

# ANTREX Electronics

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## Product Reference Information

**Part Number:** PI6CB332001ZXBIEX-13R  
**Manufacturer:** Diodes Incorporated  
**Package:** 80-VFQFN Dual Rows, Exposed Pad  
**Availability:** Please confirm with sales

**Product Page:**

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**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

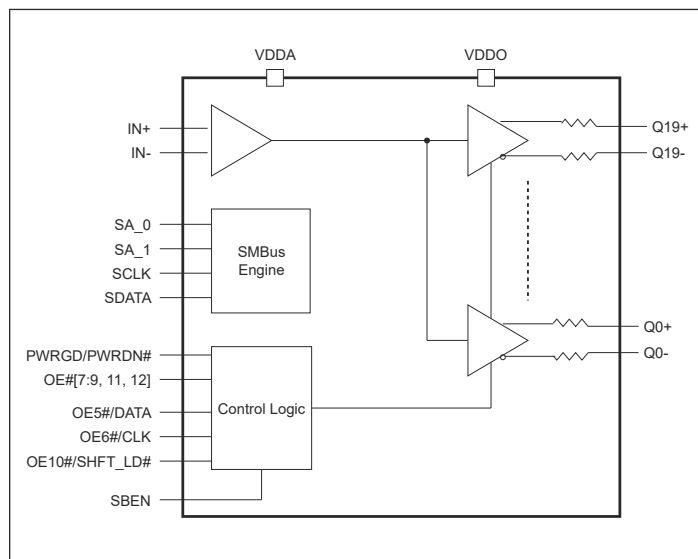
## 20-Output PCIe Gen 4/Gen 5/Gen 6 Clock Buffer With On-Chip Termination

### Description

The DIODES PI6CB332001 is a 20-output very low power PCIe® Gen 1/Gen 2/Gen 3/Gen 4/Gen 5 and Gen 6 clock buffer. It is capable of distributing the reference clocks for UPI, SAS, SATA, and other applications as well. It takes an reference input to fanout twenty 100MHz low power differential HCSL outputs with on-chip terminations. The on-chip termination can save 80 external resistors and make layout easier. OE pins combined with SMBus bits as well as 3-wire side band interface provide easier power management for each output.

It uses Diodes' proprietary design to achieve very low jitter that meets PCIe Gen 1/Gen 2/Gen 3/Gen 4/Gen 5 and Gen 6 requirement.

### Block Diagram



### Features

- Supports Intel's DB2000QL Specification
- 3.3V Supply Voltage
- HCSL Input: 100MHz (typical), Up to 400MHz
- 20 Differential Low Power HCSL Outputs with On-Chip Termination
- Two Output Enable Control Modes
  - Traditional 8 OE# Pins and 20 SMBus Bits
  - Simple 3-Wire Side-Band Interface Real-Time Control
- SMBus Interface Support
- Spread Spectrum Tolerant
- Very Low Jitter Outputs
  - Differential Additive Phase Jitter: DB2000Q <30fs RMS
  - Differential Additive Phase Jitter: PCIe Gen 4 <30fs RMS
  - Differential Additive Phase Jitter: PCIe Gen 5 <30fs RMS
  - Differential Additive Phase Jitter: PCIe Gen 6 <16fs RMS
  - PCIe Gen 1/Gen 2/Gen 3/Gen 4/Gen 5/Gen 6 Compliant
- Differential Output-to-Output Skew: <50ps
- Low Propagation Delay: <3ns
- Industrial Temperature Support: -40°C to 85°C
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.
- Packaging (Pb-free & Green):
  - 80-lead 6x6mm dual-row aQFN

### 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.

**PI6CB332001**

## Pin Configuration

|   | 1    | 2    | 3                                                                                                                                                                                     | 4     | 5    | 6                | 7    | 8         | 9    | 10       | 11              | 12   |
|---|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------------------|------|-----------|------|----------|-----------------|------|
| A | Q17+ | Q16- | Q16+                                                                                                                                                                                  | Q15-  | Q15+ | Q14-             | Q14+ | Q13-      | Q13+ | Q12-     | Q12+            | Q11- |
| B | Q17- | VDDO | NC                                                                                                                                                                                    | SA_0  | NC   | VDDO             | NC   | SA_1      | NC   | OE12#    | VDDO            | Q11+ |
| C | Q18+ | NC   | <div style="border: 1px solid black; width: 100%; height: 100%; display: flex; align-items: center; justify-content: center;">                     EPAD is GND                 </div> |       |      |                  |      |           |      |          | OE11#           | Q10- |
| D | Q18- | NC   |                                                                                                                                                                                       |       |      |                  |      |           |      |          | NC              | Q10+ |
| E | Q19+ | SBEN |                                                                                                                                                                                       |       |      |                  |      |           |      |          | OE10#/SH-FT_LD# | OE9# |
| F | Q19- | NC   |                                                                                                                                                                                       |       |      |                  |      |           |      |          | NC              | Q9-  |
| G | IN+  | NC   |                                                                                                                                                                                       |       |      |                  |      |           |      |          | NC              | Q9+  |
| H | IN-  | VDDA |                                                                                                                                                                                       |       |      |                  |      |           |      |          | OE8#            | Q8-  |
| J | Q0+  | NC   |                                                                                                                                                                                       |       |      |                  |      |           |      |          | NC              | Q8+  |
| K | Q0-  | NC   |                                                                                                                                                                                       |       |      |                  |      |           |      |          | OE7#            | Q7-  |
| L | Q1+  | VDDO | NC                                                                                                                                                                                    | SDATA | SCLK | NC               | NC   | OE5#/DATA | NC   | OE6#/CLK | VDDO            | Q7+  |
| M | Q1-  | Q2+  | Q2-                                                                                                                                                                                   | Q3+   | Q3-  | PWRGD/<br>PWRDN# | Q4+  | Q4-       | Q5+  | Q5-      | Q6+             | Q6-  |

## Pin Description

| Pin Number | Pin Name | Type   |      | Description                             |
|------------|----------|--------|------|-----------------------------------------|
| A1         | Q17+     | Output | HCSL | Differential true clock output          |
| A2         | Q16-     | Output | HCSL | Differential complementary clock output |
| A3         | Q16+     | Output | HCSL | Differential true clock output          |
| A4         | Q15-     | Output | HCSL | Differential complementary clock output |
| A5         | Q15+     | Output | HCSL | Differential true clock output          |
| A6         | Q14-     | Output | HCSL | Differential complementary clock output |
| A7         | Q14+     | Output | HCSL | Differential true clock output          |
| A8         | Q13-     | Output | HCSL | Differential complementary clock output |
| A9         | Q13+     | Output | HCSL | Differential true clock output          |
| A10        | Q12-     | Output | HCSL | Differential complementary clock output |

| Pin Number | Pin Name | Type   |      | Description                                                                                                                                                                                                                                                                                                                                                  |
|------------|----------|--------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A11        | Q12+     | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                               |
| A12        | Q11-     | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                      |
| B1         | Q17-     | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                      |
| B2         | VDDO     | Power  |      | Power supply for outputs, nominal 3.3V                                                                                                                                                                                                                                                                                                                       |
| B3         | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| B4         | SA_0     | Input  | CMOS | SMBus address bit. This is a tri-level input that works in conjunction with SA_1 pin, if present, to decode SMBus addresses. It has internal pull-up/down resistors to bias to VDD/2. See the SMBus Address Selection table.                                                                                                                                 |
| B5         | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| B6         | VDDO     | Power  |      | Power supply for outputs, nominal 3.3V                                                                                                                                                                                                                                                                                                                       |
| B7         | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| B8         | SA_1     | Input  | CMOS | SMBus address bit. This is a tri-level input that works in conjunction with SA_0 pin, if present, to decode SMBus addresses. It has internal pull-up/down resistors to bias to VDD/2. See the SMBus Address Selection table.                                                                                                                                 |
| B9         | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| B10        | OE12#    | Input  | CMOS | Active low input for enabling Q12 pair. 1 = disable outputs, 0 = enable outputs. The pin has internal pull down                                                                                                                                                                                                                                              |
| B11        | VDDO     | Power  |      | Power supply for outputs, nominal 3.3V                                                                                                                                                                                                                                                                                                                       |
| B12        | Q11+     | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                               |
| C1         | Q18+     | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                               |
| C2         | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| C11        | OE11#    | Input  | CMOS | Active low input for enabling Q11 pair. 1 = disable outputs, 0 = enable outputs. The pin has internal pull down                                                                                                                                                                                                                                              |
| C12        | Q10-     | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                      |
| D1         | Q18-     | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                      |
| D2         | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| D11        | NC       |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                |
| D12        | Q10+     | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                               |
| E1         | Q19+     | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                               |
| E2         | SBEN     | Input  | CMOS | Input that enables the Side-Band Interface for controlling output enables. This pin disables the output enable pins when asserted. It has an internal pull-down resistor.<br>0 = OE pins and SMBus enable bits control outputs, Side-band interface disabled.<br>1 = Side-Band Interface controls output enables, OE pins and SMBus enable bits are disabled |

