

**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)

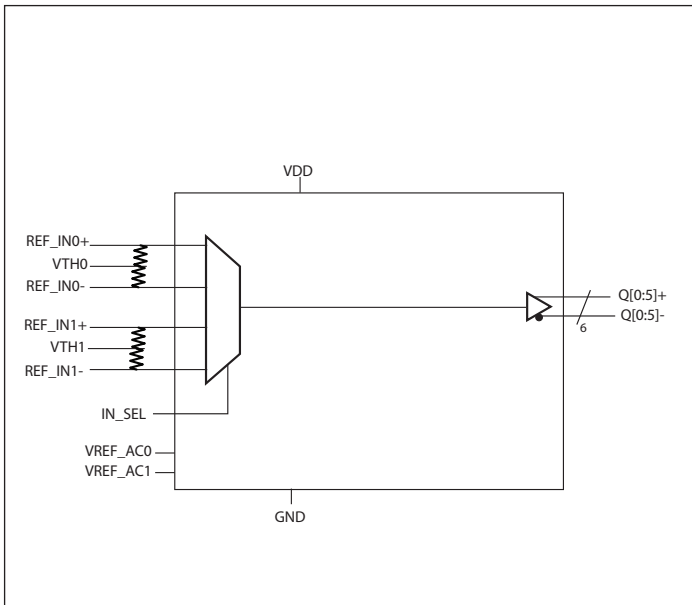
**Description**

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.

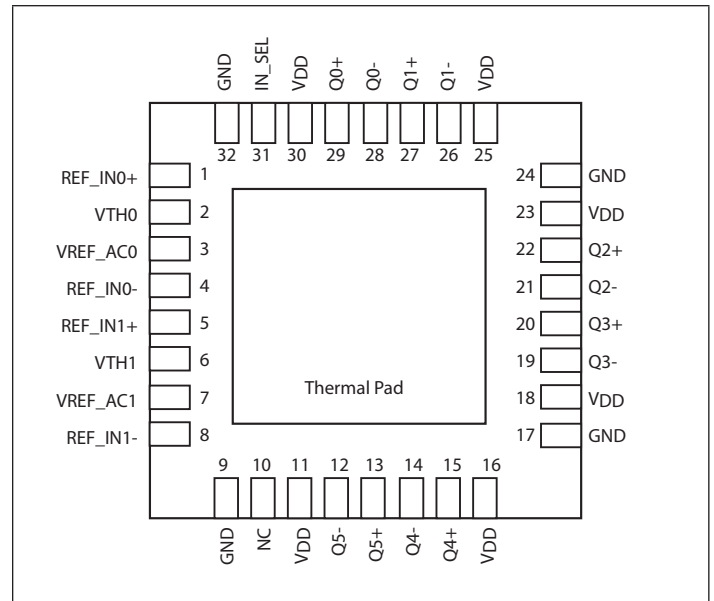
**Applications**

- 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 <sub>IN</sub>	Input Capacitance			2		pF
R <sub>PULLUP</sub>	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 <sub>DD</sub> , V <sub>DDO</sub> )....	-0.5 to +4.6V
Inputs (Referenced to GND) .....	-0.5 to V <sub>DD</sub> +0.5V
Clock Output (Referenced to GND).....	-0.5 to V <sub>DD</sub> +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 <sub>DD</sub>	Core Supply Voltage		3.135	3.3	3.465	V
			2.375	2.5	2.625	V
I <sub>DD</sub>	Core Power Supply Current	All LVPECL outputs unloaded			105	mA
T <sub>A</sub>	Ambient Operating Temperature		-40		85	°C

