

PI6C5912006

6 Output LVPECL Fanout Buffer

Features

- 6 differential LVPECL outputs
- 2 selectable reference inputs support either single-ended or differential
- Up to 2GHz output frequency
- Ultra low additive phase jitter: < 0.01 ps (typ) (differential 156.25MHz, 12KHz to 20MHz integration range)
- Low skew between outputs
- Low delay from input to output (Tpd typ. < 0.7ns)
- Separate Input output supply voltage for level shifting
- 2.5V / 3.3V power supply
- Industrial temperature support
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Package: TQFN-32 (ZH)

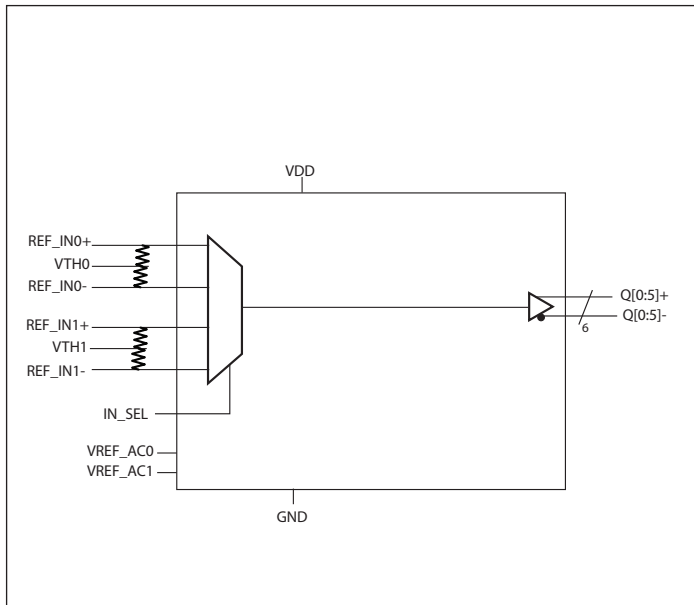
Description

The PI6C5912006 is a high performance LVPECL fanout buffer device which supports up to 2GHz frequency. This device is ideal for systems that need to distribute low jitter LVPECL clock signals to multiple destinations.

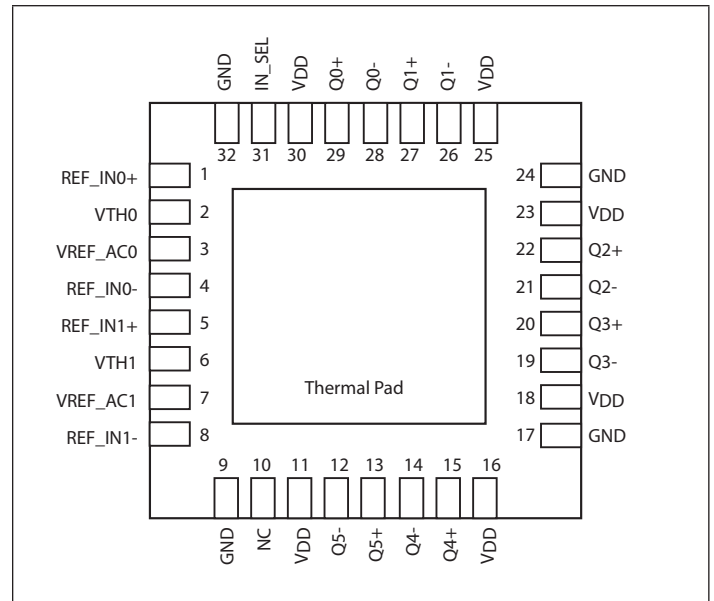
Applications

- Networking systems including switches and Routers
- High frequency backplane based computing and telecom platforms

Block Diagram



Pin Configuration (32-Pin 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.