| Pin Number | Pin Name       | Type   |      | Description                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------|----------------|--------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E11        | OE10#/SHFT_LD# | Input  | CMOS | Active low input for enabling output 10 or SHFT_LD- pin for the Side-Band Interface. Refer to the Side-Band Interface section for details. This pin has an internal pull-down.<br>OE Mode: 1 = disable output, 0 = enable output.<br>Side-Band Mode: 1 = enable Side-Band Interface shift register, 0 = disable Side-Band Interface shift register. A falling edge transfers Side-Band shift register contents to output register |
| E12        | OE9#           | Input  | CMOS | Active low input for enabling Q9 pair. 1 =disable outputs, 0 = enable outputs. The pin has internal pull down                                                                                                                                                                                                                                                                                                                     |
| F1         | Q19-           | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                                                                                           |
| F2         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| F11        | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| F12        | Q9-            | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                                                                                           |
| G1         | IN+            | Input  | HCSL | Differential true clock input                                                                                                                                                                                                                                                                                                                                                                                                     |
| G2         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| G11        | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| G12        | Q9+            | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                                                                                                    |
| H1         | IN-            | Input  | HCSL | Differential complementary clock input                                                                                                                                                                                                                                                                                                                                                                                            |
| H2         | VDDA           | Power  |      | Power supply for inputs and analog circuits, nominal 3.3V                                                                                                                                                                                                                                                                                                                                                                         |
| H11        | OE8#           | Input  | CMOS | Active low input for enabling Q8 pair. 1 =disable outputs, 0 = enable outputs. The pin has internal pull down                                                                                                                                                                                                                                                                                                                     |
| H12        | Q8-            | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                                                                                           |
| J1         | Q0+            | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                                                                                                    |
| J2         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| J11        | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| J12        | Q8+            | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                                                                                                    |
| K1         | Q0-            | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                                                                                           |
| K2         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| K11        | OE7#           | Input  | CMOS | Active low input for enabling Q7 pair. 1 =disable outputs, 0 = enable outputs. The pin has internal pull down                                                                                                                                                                                                                                                                                                                     |
| K12        | Q7-            | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                                                                                                           |
| L1         | Q1+            | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                                                                                                    |
| L2         | VDDO           | Power  |      | Power supply for outputs, nominal 3.3V                                                                                                                                                                                                                                                                                                                                                                                            |
| L3         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| L4         | SDATA          | I/O    | CMOS | SMBus data pin                                                                                                                                                                                                                                                                                                                                                                                                                    |
| L5         | SCLK           | Input  | CMOS | SMBus clock pin                                                                                                                                                                                                                                                                                                                                                                                                                   |
| L6         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |
| L7         | NC             |        |      | Not connected                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Pin Number | Pin Name         | Type   |      | Description                                                                                                                                                                                                                                                                                                                                    |
|------------|------------------|--------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| L8         | OE5#/DATA        | Input  | CMOS | Active low input for enabling output 5 or the data pin for the Side-Band Interface. Refer to the Side-Band Interface section for details. This pin has an internal pull-down.<br>OE Mode: 1 = disable output, 0 = enable output.<br>Side-Band Mode: Data pin                                                                                   |
| L9         | NC               |        |      | Not connected                                                                                                                                                                                                                                                                                                                                  |
| L10        | OE6#/CLK         | Input  | CMOS | Active low input for enabling output 6 or the clock pin for the Side-Band Interface shift register. Refer to the Side-Band Interface section for details. This pin has an internal pull-down.<br>OE Mode: 1 = disable output, 0 = enable output.<br>Side Band Mode: Clocks data into the Side-Band Interface shift register on the rising edge |
| L11        | VDDO             | Power  |      | Power supply for outputs, nominal 3.3V                                                                                                                                                                                                                                                                                                         |
| L12        | Q7+              | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                 |
| M1         | Q1-              | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                        |
| M2         | Q2+              | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                 |
| M3         | Q2-              | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                        |
| M4         | Q3+              | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                 |
| M5         | Q3-              | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                        |
| M6         | PWRGD/<br>PWRDN# | Input  | CMOS | Input notifies device to sample latched inputs and start up on first high assertion. Low enters Power Down mode, subsequent high assertions exit Power Down mode. This pin has internal pull-down resistor                                                                                                                                     |
| M7         | Q4+              | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                 |
| M8         | Q4-              | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                        |
| M9         | Q5+              | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                 |
| M10        | Q5-              | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                        |
| M11        | Q6+              | Output | HCSL | Differential true clock output                                                                                                                                                                                                                                                                                                                 |
| M12        | Q6-              | Output | HCSL | Differential complementary clock output                                                                                                                                                                                                                                                                                                        |
|            | EPAD             | Power  |      | Connect to Ground                                                                                                                                                                                                                                                                                                                              |

## SMBus Address Selection Table

| SA_1 | SA_0 | Address |
|------|------|---------|
| L    | L    | D8      |
| L    | M    | DA      |
| L    | H    | DE      |
| M    | L    | C2      |
| M    | M    | C4      |
| M    | H    | C6      |
| H    | L    | CA      |
| H    | M    | CC      |
| H    | H    | CE      |

## Output Control - SBEN = 0

| Inputs           |         | OE# Pins and Register Bits |         | Side Band Interface |    |              |
|------------------|---------|----------------------------|---------|---------------------|----|--------------|
| PWRGD/<br>PWRDN# | IN+/IN- | SMBUS Enable Bit           | OE# Pin | MASKx<br>Byte[10:8] | Dx | Q+/Q- [19:0] |
| 0                | X       | X                          | X       | X                   | X  | Low/Low      |
| 1                | Running | 0                          | X       | X                   | X  | Low/Low      |
|                  |         | 1                          | 0       | X                   | X  | Running      |
|                  |         | 1                          | 1       | X                   | X  | Low/Low      |
| 1                | Stopped | 1                          | 0       | X                   | X  | Stopped      |
|                  |         | 1                          | 1       | X                   | X  | Low/Low      |

## Output Control - SBEN = 1

| Inputs           |         | OE# Pins and Register Bits |         | Side Band Interface |    |              |
|------------------|---------|----------------------------|---------|---------------------|----|--------------|
| PWRGD/<br>PWRDN# | IN+/IN- | SMBUS Enable Bit           | OE# Pin | MASKx<br>Byte[10:8] | Dx | Q+/Q- [19:0] |
| 0                | X       | X                          | X       | X                   | X  | Low/Low      |
| 1                | Running | X                          | X       | 0                   | 0  | Low/Low      |
|                  |         | X                          | X       | 0                   | 1  | Running      |
|                  |         | X                          | X       | 1                   | X  | Running      |
| 1                | Stopped | X                          | X       | 0                   | 0  | Low/Low      |
|                  |         | X                          | X       | 0                   | 1  | Stopped      |
|                  |         | X                          | X       | 1                   | X  | Stopped      |

## Output Enable Control on PI6CB332001

The 20-output PI6CB332001 has two methods for enabling and disabling outputs. The first is the traditional method of OE# pins and SMBus output enable bits. The second method is a simple 3-wire serial interface referred to as the Side-Band Interface (SBI). Both interfaces are not active at the same time, and the SBEN pin selects which interface is active. Tying the SBEN high enables the SBI. Tying the SBEN pin low enables the traditional OE# pin/SMBus output enable interface.

Both the SBI and the traditional interface feed common output enable/disable synchronization logic ensuring glitch free enable and disable of outputs, regardless of the method used.

### Traditional Method

Outputs 5 through 12 have dedicated output enable pins and each of the 20 outputs has dedicated SMBus output enable bits in Byte0, Byte1, and Byte2 of the SMBus register set.

### Side-Band Interface

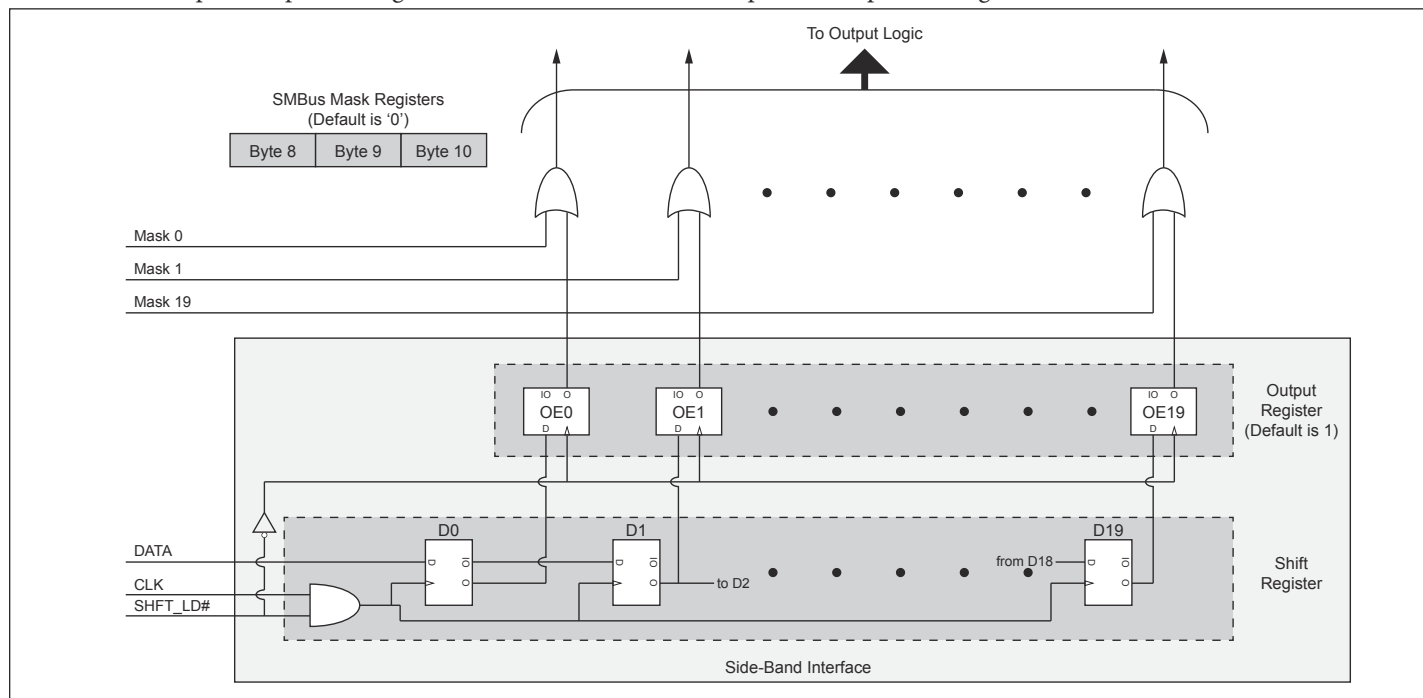
This interface consists of DATA, CLK and SHFT\_LD# pins. When the SHFT\_LD# pin is high, the rising edge of CLK can shift DATA into the shift register. After shifting data, the falling edge of SHFT\_LD# clocks the shift register contents to the Output register.