**DC Electrical Specifications - Differential Inputs**

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

### DC Electrical Specifications - LVCMOS Inputs

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

### DC Electrical Specifications- LVPECL Outputs

Parameter	Description	Conditions	Min.	Typ.	Max.	Units
V <sub>OH</sub>	Output High voltage		V <sub>DDO</sub> -1.4		V <sub>DDO</sub> -0.9	V
V <sub>OL</sub>	Output Low voltage	V <sub>DD</sub> =2.5V	V <sub>DDO</sub> -1.95		V <sub>DDO</sub> -1.25	V
		V <sub>DD</sub> =3.3V	V <sub>DDO</sub> -2.2		V <sub>DDO</sub> -1.25	V

### AC Electrical Specifications – Differential Inputs

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

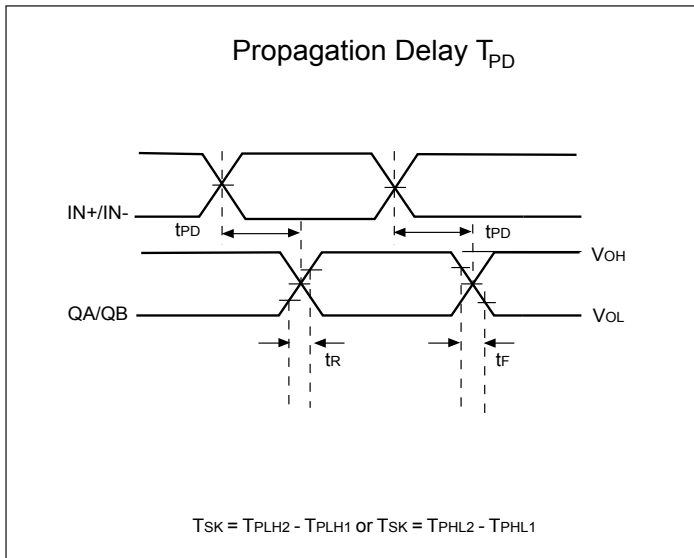
### AC Electrical Specifications – LVCMOS Inputs

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

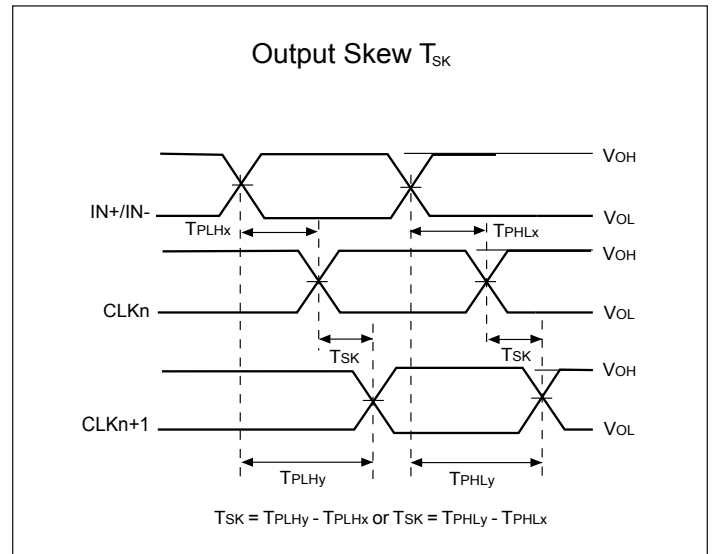
### AC Electrical Specifications – LVPECL Outputs

