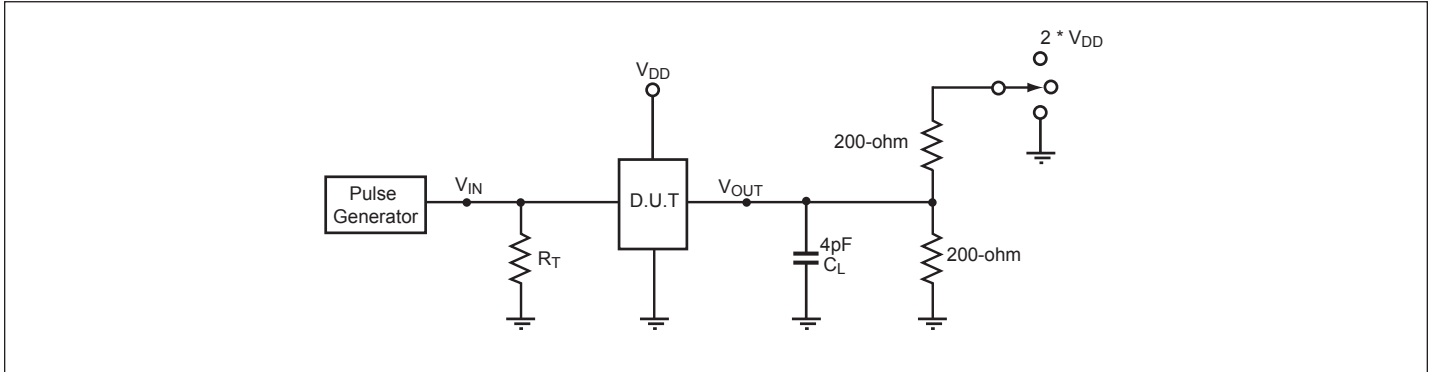


Fig 6. Insertion Loss for High-Speed Channels (D0 and D1); Red is for Path B and Blue is for Path A

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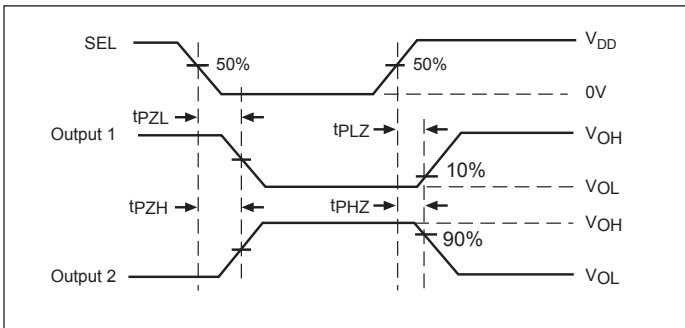
Test Circuit for Electrical Characteristics (1-5)



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, so the output is low except when disabled by the output control.
4. Output 2 is for an output with internal conditions, so the output is high except when disabled by the output control.
5. All input impulses are supplied by generators having the following characteristics: $PRR \leq$ MHz, $Z_O = 50\Omega$, $t_R \leq 2.5ns$, $t_F \leq 2.5ns$.
6. The outputs are measured one at a time with one transition per measurement.

Switching Waveforms

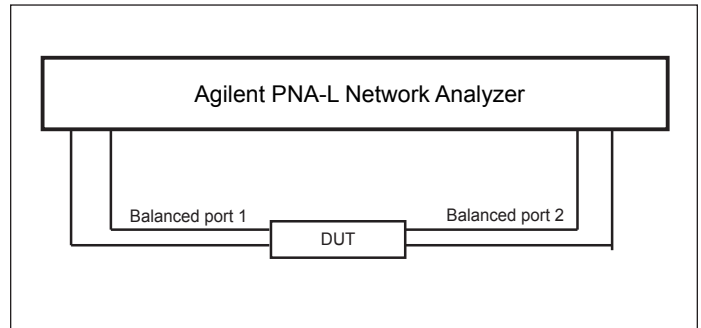


Voltage Waveforms Enable and Disable Times

Switch Positions

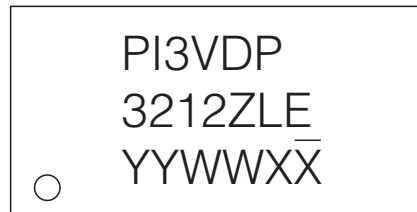
| Test | Switch |
|------------------------------------------|-------------------|
| t_{PLZ} , t_{PZL} (Output on B-side) | $2 \times V_{DD}$ |
| t_{PHZ} , t_{PZH} (Output on B-side) | GND |
| Prop Delay | Open |