When the SBI is enabled, OE[7:9, 11, 12]# are disabled and DATA, CLK, and SHFT\_LD# are enabled on OE5#, OE6# and OE10# respectively. Additionally, SMBus registers for masking off the disable function of the shift register (0 value of a bit) become active. When set to a one, the mask register forces its respective output to 'enabled.' This prevents accidentally disabling critical outputs when using the SBI.

An SMBus read back bit in Byte 4 indicates which output enable control interface is enabled.

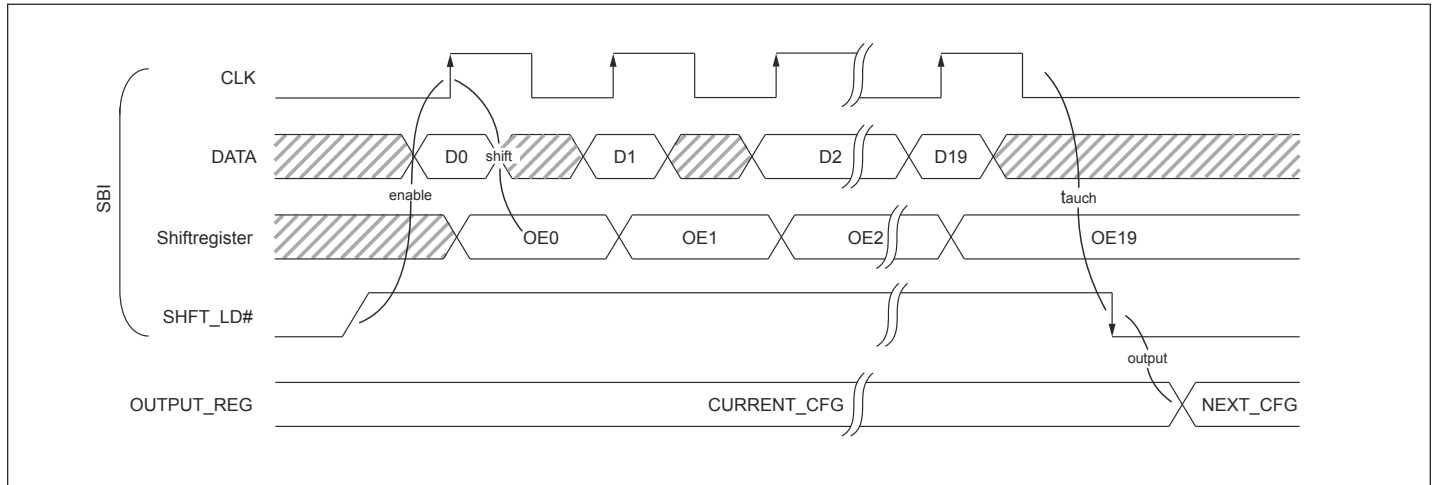
When the SBI is enabled, and power has been applied, the SBI is active, even if the PWRGD/PWRDN# pin indicates the part is in power down. This allows loading the shift register and transferring the contents to the output register before the assertion of PWRGD. Note that the mask registers are part of the normal SMBus interface and cannot be accessed when the PWRGD/PWRDN# is low. Figure 1 provides a functional description of the SBI.

The SBI and the traditional SMBus output enable registers both default to the 'output enabled' state at power-up. The mask registers default to zero at power-up, allowing the shift bits to disable their respective output. See Figure 1.



**Figure 1. Side Band Interface Control Logic Description**

Figure 2 shows the basic timing of the side-band interface. The SHFT\_LD# pin goes high to enable the CLK input. Next, the rising edge of CLK clocks enable DATA into the shift register. After the 20th clock for output 19, stop the clock low and drive the SHFT\_LD# pin low. The falling edge of SHFT\_LD# clocks the shift register contents to the output register, enabling or disabling the outputs. Always shift 20 bits of data into the shift register to control the outputs.



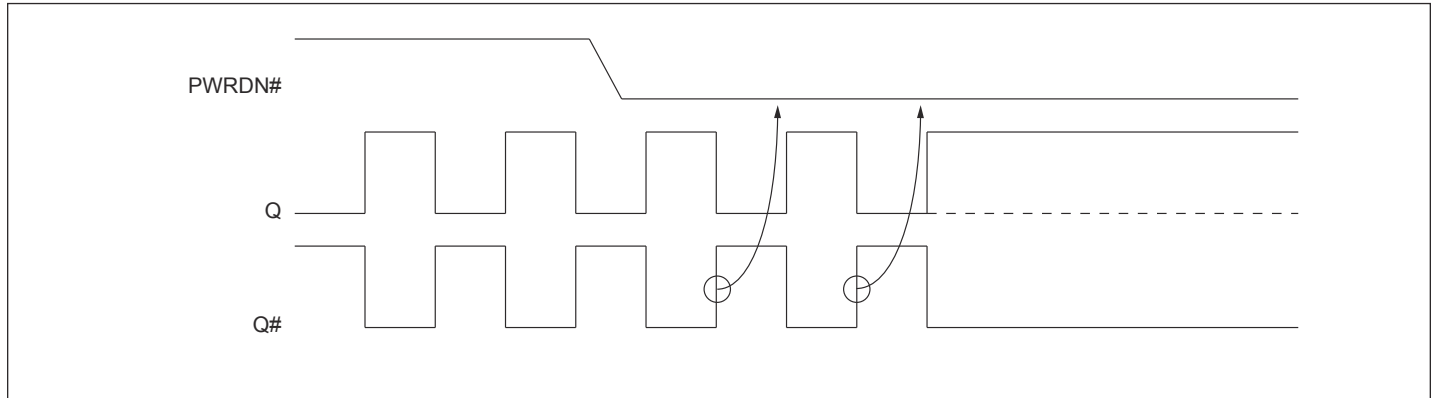
**Figure 2. Side Band Interface Functional Timing**

The SBI interface supports clock rates up to 10MHz. Multiple devices may share CLK and DATA pins. Dedicating a SHFT\_LD# pin to each device allows its use as a chip-select pin. When the SHFT\_LD# pin is low, the PI6CB332001 ignores any activity on the CLK and DATA pins.

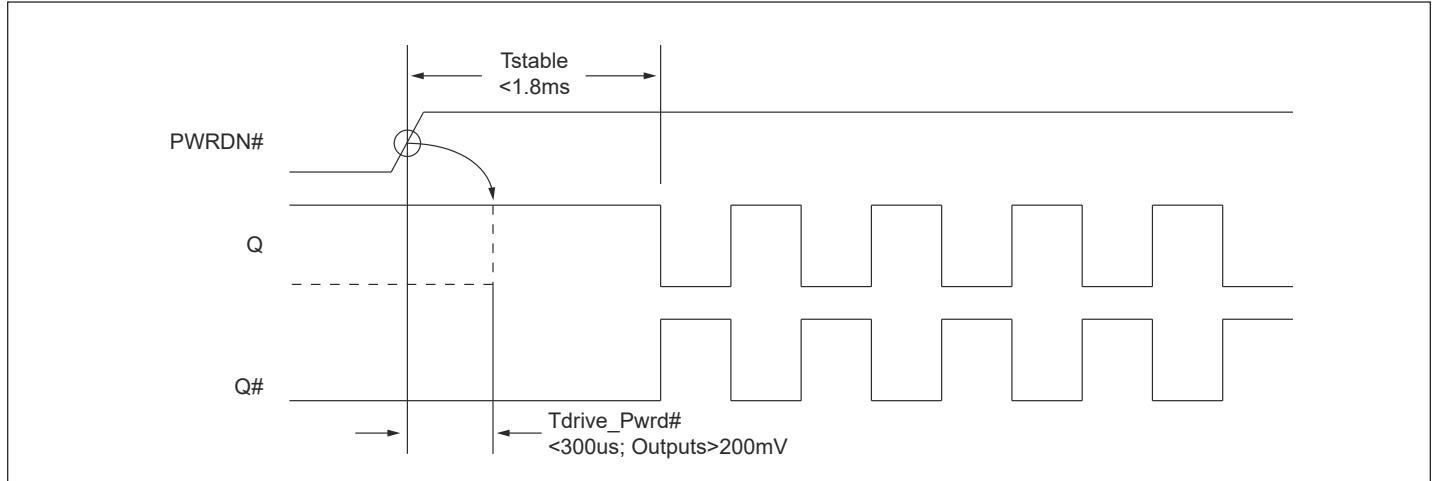
### Power Management Table

| PWRGD/PWRDN# | Q+     | Q-     |
|--------------|--------|--------|
| 0            | Low    | Low    |
| 1            | Normal | Normal |