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

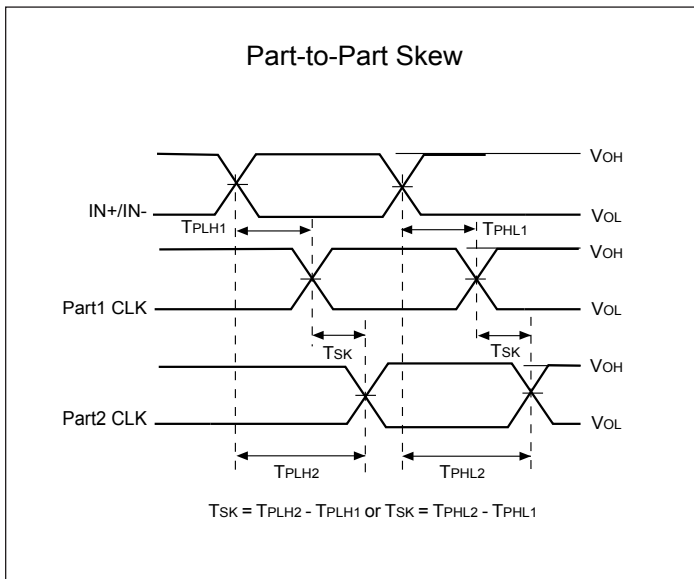
**Propagation Delay**



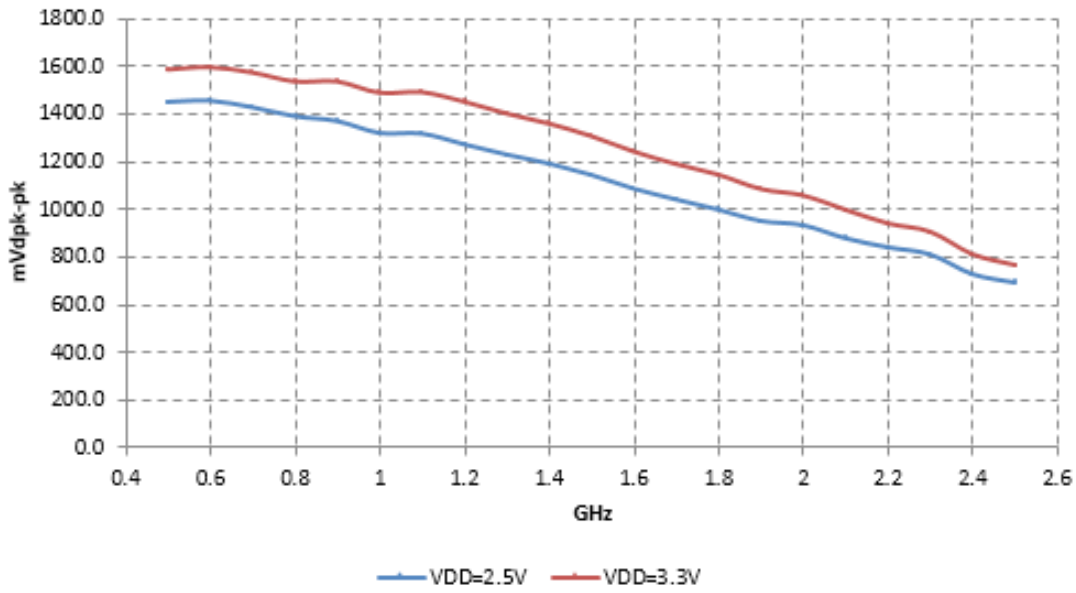
**Output Skew**



**Part to Part