Pin Description

| Pin # | Pin Name | Type | Description | |
|------------------------|----------------------|--------|--------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1, 4 | REF_IN0+ REF_IN0- | Input | Reference input 0. Accepts Differential or Single Ended inputs | |
| 2 | VTH0 | Input | Input Termination Center Tap for REF_IN0. Internal 50Ω termination | |
| 3 | VREF_AC0 | Output | Bias voltage output. | |
| 5, 8 | REF_IN1+ REF_IN1- | Input | Reference input 1. Accepts Differential or Single Ended inputs | |
| 6 | VTH1 | Input | Input Termination Center Tap for REF_IN0. Internal 50Ω termination | |
| 7 | VREF_AC1 | Output | Bias voltage output. | |
| 9, 17, 24, 32 | GND | Power | Power supply ground | |
| 10 | NC | - | No Connect | |
| 11, 16, 18, 23, 25, 30 | VDD | Power | Core power supply | |
| 12, 13 | Q5- Q5+ | Output | LVPECL output pair 5. | |
| 14, 15 | Q4- Q4+ | Output | LVPECL output pair 4. | |
| 19, 20 | Q3- Q3+ | Output | LVPECL output pair 3. | |
| 21, 22 | Q2- Q2+ | Output | LVPECL output pair 2. | |
| 26, 27 | Q1- Q1+ | Output | LVPECL output pair 1. | |
| 28, 29 | Q0- Q0+ | Output | LVPECL output pair 0. | |
| 31 | IN_SEL | Input | Pullup | Input clock select. See Table 1 for function. LVCMOS/LVTTL interface levels. |

Function Table

Table 1: Input select function

| IN_SEL | Function |
|-------------|-----------------------------------------|
| 0 | REF_IN0 is the selected reference input |
| 1 (default) | REF_IN1 is the selected reference input |

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---------------------|-----------------------|----------------|------|------|------|-------|
| C _{IN} | Input Capacitance | | | 2 | | pF |
| R _{PULLUP} | Input Pullup Resistor | | | 25 | | kΩ |

Maximum Ratings (Above which the useful life may be impaired. For user guidelines, not tested)

| | |
|------------------------------------------------------------------------------|-------------------------------|
| Storage temperature..... | -55 to +150°C |
| Supply Voltage to Ground Potential (V _{DD} , V _{DDO}).... | -0.5 to +4.6V |
| Inputs (Referenced to GND) | -0.5 to V _{DD} +0.5V |
| Clock Output (Referenced to GND)..... | -0.5 to V _{DD} +0.5V |
| Latch up | 200mA |
| ESD Protection (Input) | 2000 V min (HBM) |
| ESD Protection (Input) | 1000 V min (CDM) |

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 and Operating Conditions

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|-----------------|-------------------------------|-----------------------------|-------|------|-------|-------|
| V _{DD} | Core Supply Voltage | | 3.135 | 3.3 | 3.465 | V |
| | | | 2.375 | 2.5 | 2.625 | V |
| I _{DD} | Core Power Supply Current | All LVPECL outputs unloaded | | | 105 | mA |
| T _A | Ambient Operating Temperature | | -40 | | 85 | °C |

DC Electrical Specifications - Differential Inputs

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|--------------------|------------------------------------|-------------------------|-----------|------|-----------------------|-------|
| I _{IH} | Input High current | Input = V _{DD} | | | 20 | uA |
| I _{IL} | Input Low current | Input = GND | -20 | | | uA |
| V _{IH} | Input high voltage | | | | V _{DD} +0.3 | V |
| V _{IL} | Input low voltage | | -0.3 | | | V |
| V _{ID} | Input Differential Amplitude PK-PK | | 0.1 | | | V |
| V _{CM} | Common mode input voltage | | GND + 0.5 | | V _{DD} -0.85 | V |
| ISO _{MUX} | MUX isolation | | | -89 | | dBc |

DC Electrical Specifications - LVCMOS Inputs

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-----------------|--------------------|-------------------------|------|------|----------------------|-------|
| I _{IH} | Input High current | Input = V _{DD} | | | 150 | uA |
| I _{IL} | Input Low current | Input = GND | -150 | | | uA |
| V _{IH} | Input high voltage | V _{DD} =3.3V | 2.0 | | V _{DD} +0.3 | V |
| V _{IL} | Input low voltage | V _{DD} =3.3V | -0.3 | | 0.8 | V |
| V _{IH} | Input high voltage | V _{DD} =2.5V | 1.7 | | V _{DD} +0.3 | V |
| V _{IL} | Input low voltage | V _{DD} =2.5V | -0.3 | | 0.7 | V |

DC Electrical Specifications- LVPECL Outputs

| Parameter | Description | Conditions | Min. | Typ. | Max. | Units |
|-----------------|---------------------|-----------------------|------------------------|------|------------------------|-------|
| V _{OH} | Output High voltage | | V _{DDO} -1.4 | | V _{DDO} -0.9 | V |
| V _{OL} | Output Low voltage | V _{DD} =2.5V | V _{DDO} -1.95 | | V _{DDO} -1.25 | V |
| | | V _{DD} =3.3V | V _{DDO} -2.2 | | V _{DDO} -1.25 | V |