### PWRDN# Assertion



### PWRGD Assertion



## 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, $V_{DDXX}$ ..... | -0.5V to +4.0V         |
| Input Control Pins Voltage .....                     | -0.5V to $V_{DD}+0.5V$ |
| CLK+/- Pins .....                                    | -0.5V to 2.5V          |
| SMBus, Input High Voltage .....                      | 3.6V                   |
| ESD Protection (HBM) .....                           | 2000V                  |
| Junction Temperature .....                           | 125°C Max.             |

### 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.

## Operating Conditions

Temperature =  $T_A$ ; Supply voltages per normal operation conditions; See test circuits for the load conditions

| Symbol              | Parameters                                     | Conditions                                      | Min.  | Typ. | Max.  | Units |
|---------------------|------------------------------------------------|-------------------------------------------------|-------|------|-------|-------|
| $V_{DD}, V_{DD\_A}$ | Power Supply Voltage                           |                                                 | 3.135 | 3.3  | 3.465 | V     |
| $I_{DD}$            | Power Supply Current                           | $V_{DD} + V_{DDA}$ , All outputs active @100MHz |       | 160  | 200   | mA    |
| $I_{DD\_PD}$        | Power Supply Power Down <sup>(1)</sup> Current | $V_{DD} + V_{DDA}$ , All outputs LOW/LOW        |       | 3    | 5     | mA    |
| $T_A$               | Ambient Temperature                            | Industrial grade                                | -40   |      | 85    | °C    |

### Note:

1. Input clock is not running.

## Input Electrical Characteristics

| Symbol    | Parameters                    | Conditions | Min. | Typ. | Max. | Units      |
|-----------|-------------------------------|------------|------|------|------|------------|
| $R_{pu}$  | Internal pull up resistance   |            |      | 120  |      | K $\Omega$ |
| $R_{dn}$  | Internal pull down resistance |            |      | 120  |      | K $\Omega$ |
| $L_{PIN}$ | Pin inductance                |            |      |      | 7    | nH         |

## SMBus Electrical Characteristics

Temperature =  $T_A$ ; Supply voltages per normal operation conditions; See test circuits for the load conditions

| Symbol        | Parameters               | Conditions                | Min.                | Typ. | Max. | Units |
|---------------|--------------------------|---------------------------|---------------------|------|------|-------|
| $V_{DDSMB}$   | Nominal bus voltage      |                           | 2.7                 |      | 3.6  | V     |
| $V_{IHSMB}$   | SMBus Input High Voltage | SMBus, $V_{DDSMB} = 3.3V$ | 2.1                 |      | 3.6  | V     |
|               |                          | SMBus, $V_{DDSMB} < 3.3V$ | 0.65<br>$V_{DDSMB}$ |      |      |       |
| $V_{ILSMB}$   | SMBus Input Low Voltage  | SMBus, $V_{DDSMB} = 3.3V$ |                     |      | 0.6  | V     |
|               |                          | SMBus, $V_{DDSMB} < 3.3V$ |                     |      | 0.6  |       |
| $I_{SMBSINK}$ | SMBus sink current       | SMBus, at $V_{OLSMB}$     | 4                   |      |      | mA    |

**PI6CB332001**

| Symbol               | Parameters                | Conditions                                                   | Min. | Typ. | Max. | Units |
|----------------------|---------------------------|--------------------------------------------------------------|------|------|------|-------|
| V <sub>OL</sub> SMB  | SMBus Output Low Voltage  | SMBus, at I <sub>SMB</sub> SINK                              |      |      | 0.4  | V     |
| f <sub>MAX</sub> SMB | SMBus operating frequency | Maximum frequency                                            |      |      | 400  | kHz   |
| t <sub>RMSB</sub>    | SMBus rise time           | (Max V <sub>IL</sub> - 0.15) to (Min V <sub>IH</sub> + 0.15) |      |      | 1000 | ns    |
| t <sub>FMSB</sub>    | SMBus fall time           | (Min V <sub>IH</sub> + 0.15) to (Max V <sub>IL</sub> - 0.15) |      |      | 300  | ns    |

**LVCMOS DC Electrical Characteristics**

Temperature = T<sub>A</sub>; Supply voltages per normal operation conditions; See test circuits for the load conditions

| Symbol          | Parameters               | Conditions                                                                      | Min. | Typ.               | Max.                    | Units |
|-----------------|--------------------------|---------------------------------------------------------------------------------|------|--------------------|-------------------------|-------|
| V <sub>IH</sub> | Input High Voltage       | Single-ended inputs, except tri-level pins                                      | 2    |                    | V <sub>DD</sub><br>+0.3 | V     |
| V <sub>IL</sub> | Input Low Voltage        | Single-ended inputs, except tri-level pins                                      | -0.3 |                    | 0.8                     | V     |
| V <sub>IH</sub> | Input High Voltage       | Single-ended tri-level inputs                                                   | 2.4  |                    | V <sub>DD</sub><br>+0.3 | V     |
| V <sub>IM</sub> | Input Mid Voltage        | Single-ended tri-level inputs                                                   | 1.3  | 0.5V <sub>DD</sub> | 1.8                     | V     |
| V <sub>IL</sub> | Input Low Voltage        | Single-ended tri-level inputs                                                   | -0.3 |                    | 0.9                     | V     |
| I <sub>IH</sub> | Input High Current       | Single-ended inputs, V <sub>IN</sub> = V <sub>DD</sub>                          |      |                    | 5                       | μA    |
| I <sub>IL</sub> | Input Low Current        | Single-ended inputs, V <sub>IN</sub> = 0V                                       | -5   |                    |                         | μA    |
| I <sub>IH</sub> | Input High Current       | Single-ended inputs with pull up resistor,<br>V <sub>IN</sub> = V <sub>DD</sub> |      |                    | 50                      | μA    |
| I <sub>IL</sub> | Input Low Current        | Single-ended inputs with pull up resistor,<br>V <sub>IN</sub> = 0V              | -50  |                    |                         | μA    |
| C <sub>IN</sub> | Input Capacitance        |                                                                                 | 1.5  |                    | 5                       | pF    |
| t <sub>RF</sub> | Rise/ Fall time of Input |                                                                                 |      |                    | 5                       | ns    |

**LVCMOS AC Electrical Characteristics**

Temperature = T<sub>A</sub>; Supply voltages per normal operation conditions; See test circuits for the load conditions

| Symbol             | Parameters            | Conditions                                                                               | Min. | Typ. | Max. | Units  |
|--------------------|-----------------------|------------------------------------------------------------------------------------------|------|------|------|--------|
| t <sub>OELAT</sub> | Output enable latency | Q start after OE# assertion<br>Q stop after OE# deassertion                              |      | 5    | 10   | clocks |
| t <sub>PDLAT</sub> | PD# de-assertion      | Differential outputs enable after PD# de-assertion                                       |      |      | 300  | us     |
| t <sub>STAB</sub>  | Output stabilization  | From power up and after input clock stabilization or after PD# de-assertion to 1st clock |      | 1.0  | 1.8  | ms     |

## HCSSL Input Characteristics<sup>(1)</sup>

Temperature = T<sub>A</sub>; Supply voltages per normal operation conditions; See test circuits for the load conditions

| Symbol             | Parameters                                     | Conditions                                                    | Min. | Typ. | Max. | Units |
|--------------------|------------------------------------------------|---------------------------------------------------------------|------|------|------|-------|
| f <sub>IN</sub>    | Input Frequency                                | V <sub>DD</sub> = 3.3V                                        | 1    | 100  | 400  | MHz   |
| V <sub>IHDIF</sub> | Differential Input High Voltage <sup>(3)</sup> | IN+, IN-, single-end measurement                              | 330  |      | 1150 | mV    |
| V <sub>ILDIF</sub> | Differential Input Low Voltage <sup>(3)</sup>  | IN+, IN-, single-end measurement                              | -300 | 0    | 300  | mV    |
| V <sub>SWING</sub> | Differential Input Swing Voltage               | Peak to peak value (V <sub>IHDIF</sub> - V <sub>ILDIF</sub> ) | 200  |      |      | mV    |
| V <sub>COM</sub>   | Common mode voltage                            |                                                               | 100  |      | 900  | mV    |
| t <sub>RF</sub>    | Differential Input Slew Rate <sup>(2)</sup>    |                                                               | 0.7  |      |      | V/ns  |
| I <sub>IN</sub>    | Differential Input Leakage Current             | V <sub>IN+</sub> = V <sub>DD</sub> , V <sub>IN-</sub> = 0.8V  | -40  |      | 100  | uA    |
| t <sub>DC</sub>    | Differential Input Duty Cycle                  | Measured differentially                                       | 45   |      | 55   | %     |
| t <sub>jC-c</sub>  | Differential Input Cycle to cycle jitter       | Measured differentially                                       |      |      | 125  | ps    |

### Note:

- Guaranteed by design and characterization, not 100% tested in production
- Slew rate measured through +/-75mV window centered around differential zero
- The device can be driven by a single-ended clock by driving the true clock and biasing the complement clock input to the V<sub>bias</sub>, where V<sub>bias</sub> is (V<sub>IH</sub>-V<sub>IL</sub>)/2