Skew**



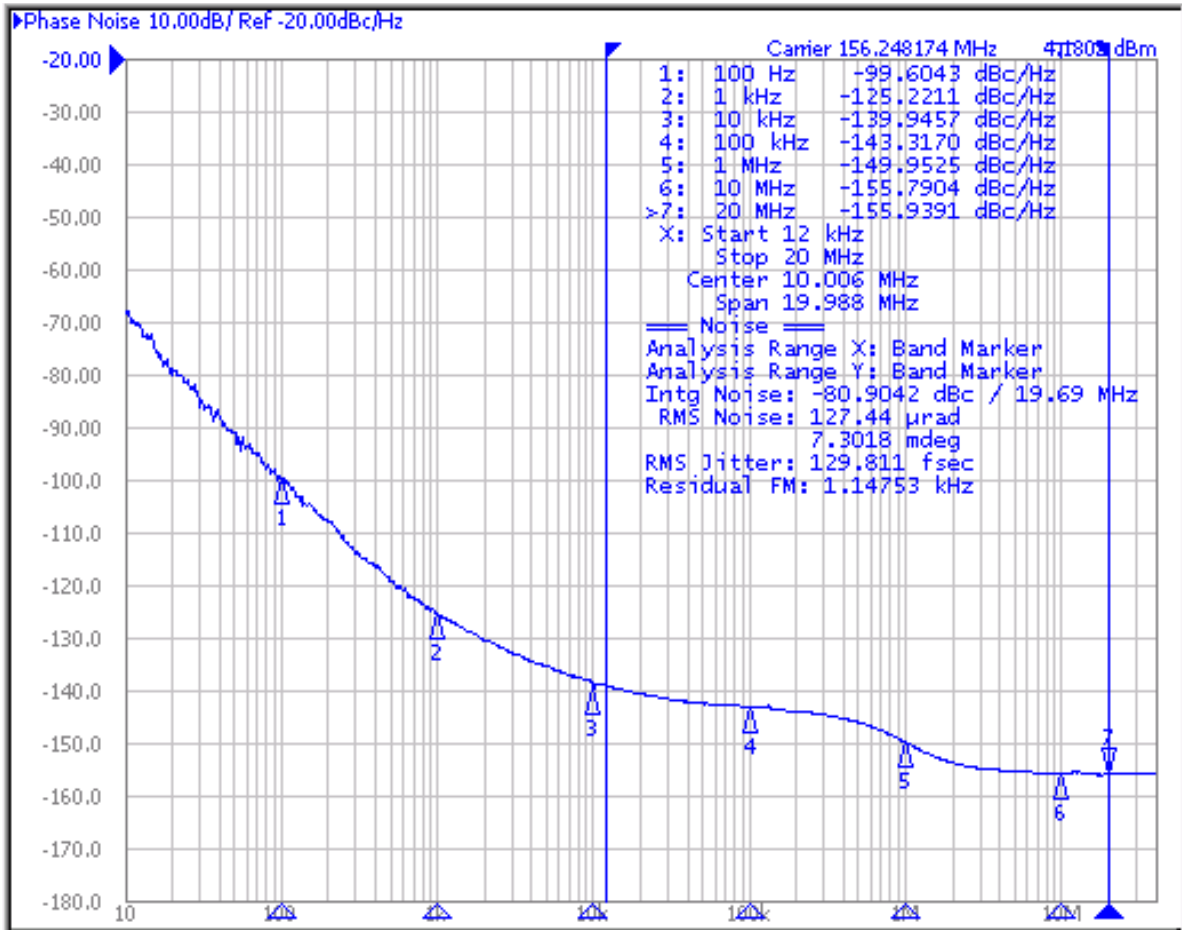
### LVPECL Output Swing vs. Frequency



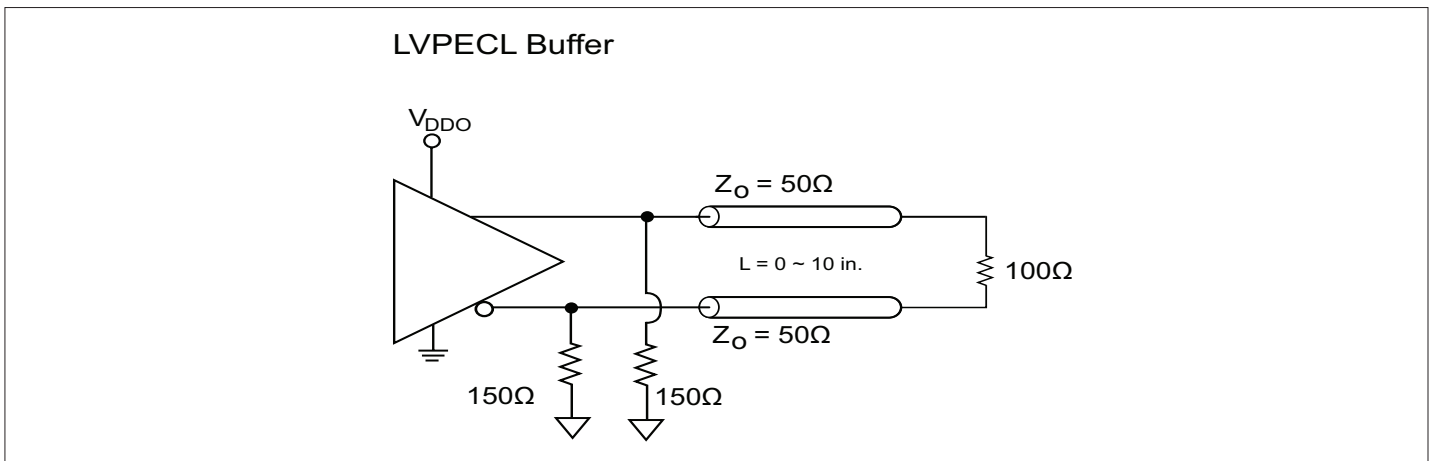
### Phase Noise and Additive Jitter