AC Electrical Specifications – Differential Inputs

| Parameter | Description | Conditions | Min. | Typ. | Max. | Units |
|-------------------|-----------------------------------------|----------------------------------|------|------|------|-------|
| F _{IN} | Clock input frequency | | | | 2000 | MHz |
| V _{INPP} | Differential Input peak to peak voltage | 1.5GHz ≤ F _{IN} ≤ 2 GHz | 0.2 | | 1.5 | V |
| | | F _{IN} ≤ 1.5 GHz | 0.1 | | 1.5 | V |
| ER | Input Edge Rate | | 1.5 | | | V/ns |

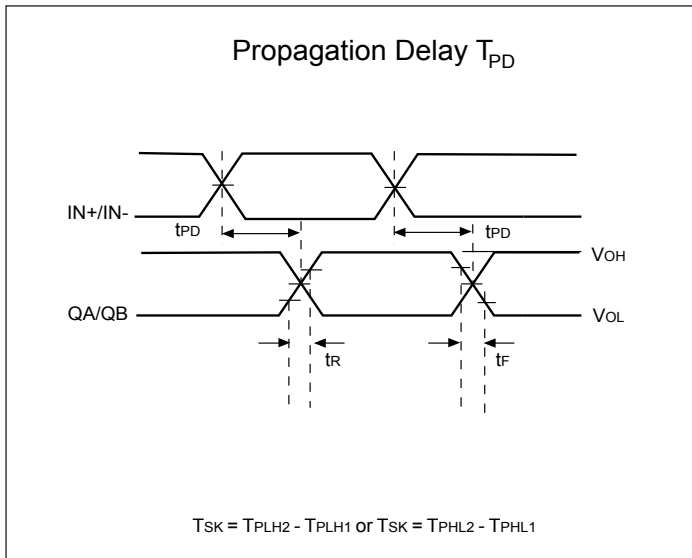
AC Electrical Specifications – LVCMOS Inputs

| Parameter | Description | Conditions | Min. | Typ. | Max. | Units |
|-------------------|-----------------------------------------|----------------------------------|------|------|------|-------|
| F _{IN} | Clock input frequency | | | | 200 | MHz |
| V _{INPP} | Differential Input peak to peak voltage | 1.5GHz ≤ F _{IN} ≤ 2 GHz | 0.2 | | 1.5 | V |
| | | F _{IN} ≤ 1.5 GHz | 0.1 | | 1.5 | V |
| ER | Input Edge Rate | | 1.5 | | | V/ns |

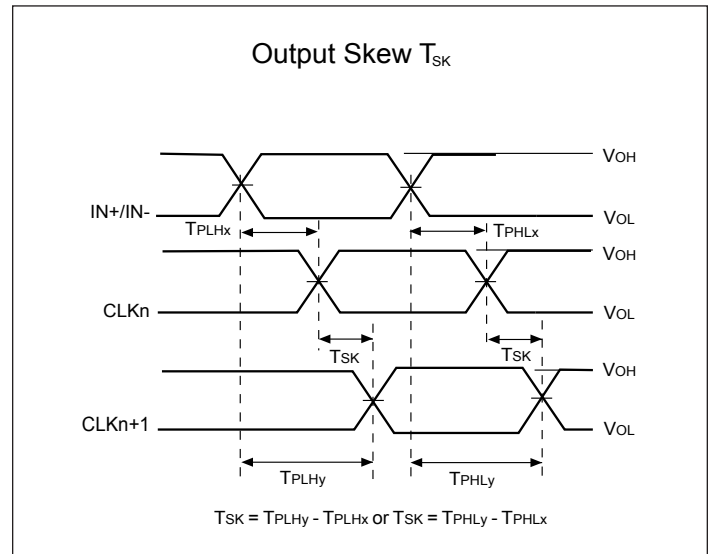
AC Electrical Specifications – LVPECL Outputs