## HCSSL Output Characteristics

Temperature = T<sub>A</sub>; Supply voltages per normal operation conditions; See test circuits for the load conditions

| Symbol                      | Parameters                            | Condition                                               | Min. | Typ. | Max. | Units |
|-----------------------------|---------------------------------------|---------------------------------------------------------|------|------|------|-------|
| V <sub>MAX</sub>            | Maximum output voltage                | Measurement on single ended signal using absolute value | 660  | 780  | 900  | mV    |
| V <sub>MIN</sub>            | Minimum output voltage                |                                                         | -150 | 20   | 150  | mV    |
| V <sub>cross absolute</sub> | Absolute Crossing point Voltage       |                                                         | 250  |      | 550  | mV    |
| V <sub>cross relative</sub> | Relative Crossing point Voltage       |                                                         |      |      | 140  | mV    |
| f <sub>OUT</sub>            | Output Frequency                      |                                                         |      | 100  | 400  | MHz   |
| t <sub>RF</sub>             | Slew rate <sup>(1,2,3)</sup>          | Scope averaging on, 10 inch trace                       | 1.5  | 3.0  | 4    | V/ns  |
| D <sub>tRF</sub>            | Slew rate matching <sup>(1,2,4)</sup> | Scope averaging on, 10 inch trace                       |      |      | 20   | %     |
| t <sub>SKEW</sub>           | Output Skew <sup>(1,2)</sup>          | Averaging on, V <sub>T</sub> = 50%                      |      |      | 50   | ps    |
| t <sub>DC</sub>             | Differential Output Duty Cycle        | Measured differentially                                 | 45   |      | 55   | %     |
| DC Distortion               | Duty Cycle Distortion <sup>(5)</sup>  | Measured differentially at 100MHz                       | -0.5 |      | 0.5  | %     |
| T <sub>pd</sub>             | Propagation Delay                     |                                                         |      | 2.0  | 3    | ns    |

### Note:

- Guaranteed by design and characterization, not 100% tested in production
- Measured from differential waveform
- Slew rate is measured through the V<sub>swing</sub> voltage range centered around differential 0V, within +/-150mV window
- Slew rate matching is measured through +/-75mV window centered around differential zero
- Duty cycle distortion is the difference in duty cycle between the out and input clock

## Side Band Interface

Temperature = T<sub>A</sub>; Supply voltages per normal operation conditions

| Symbol              | Parameters                       | Conditions                                                        | Min. | Typ. | Max. | Units  |
|---------------------|----------------------------------|-------------------------------------------------------------------|------|------|------|--------|
| t <sub>PERIOD</sub> | Side Band clock period           |                                                                   | 40   |      |      | ns     |
| t <sub>SETUP</sub>  | SHFT Setup time                  | SHFT setup time to CLK rising edge                                | 10   |      |      | ns     |
| t <sub>DSETUP</sub> | Data setup time                  | DATA setup time to CLK rising edge                                | 5    |      |      | ns     |
| t <sub>DHOLD</sub>  | Data hold time <sup>(1)</sup>    | DATA hold time after CLK rising edge                              | 2    |      |      | ns     |
| t <sub>DELAY</sub>  | Delay time <sup>(1)</sup>        | Delay from CLK rising edge to LD# falling edge                    | 10   |      |      | ns     |
| t <sub>PD</sub>     | Propagation delay <sup>(2)</sup> | Delay LD# falling edge to next output configuration taking effect | 4    |      | 10   | clocks |
| t <sub>RF</sub>     | CLK slew rate <sup>(3)</sup>     | CLK input between 20% to 80%                                      | 0.7  |      | 4    | V/ns   |

**Note:**

1. Guaranteed by design and characterization, not 100% tested in production
2. Refer to device differential input clock
3. Control input must be monotonic from 20% to 80% of input swing

## PCIe Common Clock (CC) Architecture Jitter<sup>(3)</sup>

| Symbol              | Parameters                                            | Condition                                                                                   | Min. | Typ.  | Max.  | Spec Limit        | Units     |
|---------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------|------|-------|-------|-------------------|-----------|
| t <sub>JPHASE</sub> | Additive Integrated phase jitter (RMS) <sup>(1)</sup> | PCIe Gen 1                                                                                  |      | 0     | 0.03  | 86                | ps (pkpk) |
|                     |                                                       | PCIe Gen 2 Low Band, 10kHz < f < 1.5MHz (PLL BW 5-16MHz or 8-5MHz, CDR = 10MHz)             |      | 0     | 0.03  | 3                 | ps        |
|                     |                                                       | PCIe Gen 2 High Band, 1.5MHz < f < Nyquist (50MHz); (PLL BW 5-16MHz or 8-5MHz, CDR = 10MHz) |      | 0     | 0.03  | 3.1               | ps        |
|                     |                                                       | PCIe Gen 3 (PLL BW 2-4MHz or 2-5MHz, CDR = 10MHz)                                           |      | 0     | 0.03  | 1                 | ps        |
|                     |                                                       | PCIe Gen 4 (PLL BW 2-4MHz or 2-5MHz, CDR = 10MHz)                                           |      | 0     | 0.03  | 0.5               | ps        |
|                     |                                                       | PCIe Gen 5 (PLL BW of 500k to 1.8MHz, CDR = 20MHz) <sup>(4)</sup>                           |      | 0.015 | 0.03  | 0.15              | ps        |
|                     |                                                       | PCIe Gen 6 (PLL BW of 500K to 1MHz, CDR = 10MHz)                                            |      | 0.008 | 0.016 | 0.10              | ps        |
|                     |                                                       | 100MHz (12kHz to 20MHz), input jitter ~156fs <sup>(2)</sup>                                 |      | 67    | 105   | NA <sup>(5)</sup> | fs        |
|                     |                                                       | 156.25MHz (12kHz to 20MHz), input jitter ~110fs <sup>(2)</sup>                              |      | 50    | 90    | NA <sup>(5)</sup> | fs        |
|                     |                                                       | 100MHz, apply DB2000Q filter, see figure 5                                                  |      |       | 25    | 80                | fs        |

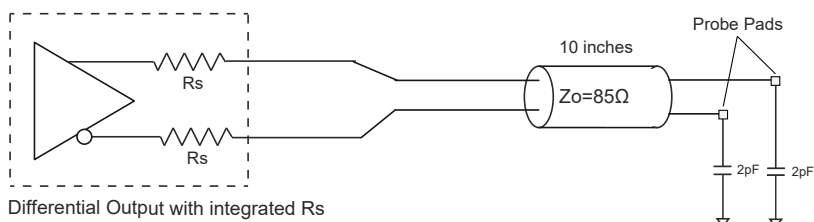
## PCIe Independent Reference Clock Architecture Jitter<sup>(3)</sup>

| Symbol              | Parameters                             | Condition                                              | Min. | Typ.  | Max.  | Spec Limit | Units |
|---------------------|----------------------------------------|--------------------------------------------------------|------|-------|-------|------------|-------|
| t <sub>JPHASE</sub> | Additive Integrated phase jitter (RMS) | PCIe Gen 3 SRIS (PLL BW 2-4MHz or 2-5MHz, CDR = 10MHz) |      | 0     | 0.03  | 0.7        | ps    |
|                     |                                        | PCIe Gen 4 SRIS (PLL BW 2-4MHz or 2-5MHz, CDR = 10MHz) |      | 0     | 0.03  | 0.7        | ps    |
|                     |                                        | PCIe Gen 4 SRNS (PLL BW 2-4MHz or 2-5MHz, CDR = 10MHz) |      | 0     | 0.03  | 0.7        | ps    |
|                     |                                        | PCIe Gen 5 SRIS (PLL BW 500K-1.8MHz, CDR = 20MHz)      |      | 0.01  | 0.02  | 0.177      | ps    |
|                     |                                        | PCIe Gen 6 SRIS (PLL BW 500K-1MHz, CDR = 10MHz)        |      | 0.008 | 0.016 | 0.106      | ps    |

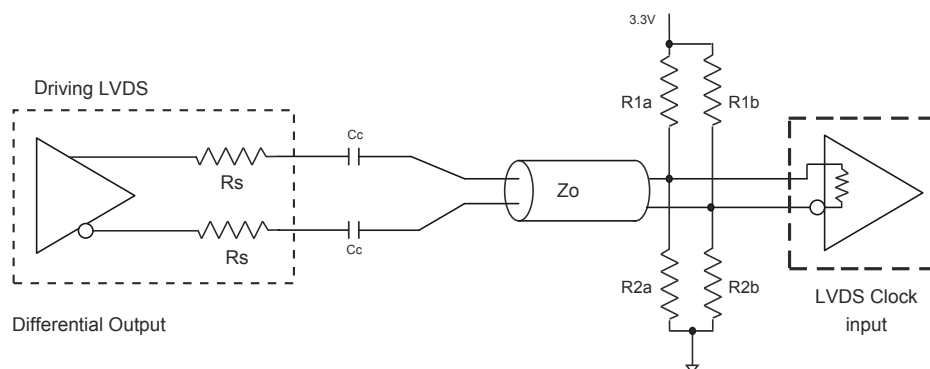
### Note:

1. Guaranteed by design and characterization, not 100% tested in production
2. Additive jitter RMS value is calculated by the following equation =  $\text{SQRT} [(\text{total jitter})^2 - (\text{input jitter})^2]$
3. See <http://www.pcisig.com> for complete specs
4. PCIe Gen 5 v0.9 specification
5. Not available