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

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



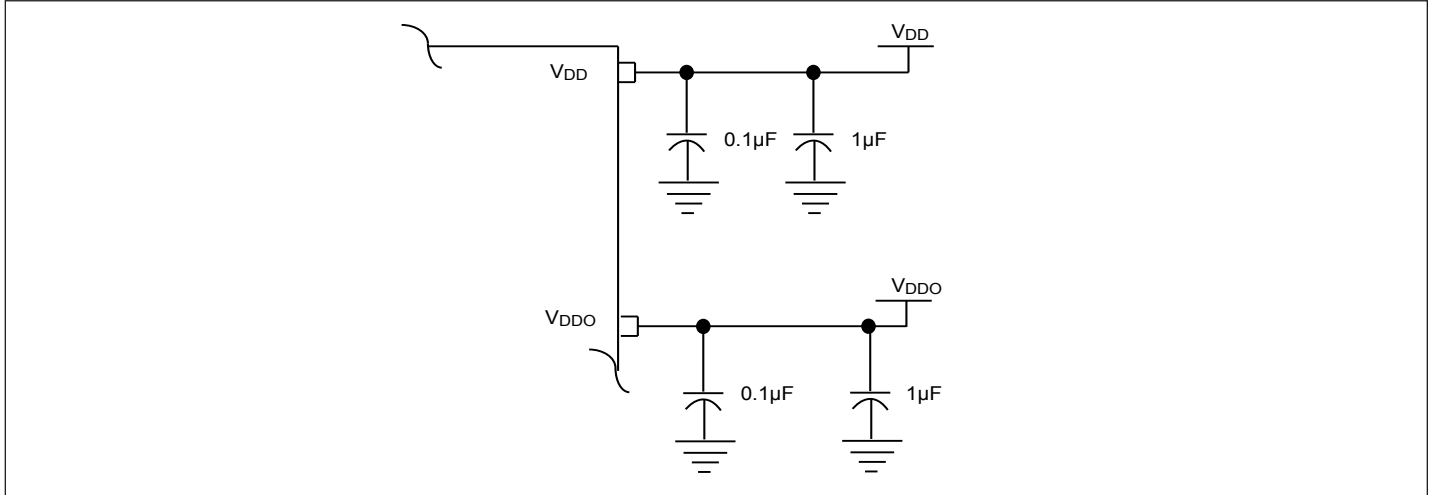
### Configuration Test Load Board Termination for LVPECL Outputs