| Parameter | Description | Conditions | Min. | Typ. | Max. | Units |
|-----------------------|--------------------------------|--------------------------------|----------------------|------|----------------------|-------|
| F _{OUT} | Clock output frequency | LVPECL | | | 2000 | MHz |
| T _r | Output rise time | From 20% to 80% | | 150 | | ps |
| T _f | Output fall time | From 80% to 20% | | 150 | | ps |
| T _{ODC} | Output duty cycle | | 48 | | 52 | % |
| V _{PP} | Output swing Single-ended | 1GHz < F _{IN} ≤ 2 GHz | 0.25 | | 0.85 | V |
| | | F _{IN} ≤ 1 GHz | 0.5 | | 0.95 | V |
| T _j | Buffer additive jitter RMS | 156.25MHz, 12kHz to 20MHz | | 0.01 | | ps |
| | | 156.25MHz, 10kHz to 1MHz | | 0.01 | | ps |
| T _{SK} | Output Skew | | | 13 | 30 | ps |
| T _{PD} | Propagation Delay | | | 620 | 700 | ps |
| T _{OD} | Valid to HiZ | | | | 100 | ns |
| T _{OE} | HiZ to valid | | | | 100 | ns |
| T _{P2P Skew} | Part to Part Skew ¹ | | -50 | | 50 | ps |
| V _{REF_AC} | Input bias voltage | I _{AC} = 2mA | V _{DD} -1.6 | | V _{DD} -1.1 | V |