Low-Power HCSL Differential Output Test Load



**Figure 3. Low Power HCSL Test Circuit**

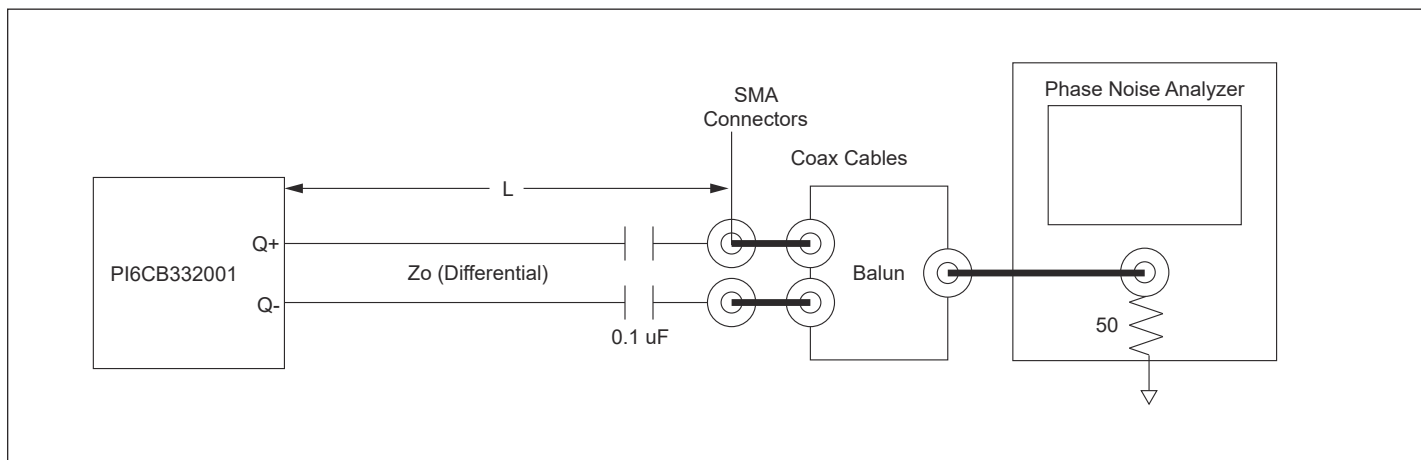


**Figure 4. Differential Output Driving LVDS**

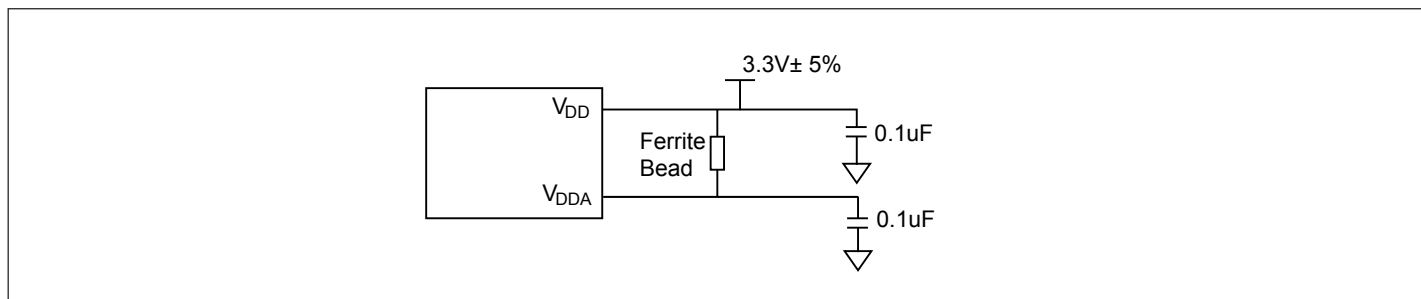
### Differential Output Terminations Driving LVDS ( $Z_O = 85\Omega$ )

| Component        | Receiver with termination | Receiver without termination | Unit     |
|------------------|---------------------------|------------------------------|----------|
| $R_{1a}, R_{1b}$ | 10,000                    | 130                          | $\Omega$ |
| $R_{2a}, R_{2b}$ | 5,600                     | 64                           | $\Omega$ |
| $C_C$            | 0.1                       | 0.1                          | $\mu F$  |
| $V_{CM}$         | 1.2                       | 1.2                          | V        |

**PI6CB332001**



**Figure 5. Test Setup for PI6CB332001 Additive Phase Jitter Measurement**



**Figure 6. Power Supply Filter**

## SMBus Serial Data Interface

PI6CB332001 is a slave only device that supports block read and block write protocol using a single 7-bit address and read/write bit as shown below.

Read and write block transfers can be stopped after any complete byte transfer.

### Address Assignment

| A6 | A5 | A4 | A3 | A2                                | A1 | A0 | R/W |
|----|----|----|----|-----------------------------------|----|----|-----|
| 1  | 1  | 0  | 1  | See SMBus Address Selection table |    |    | 1/0 |

Note: SMBus address is latched on SADR pin

### How to Write

| 1 bit     | 7 bits | 1 bit | 1 bit | 8 bits                      | 1 bit | 8 bits              | 1 bit | 8 bits                  | 1 bit |       | 8 bits            | 1 bit | 1 bit    |
|-----------|--------|-------|-------|-----------------------------|-------|---------------------|-------|-------------------------|-------|-------|-------------------|-------|----------|
| Start bit | Add.   | W(0)  | Ack   | Beginning Byte location = N | Ack   | Data Byte count = X | Ack   | Beginning Data Byte (N) | Ack   | ..... | Data Byte (N+X-1) | Ack   | Stop bit |

### How to Read

| 1 bit     | 7 bits  | 1 bit | 1 bit | 8 bits                      | 1 bit | 1 bit            | 7 bits  | 1 bit | 1 bit | 8 bits              | 1 bit | 8 bits                  | 1 bit |
|-----------|---------|-------|-------|-----------------------------|-------|------------------|---------|-------|-------|---------------------|-------|-------------------------|-------|
| Start bit | Address | W(0)  | Ack   | Beginning Byte location = N | Ack   | Repeat Start bit | Address | R(1)  | Ack   | Data Byte count = X | Ack   | Beginning Data Byte (N) | Ack   |

|       |  |  |  |  |  |  |  |  |  | 8 bits            | 1 bit | 1 bit    |
|-------|--|--|--|--|--|--|--|--|--|-------------------|-------|----------|
| ..... |  |  |  |  |  |  |  |  |  | Data Byte (N+X-1) | NAck  | Stop bit |

### Byte 0: Output Enable Register

| Bit | Control Function | Description       | Type | Power Up Condition | 0       | 1      |
|-----|------------------|-------------------|------|--------------------|---------|--------|
| 7   | Reserved         |                   |      | 0                  |         |        |
| 6   | Q19_OE           | Q19 output enable | RW   | 1                  | Low/Low | Enable |
| 5   | Q18_OE           | Q18 output enable | RW   | 1                  | Low/Low | Enable |
| 4   | Q17_OE           | Q17 output enable | RW   | 1                  | Low/Low | Enable |
| 3   | Q16_OE           | Q16 output enable | RW   | 1                  | Low/Low | Enable |
| 2   | Reserved         |                   |      | 0                  |         |        |
| 1   | Reserved         |                   |      | 0                  |         |        |
| 0   | Reserved         |                   |      | 0                  |         |        |

### Byte 1: Output Enable Register

| Bit | Control Function | Description      | Type | Power Up Condition | 0       | 1            |
|-----|------------------|------------------|------|--------------------|---------|--------------|
| 7   | Q7_OE            | Q7 output enable | RW   | 1                  | Low/Low | OE7# control |
| 6   | Q6_OE            | Q6 output enable | RW   | 1                  | Low/Low | OE6# control |
| 5   | Q5_OE            | Q5 output enable | RW   | 1                  | Low/Low | OE5# control |
| 4   | Q4_OE            | Q4 output enable | RW   | 1                  | Low/Low | Enable       |
| 3   | Q3_OE            | Q3 output enable | RW   | 1                  | Low/Low | Enable       |
| 2   | Q2_OE            | Q2 output enable | RW   | 1                  | Low/Low | Enable       |
| 1   | Q1_OE            | Q1 output enable | RW   | 1                  | Low/Low | Enable       |
| 0   | Q0_OE            | Q0 output enable | RW   | 1                  | Low/Low | Enable       |

### Byte 2: Output Enable Register

| Bit | Control Function | Description       | Type | Power Up Condition | 0       | 1             |
|-----|------------------|-------------------|------|--------------------|---------|---------------|
| 7   | Q15_OE           | Q15 output enable | RW   | 1                  | Low/Low | Enable        |
| 6   | Q14_OE           | Q14 output enable | RW   | 1                  | Low/Low | Enable        |
| 5   | Q13_OE           | Q13 output enable | RW   | 1                  | Low/Low | Enable        |
| 4   | Q12_OE           | Q12 output enable | RW   | 1                  | Low/Low | OE12# control |
| 3   | Q11_OE           | Q11 output enable | RW   | 1                  | Low/Low | OE11# control |
| 2   | Q10_OE           | Q10 output enable | RW   | 1                  | Low/Low | OE10# control |
| 1   | Q9_OE            | Q9 output enable  | RW   | 1                  | Low/Low | OE9# control  |
| 0   | Q8_OE            | Q8 output enable  | RW   | 1                  | Low/Low | OE8# control  |

### Byte 3: OE# Pin Realtime Readback Control Register

| Bit | Control Function | Description                | Type | Power Up Condition | 0           | 1            |
|-----|------------------|----------------------------|------|--------------------|-------------|--------------|
| 7   | OE12#            | Realtime Readback of OE12# | R    | Realtime           | OE12# = Low | OE12# = High |
| 6   | OE11#            | Realtime Readback of OE11# | R    | Realtime           | OE11# = Low | OE11# = High |
| 5   | OE10#            | Realtime Readback of OE10# | R    | Realtime           | OE10# = Low | OE10# = High |
| 4   | OE9#             | Realtime Readback of OE9#  | R    | Realtime           | OE9# = Low  | OE9# = High  |
| 3   | OE8#             | Realtime Readback of OE8#  | R    | Realtime           | OE8# = Low  | OE8# = High  |
| 2   | OE7#             | Realtime Readback of OE7#  | R    | Realtime           | OE7# = Low  | OE7# = High  |
| 1   | OE6#             | Realtime Readback of OE6#  | R    | Realtime           | OE6# = Low  | OE6# = High  |
| 0   | OE5#             | Realtime Readback of OE5#  | R    | Realtime           | OE5# = Low  | OE5# = High  |