Test Circuit for Dynamic Electrical Characteristics



Part Marking

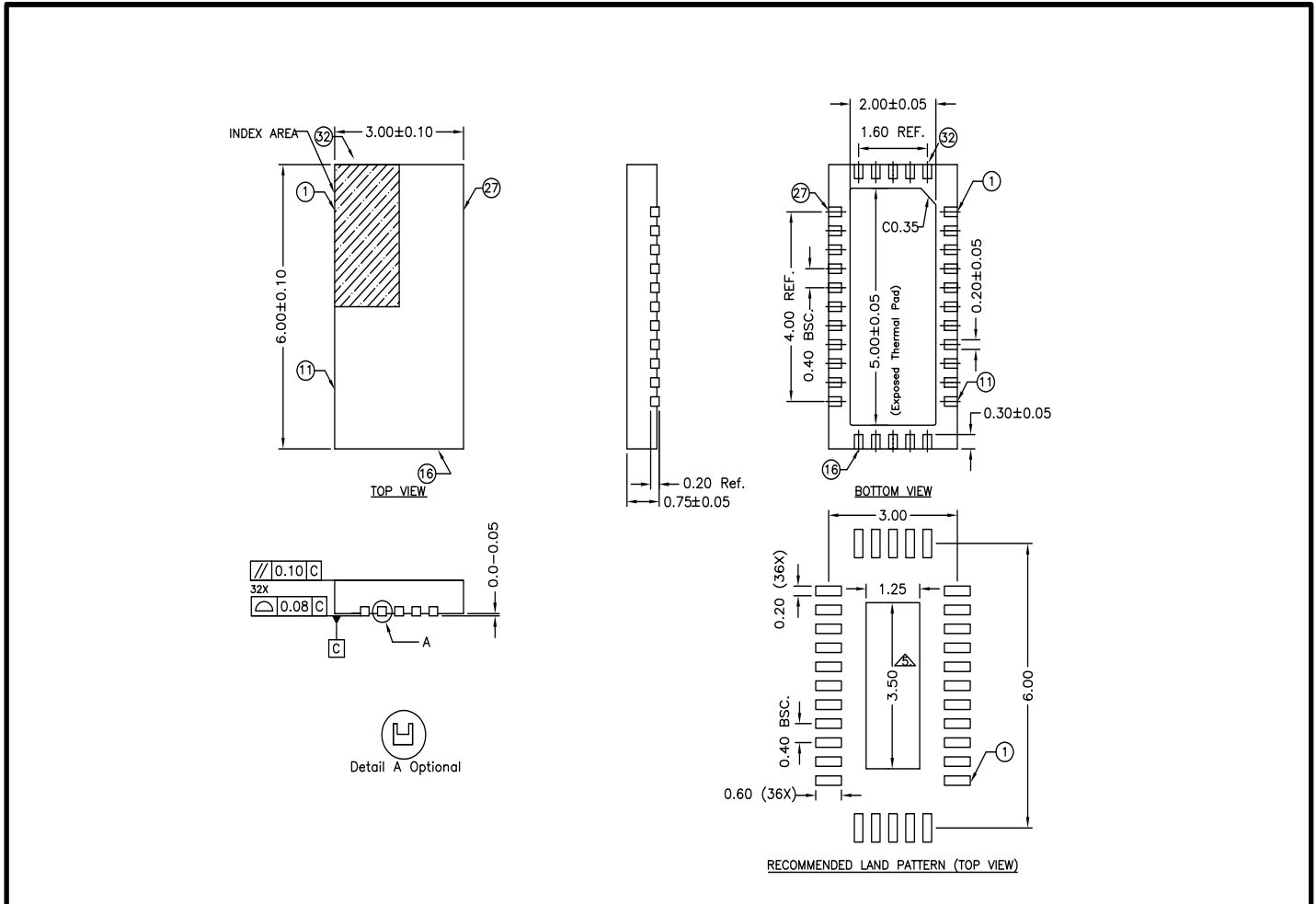
ZL Package



YY: Year
 WW: Workweek
 1st X: Assembly Code
 2nd X: Fab Code

PI3VDP3212

Packaging Mechanical: 32-TQFN (ZL)



- 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-220
 4. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.
 5. THERMAL PAD SOLDERING AREA (MESH STENCIL DESIGN IS RECOMMENDED).

DATE: 07/05/16

DESCRIPTION: 32-Contact, Very Thin Quad Flat No-Lead (TQFN)

PACKAGE CODE: ZL (ZL32)

DOCUMENT CONTROL #: PD-2044

REVISION: C

16-0142

For latest package information:

See <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>.

Ordering Information

| Ordering Code | Package Code | Package Description |
|----------------|--------------|------------------------------------------------|
| PI3VDP3212ZLEX | ZL | 32-Contact, Very-Thin Quad-Flat No-Lead (TQFN) |

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. E = Pb-free and Green
5. X suffix = Tape/Reel

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