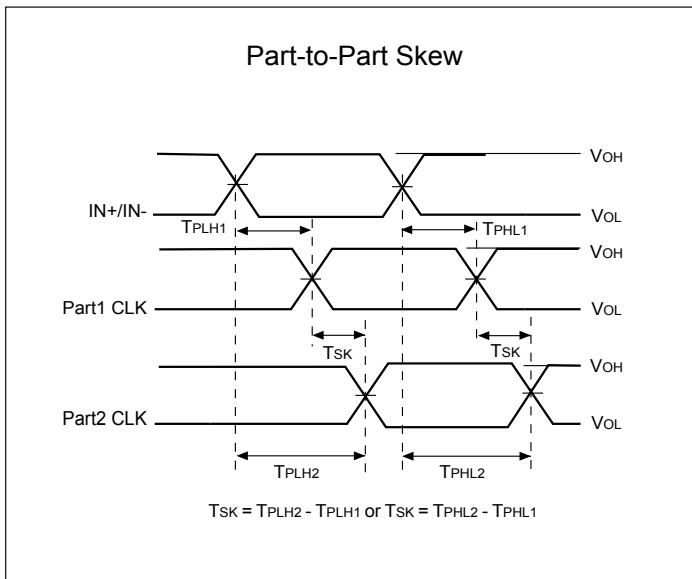
Propagation Delay



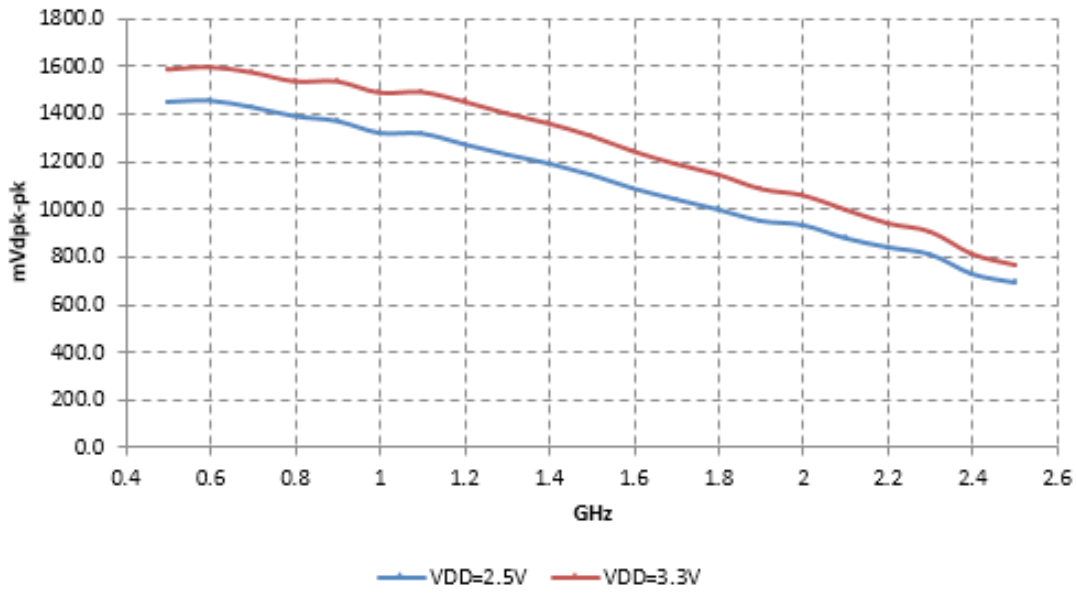
Output Skew



Part to Part Skew



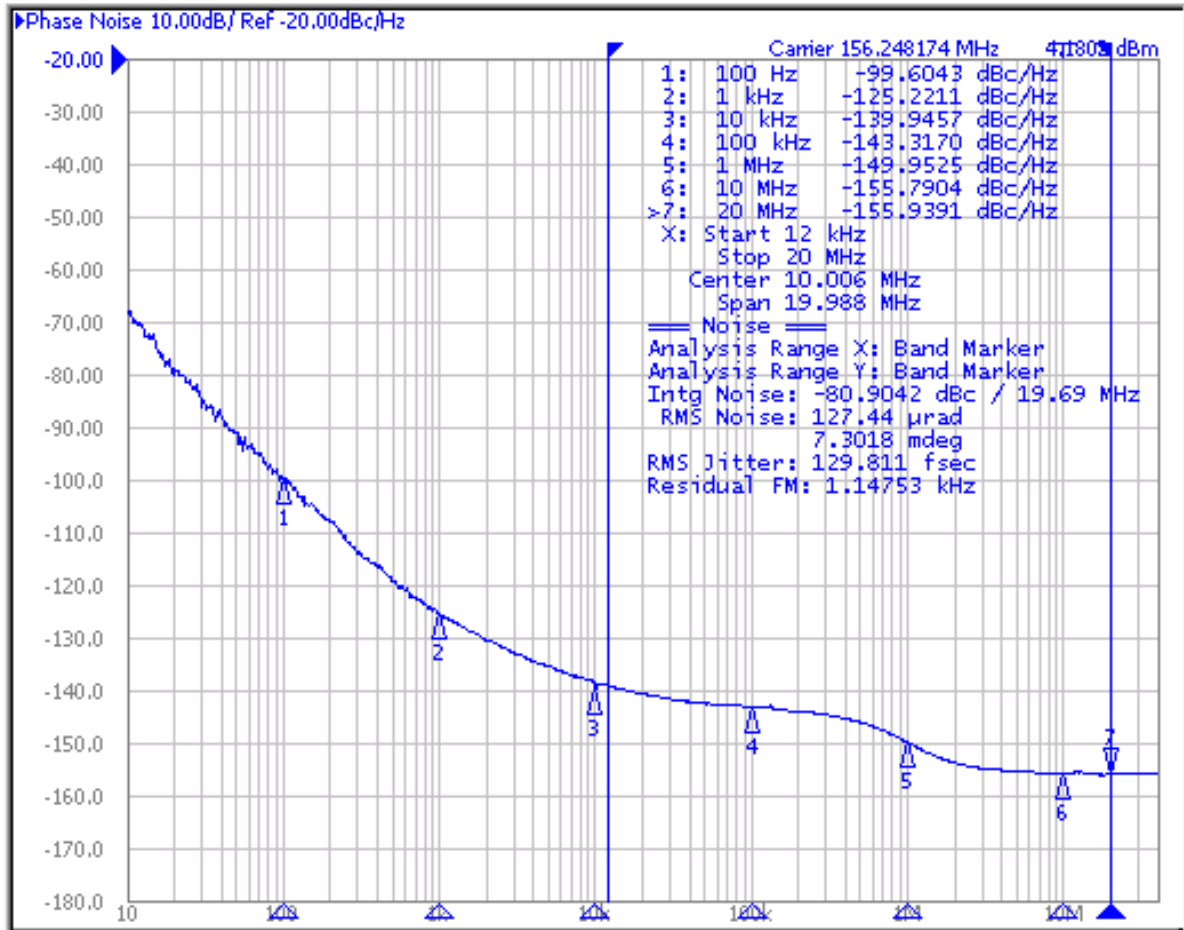
LVPECL Output Swing vs. Frequency