### Byte 4: SBEN

| Bit | Control Function | Description      | Type | Power Up Condition | 0        | 1         |
|-----|------------------|------------------|------|--------------------|----------|-----------|
| 7:1 | Reserved         |                  |      | 0                  |          |           |
| 0   | RB_SBEN          | Readback of SBEN | R    | Realtime           | SBEN=Low | SBEN=High |

### Byte 5: Revision and Vendor ID Register

| Bit | Control Function | Description | Type | Power Up Condition | 0              | 1 |
|-----|------------------|-------------|------|--------------------|----------------|---|
| 7   | RID3             | Revision ID | R    | 0                  | rev = 0000     |   |
| 6   | RID2             |             | R    | 0                  |                |   |
| 5   | RID1             |             | R    | 0                  |                |   |
| 4   | RID0             |             | R    | 0                  |                |   |
| 3   | PVID3            | Vendor ID   | R    | 0                  | Pericom = 0011 |   |
| 2   | PVID2            |             | R    | 0                  |                |   |
| 1   | PVID1            |             | R    | 1                  |                |   |
| 0   | PVID0            |             | R    | 1                  |                |   |

### Byte 6: Device Type/Device ID Register

| Bit | Control Function | Description | Type | Power Up Condition | 0 | 1 |
|-----|------------------|-------------|------|--------------------|---|---|
| 7   | DID7             | Device ID   | R    | 0                  |   |   |
| 6   | DID6             |             | R    | 1                  |   |   |
| 5   | DID5             |             | R    | 0                  |   |   |
| 4   | DID4             |             | R    | 0                  |   |   |
| 3   | DID3             |             | R    | 1                  |   |   |
| 2   | DID2             |             | R    | 0                  |   |   |
| 1   | DID1             |             | R    | 0                  |   |   |
| 0   | DID0             |             | R    | 0                  |   |   |

### Byte 7: Byte Count Register

| Bit | Control Function | Description            | Type | Power Up Condition | 0                                                                                            | 1 |
|-----|------------------|------------------------|------|--------------------|----------------------------------------------------------------------------------------------|---|
| 7   | Reserved         |                        |      | 0                  |                                                                                              |   |
| 6   | Reserved         |                        |      | 0                  |                                                                                              |   |
| 5   | Reserved         |                        |      | 0                  |                                                                                              |   |
| 4   | BC4              | Byte count programming | RW   | 0                  | Writing to this register will configure how many bytes will be read back, default is 8 bytes |   |
| 3   | BC3              |                        | RW   | 1                  |                                                                                              |   |
| 2   | BC2              |                        | RW   | 0                  |                                                                                              |   |
| 1   | BC1              |                        | RW   | 0                  |                                                                                              |   |
| 0   | BC0              |                        | RW   | 0                  |                                                                                              |   |

### Byte 8: Side-band Mask Register only when SBEN=1

| Bit | Control Function | Description                | Type | Power Up Condition | 0                                               | 1                                                                       |
|-----|------------------|----------------------------|------|--------------------|-------------------------------------------------|-------------------------------------------------------------------------|
| 7   | Mask7            | Mask off Side-band Disable | RW   | 0                  | Side-band shift register may disable the output | Force output to be enabled regardless of side-band shift register value |
| 6   | Mask6            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 5   | Mask5            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 4   | Mask4            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 3   | Mask3            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 2   | Mask2            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 1   | Mask1            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 0   | Mask0            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |

### Byte 9: Side-band Mask Register only when SBEN=1

| Bit | Control Function | Description                | Type | Power Up Condition | 0                                               | 1                                                                       |
|-----|------------------|----------------------------|------|--------------------|-------------------------------------------------|-------------------------------------------------------------------------|
| 7   | Mask15           | Mask off Side-band Disable | RW   | 0                  | Side-band shift register may disable the output | Force output to be enabled regardless of side-band shift register value |
| 6   | Mask14           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 5   | Mask13           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 4   | Mask12           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 3   | Mask11           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 2   | Mask10           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 1   | Mask9            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 0   | Mask8            | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |

### Byte 10: Side-band Mask Register only when SBEN=1

| Bit | Control Function | Description                | Type | Power Up Condition | 0                                               | 1                                                                       |
|-----|------------------|----------------------------|------|--------------------|-------------------------------------------------|-------------------------------------------------------------------------|
| 7   | Reserved         |                            |      | 0                  |                                                 |                                                                         |
| 6   | Reserved         |                            |      | 0                  |                                                 |                                                                         |
| 5   | Reserved         |                            |      | 0                  |                                                 |                                                                         |
| 4   | Reserved         |                            |      | 0                  |                                                 |                                                                         |
| 3   | Mask19           | Mask off Side-band Disable | RW   | 0                  | Side-band shift register may disable the output | Force output to be enabled regardless of side-band shift register value |
| 2   | Mask18           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 1   | Mask17           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |
| 0   | Mask16           | Mask off Side-band Disable | RW   | 0                  |                                                 |                                                                         |

### Byte 11: Output Impedance Selection Register

| Bit | Control Function | Description                | Type | Power Up Condition | 0                  | 1 |
|-----|------------------|----------------------------|------|--------------------|--------------------|---|
| 7   | Z0_Q19           | Impedance selection of Q19 | RW   | 0                  | 00 or 11 = Nominal |   |
| 6   | Z1_Q19           |                            | RW   | 0                  | 01=-5%, 10=+5%     |   |
| 5   | Reserved         |                            |      | 0                  |                    |   |
| 4   | Z0_Q18           | Impedance selection of Q18 | RW   | 0                  | 00 or 11 = Nominal |   |
| 3   | Z1_Q18           |                            | RW   | 0                  | 01=-5%, 10=+5%     |   |
| 2   | Reserved         |                            |      | 0                  |                    |   |
| 1   | Z0_Q17           | Impedance selection of Q17 | RW   | 0                  | 00 or 11 = Nominal |   |
| 0   | Z1_Q17           |                            | RW   | 0                  | 01=-5%, 10=+5%     |   |

### Byte 12: Output Impedance Selection Register

| Bit | Control Function | Description                | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|----------------------------|------|--------------------|--------------------------------------|---|
| 7   | Reserved         |                            |      | 0                  |                                      |   |
| 6   | Z0_Q16           | Impedance selection of Q16 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 5   | Z1_Q16           |                            | RW   | 0                  |                                      |   |
| 4   | Reserved         |                            |      | 0                  |                                      |   |
| 3   | Z0_Q15           | Impedance selection of Q15 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 2   | Z1_Q15           |                            | RW   | 0                  |                                      |   |
| 1   | Reserved         |                            |      | 0                  |                                      |   |
| 0   | Reserved         |                            |      | 0                  |                                      |   |

### Byte 13: Output Impedance Selection Register

| Bit | Control Function | Description                | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|----------------------------|------|--------------------|--------------------------------------|---|
| 7   | Z0_Q14           | Impedance selection of Q14 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 6   | Z1_Q14           |                            | RW   | 0                  |                                      |   |
| 5   | Reserved         |                            |      | 0                  |                                      |   |
| 4   | Z0_Q13           | Impedance selection of Q13 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 3   | Z1_Q13           |                            | RW   | 0                  |                                      |   |
| 2   | Reserved         |                            |      | 0                  |                                      |   |
| 1   | Z0_Q12           | Impedance selection of Q12 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 0   | Z1_Q12           |                            | RW   | 0                  |                                      |   |

### Byte 14: Output Impedance Selection Register

| Bit | Control Function | Description                | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|----------------------------|------|--------------------|--------------------------------------|---|
| 7   | Reserved         |                            |      | 0                  |                                      |   |
| 6   | Z0_Q11           | Impedance selection of Q11 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 5   | Z1_Q11           |                            | RW   | 0                  |                                      |   |
| 4   | Reserved         |                            |      | 0                  |                                      |   |
| 3   | Z0_Q10           | Impedance selection of Q10 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 2   | Z1_Q10           |                            | RW   | 0                  |                                      |   |
| 1   | Reserved         |                            |      | 0                  |                                      |   |
| 0   | Reserved         |                            |      | 0                  |                                      |   |

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### Byte 15: Output Impedance Selection Register

| Bit | Control Function | Description               | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|---------------------------|------|--------------------|--------------------------------------|---|
| 7   | Z0_Q9            | Impedance selection of Q9 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 6   | Z1_Q9            |                           | RW   | 0                  |                                      |   |
| 5   | Reserved         |                           |      | 0                  |                                      |   |
| 4   | Z0_Q8            | Impedance selection of Q8 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 3   | Z1_Q8            |                           | RW   | 0                  |                                      |   |
| 2   | Reserved         |                           |      | 0                  |                                      |   |
| 1   | Z0_Q7            | Impedance selection of Q7 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 0   | Z1_Q7            |                           | RW   | 0                  |                                      |   |

### Byte 16: Output Impedance Selection Register

| Bit | Control Function | Description               | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|---------------------------|------|--------------------|--------------------------------------|---|
| 7   | Reserved         |                           |      | 0                  |                                      |   |
| 6   | Z0_Q6            | Impedance selection of Q6 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 5   | Z1_Q6            |                           | RW   | 0                  |                                      |   |
| 4   | Reserved         |                           |      | 0                  |                                      |   |
| 3   | Z0_Q5            | Impedance selection of Q5 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 2   | Z1_Q5            |                           | RW   | 0                  |                                      |   |
| 1   | Reserved         |                           |      | 0                  |                                      |   |
| 0   | Reserved         |                           |      | 0                  |                                      |   |