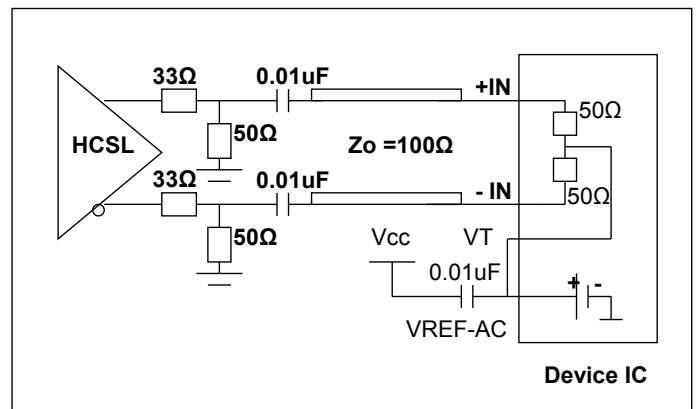
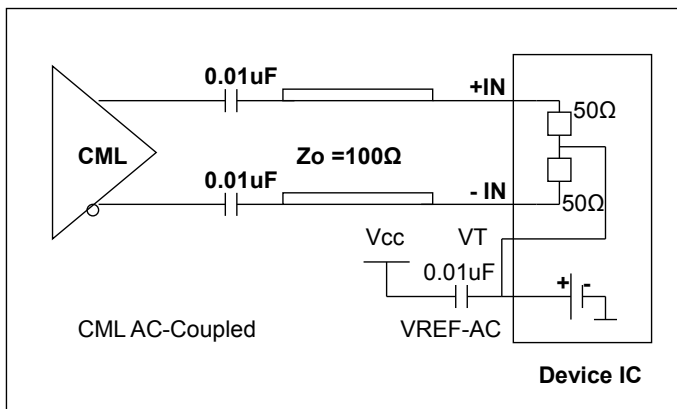
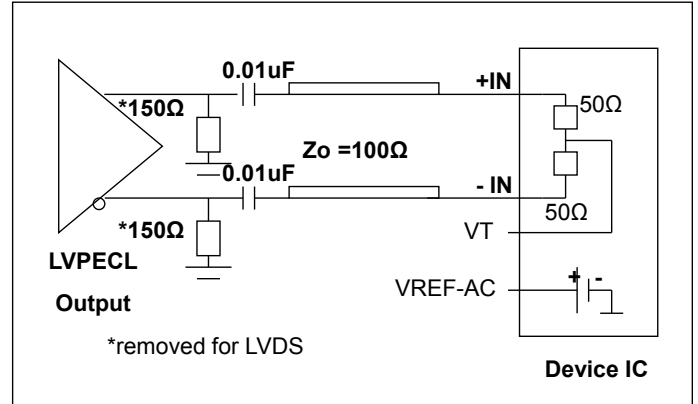
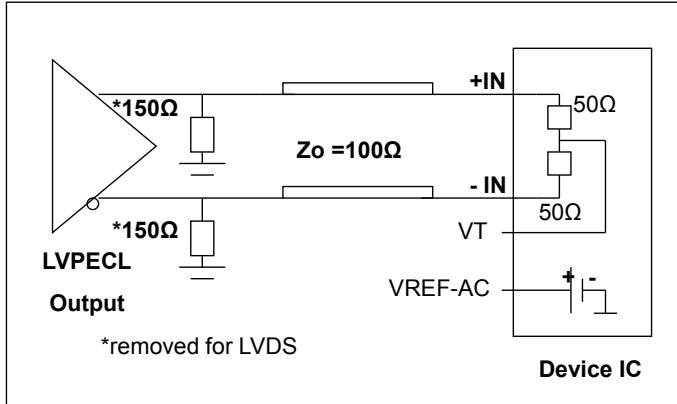


## Power Supply Filtering Techniques

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 $\mu$ F and 1 $\mu$ F bypass capacitors should be used for each pin.