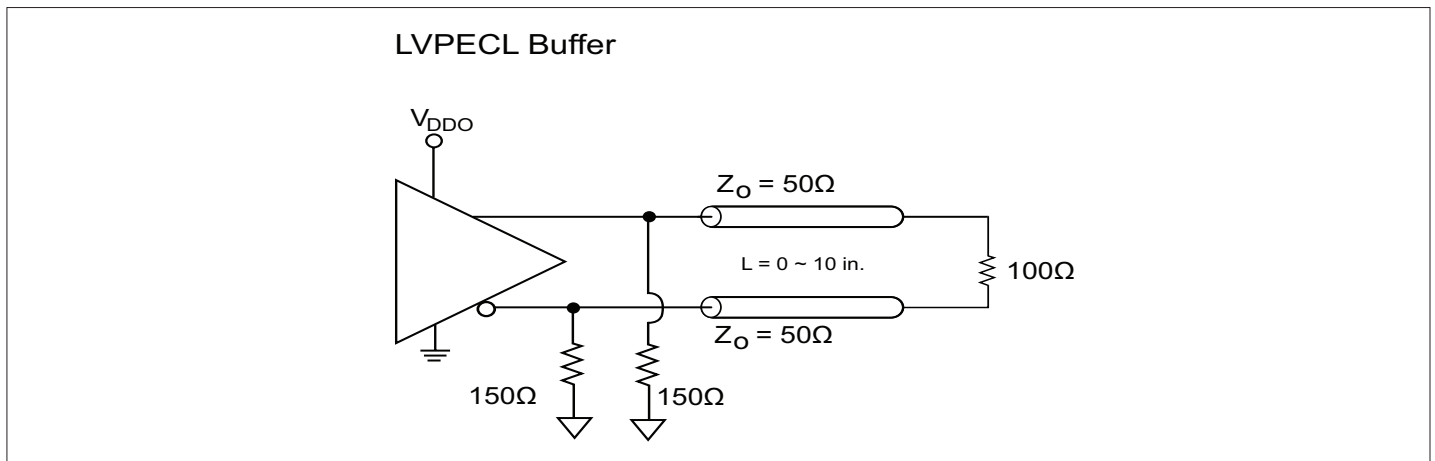
Phase Noise and Additive Jitter

Output phase noise (Dark Blue) vs Input Phase noise (light blue)

$$\text{Additive jitter} = \sqrt{(\text{Output jitter}^2 - \text{Input jitter}^2)}$$

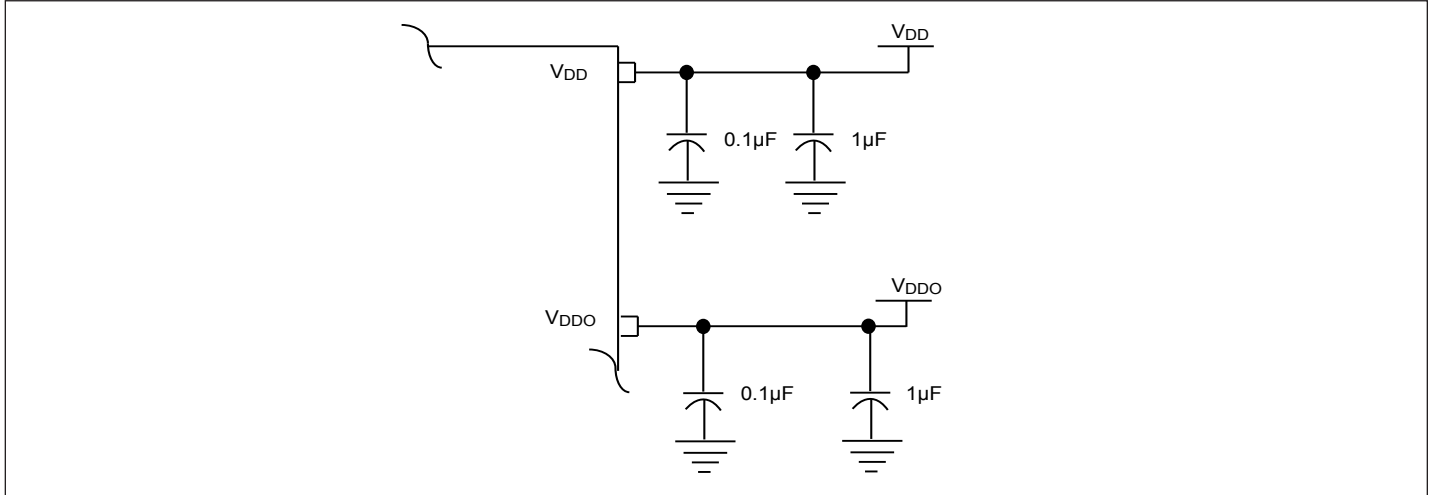


Configuration Test Load Board Termination for LVPECL Outputs

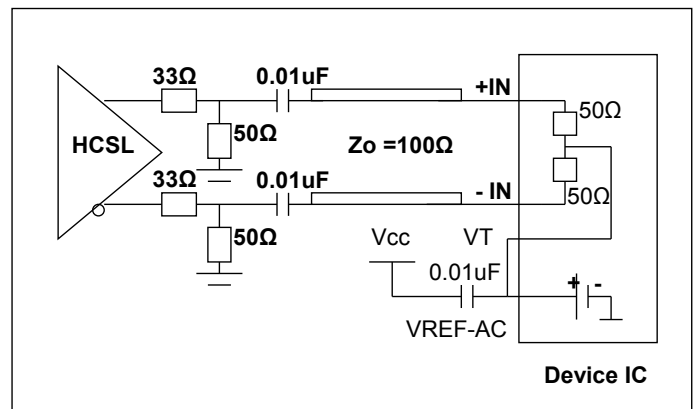
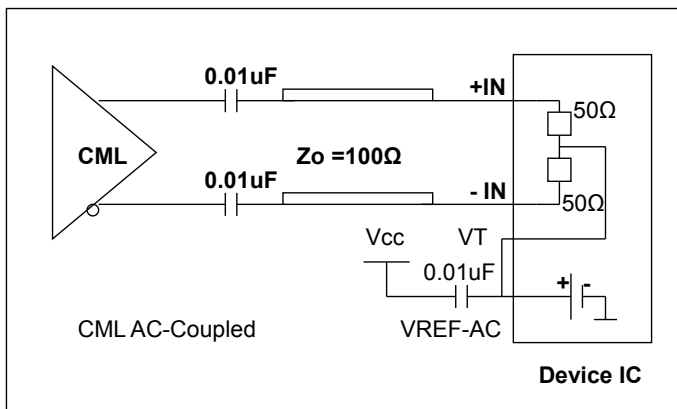
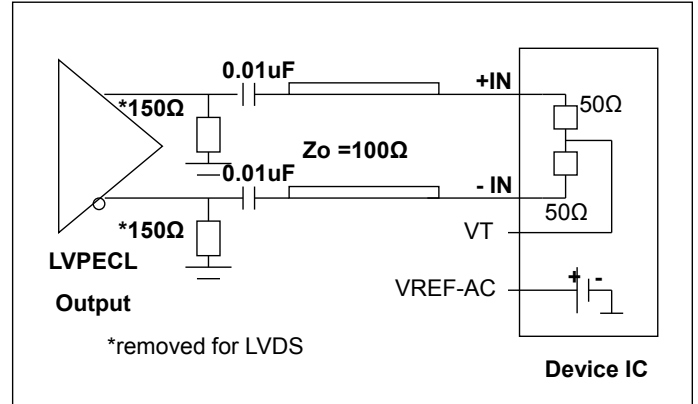
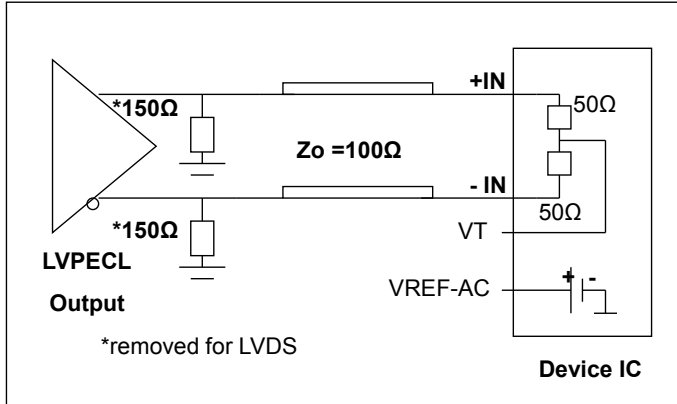


Power Supply Filtering Techniques

As in any high speed analog circuitry, the power supply pins are vulnerable to random noise. To achieve optimum jitter performance, power supply isolation is required. All power pins should be individually connected to the power supply plane through vias, and 0.1 μ F and 1 μ F bypass capacitors should be used for each pin.