## Using Differential Inputs to PI6C5912006

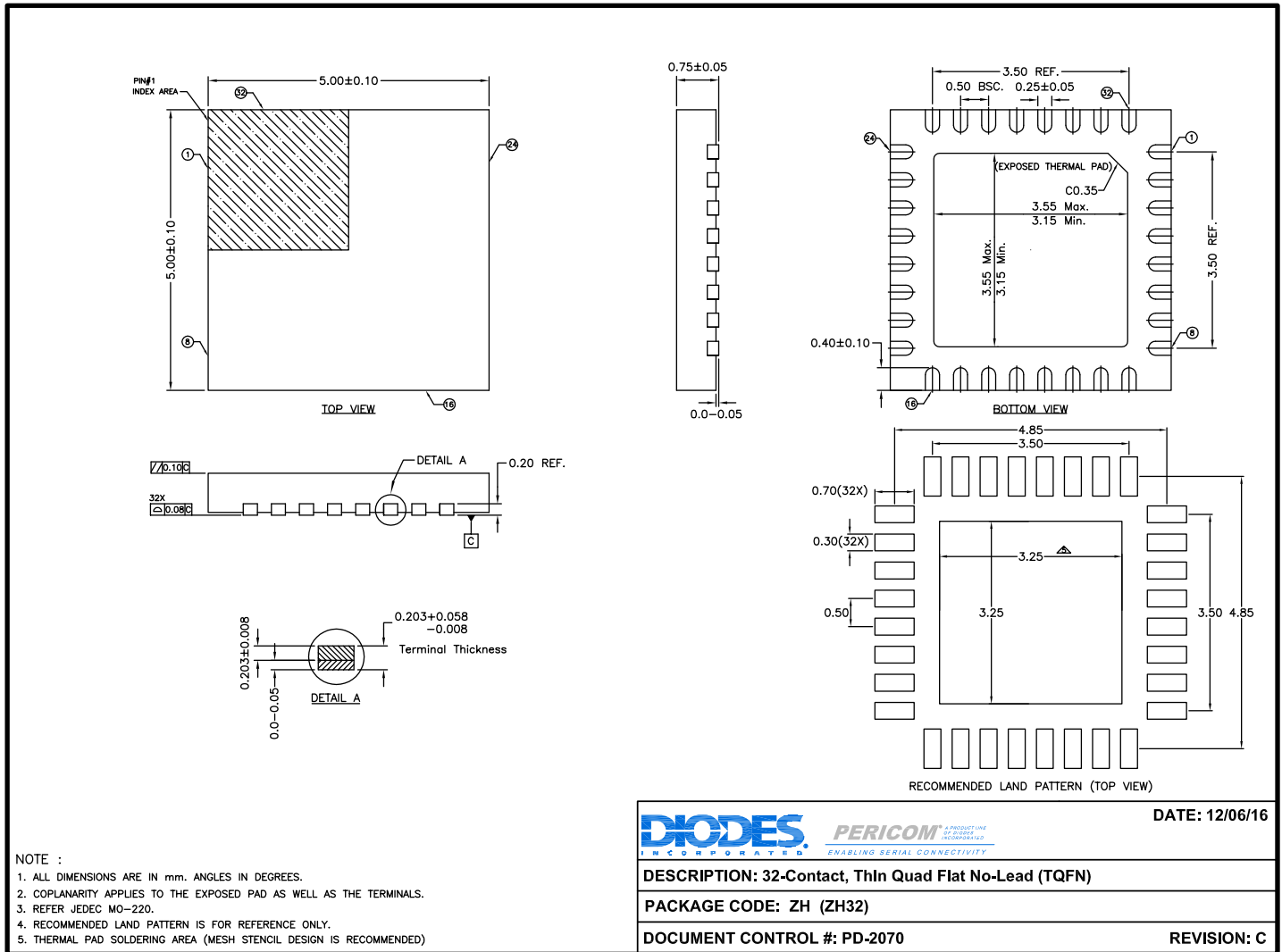


## Thermal Information

Symbol	Description	Condition	
$\Theta_{JA}$	Junction-to-ambient thermal resistance	Still air	44.7 °C/W
$\Theta_{JC}$	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

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