Using Differential Inputs to PI6C5912006

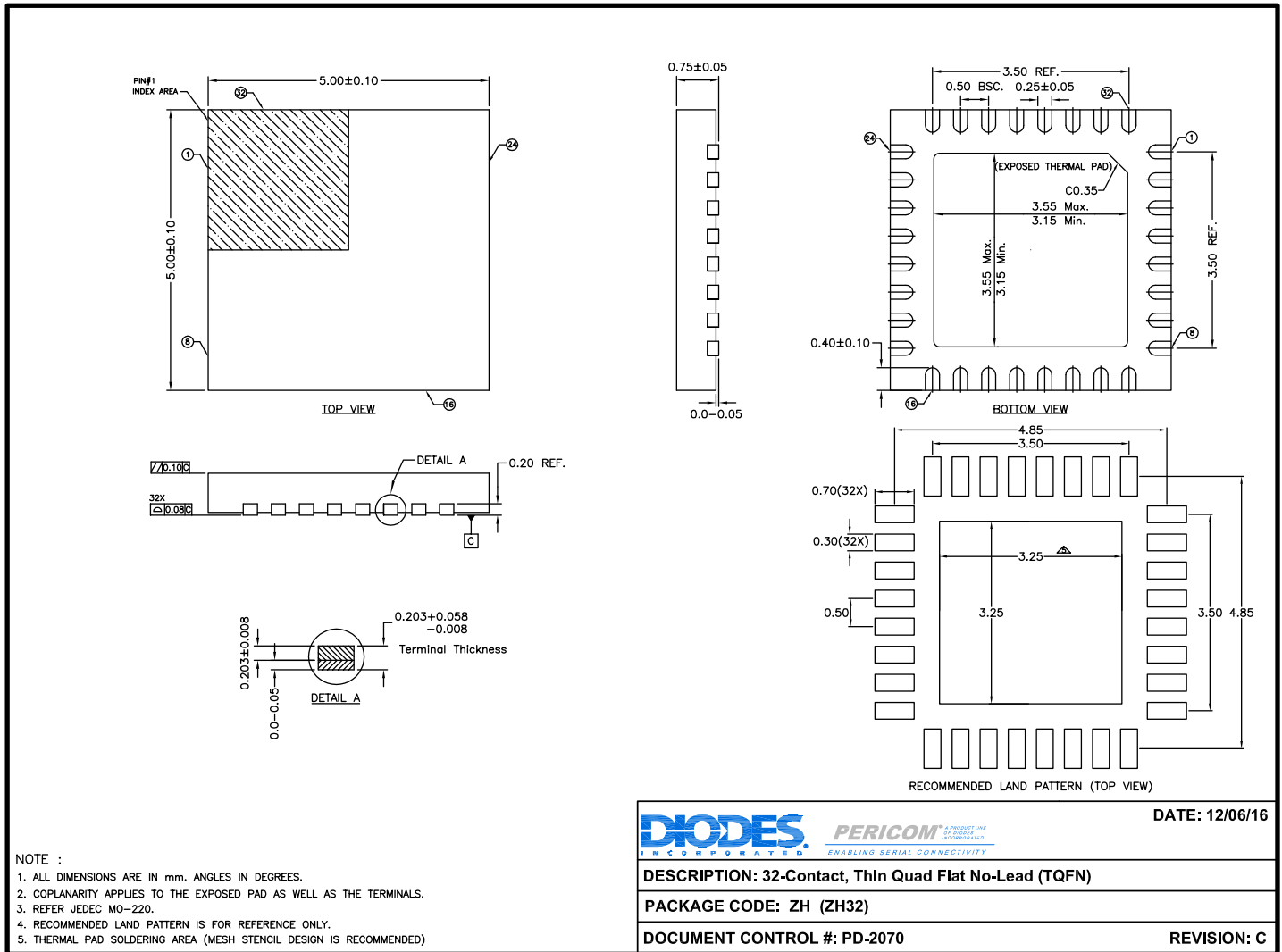


Thermal Information

| Symbol | Description | Condition | |
|---------------|----------------------------------------|-----------|-----------|
| Θ_{JA} | Junction-to-ambient thermal resistance | Still air | 44.7 °C/W |
| Θ_{JC} | Junction-to-case thermal resistance | | 21.7 °C/W |

Part Marking

Packaging Mechanical: 32-TQFN (ZH)



17-0570

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 | Operating Temperature |
|------------------|--------------|-------------------------------------------|-----------------------|
| PI6C5912006ZHIEX | ZH | 32-contact, Thin Quad Flat No-Lead (TQFN) | -40 °C to 85 °C |

Notes:

- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
- 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.
- Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- E = Pb-free and Green
- X suffix = Tape/Reel