### Byte 17: Output Impedance Selection Register

| Bit | Control Function | Description               | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|---------------------------|------|--------------------|--------------------------------------|---|
| 7   | Z0_Q4            | Impedance selection of Q4 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 6   | Z1_Q4            |                           | RW   | 0                  |                                      |   |
| 5   | Reserved         |                           |      | 0                  |                                      |   |
| 4   | Z0_Q3            | Impedance selection of Q3 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 3   | Z1_Q3            |                           | RW   | 0                  |                                      |   |
| 2   | Reserved         |                           |      | 0                  |                                      |   |
| 1   | Z0_Q2            | Impedance selection of Q2 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 0   | Z1_Q2            |                           | RW   | 0                  |                                      |   |

### Byte 18: Output Impedance Selection Register

| Bit | Control Function | Description               | Type | Power Up Condition | 0                                    | 1 |
|-----|------------------|---------------------------|------|--------------------|--------------------------------------|---|
| 7   | Reserved         |                           |      | 0                  |                                      |   |
| 6   | Z0_Q1            | Impedance selection of Q1 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 5   | Z1_Q1            |                           | RW   | 0                  |                                      |   |
| 4   | Reserved         |                           |      | 0                  |                                      |   |
| 3   | Z0_Q0            | Impedance selection of Q0 | RW   | 0                  | 00 or 11 = Nominal<br>01=-5%, 10=+5% |   |
| 2   | Z1_Q0            |                           | RW   | 0                  |                                      |   |
| 1   | Reserved         |                           |      | 0                  |                                      |   |
| 0   | Reserved         |                           |      | 0                  |                                      |   |

### Byte 19: Reserve

### Byte 20: Stop State Configuration Register

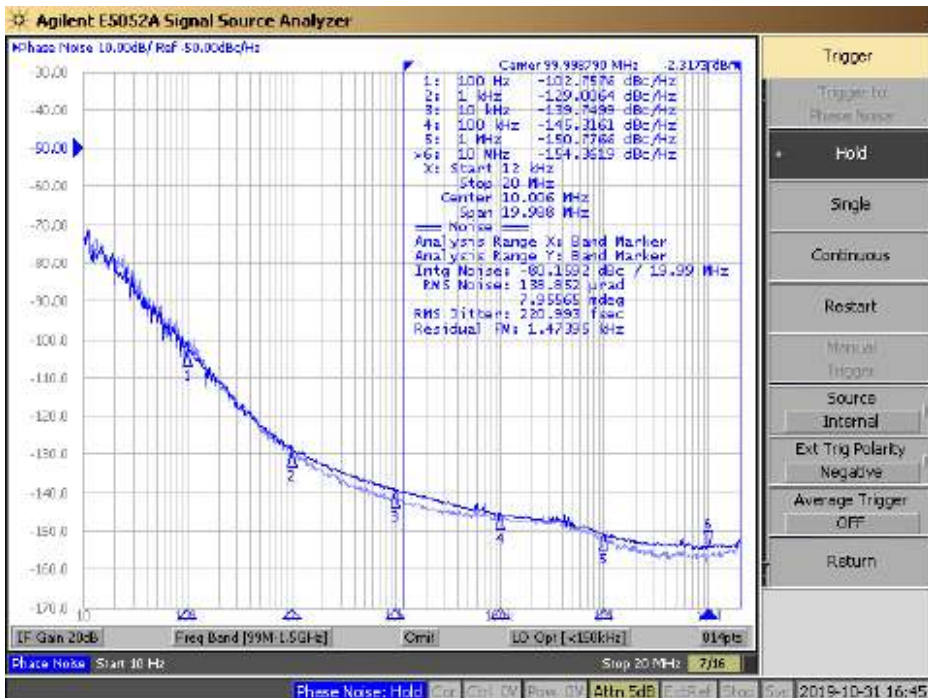
| Bit | Control Function | Description                              | Type | Power Up Condition | 0                                                  | 1 |
|-----|------------------|------------------------------------------|------|--------------------|----------------------------------------------------|---|
| 7   | VSW[2]           | Global differential output swing control | RW   | 1                  | Default=750mV<br>0.3V-1.0V<br>100mV/Step           |   |
| 6   | VSW[1]           |                                          | RW   | 0                  |                                                    |   |
| 5   | VSW[0]           |                                          | RW   | 1                  |                                                    |   |
| 4   | Reserved         |                                          |      | 0                  |                                                    |   |
| 3   | Reserved         |                                          |      | 0                  |                                                    |   |
| 2   | Reserved         |                                          |      | 1                  |                                                    |   |
| 1   | STOPST[1]        | Differential Stop Mode State             | RW   | 0                  | 00=Low/Low; 10=High/Low<br>01=HiZ/HiZ; 11=Low/High |   |
| 0   | STOPST[0]        |                                          | RW   | 0                  |                                                    |   |

### Byte 21: Power Down Restore Configuration Register

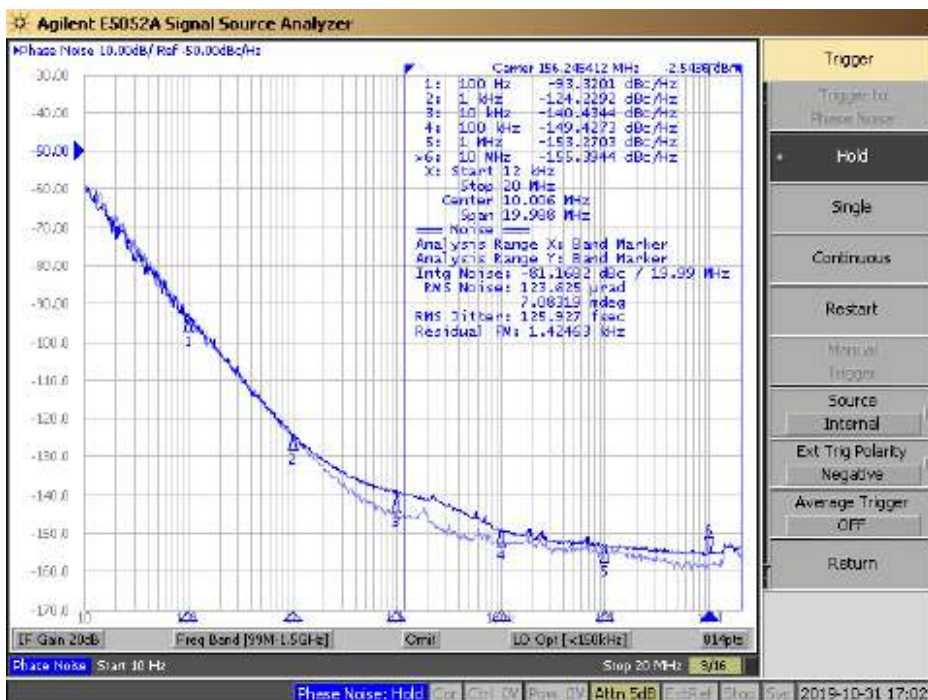
| Bit | Control Function | Description                           | Type | Power Up Condition | 0              | 1            |
|-----|------------------|---------------------------------------|------|--------------------|----------------|--------------|
| 7   | Reserved         |                                       |      | 0                  |                |              |
| 6   | Reserved         |                                       |      | 0                  |                |              |
| 5   | Reserved         |                                       |      | 0                  |                |              |
| 4   | Reserved         |                                       |      | 0                  |                |              |
| 3   | PD_RESTORE#      | Save configuration in power down mode | RW   | 1                  | Config cleared | Config saved |
| 2   | Reserved         |                                       |      | 0                  |                |              |
| 1   | Reserved         |                                       |      | 0                  |                |              |
| 0   | Reserved         |                                       |      | 0                  |                |              |

## Phase Noise Plots

100MHz input phase noise vs output phase noise. Additive jitter<sup>1</sup> 67fs.



156.25MHz input phase noise vs output phase noise. Additive jitter<sup>1</sup> 51fs.



Note:

1. Additive jitter RMS value is calculated by the following equation =  $\sqrt{[(\text{total jitter})^2 - (\text{input jitter})^2]}$

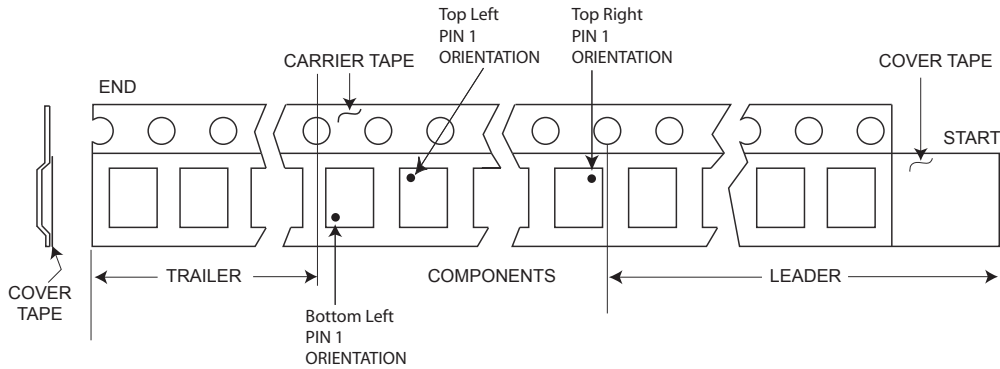
PI6CB332001

### Part Marking



Device/Pkg Type  
Z: Die Rev  
YY: Year  
WW: Work Week  
1st X: Assembly Code  
2nd X: Fab Code

### Package Information

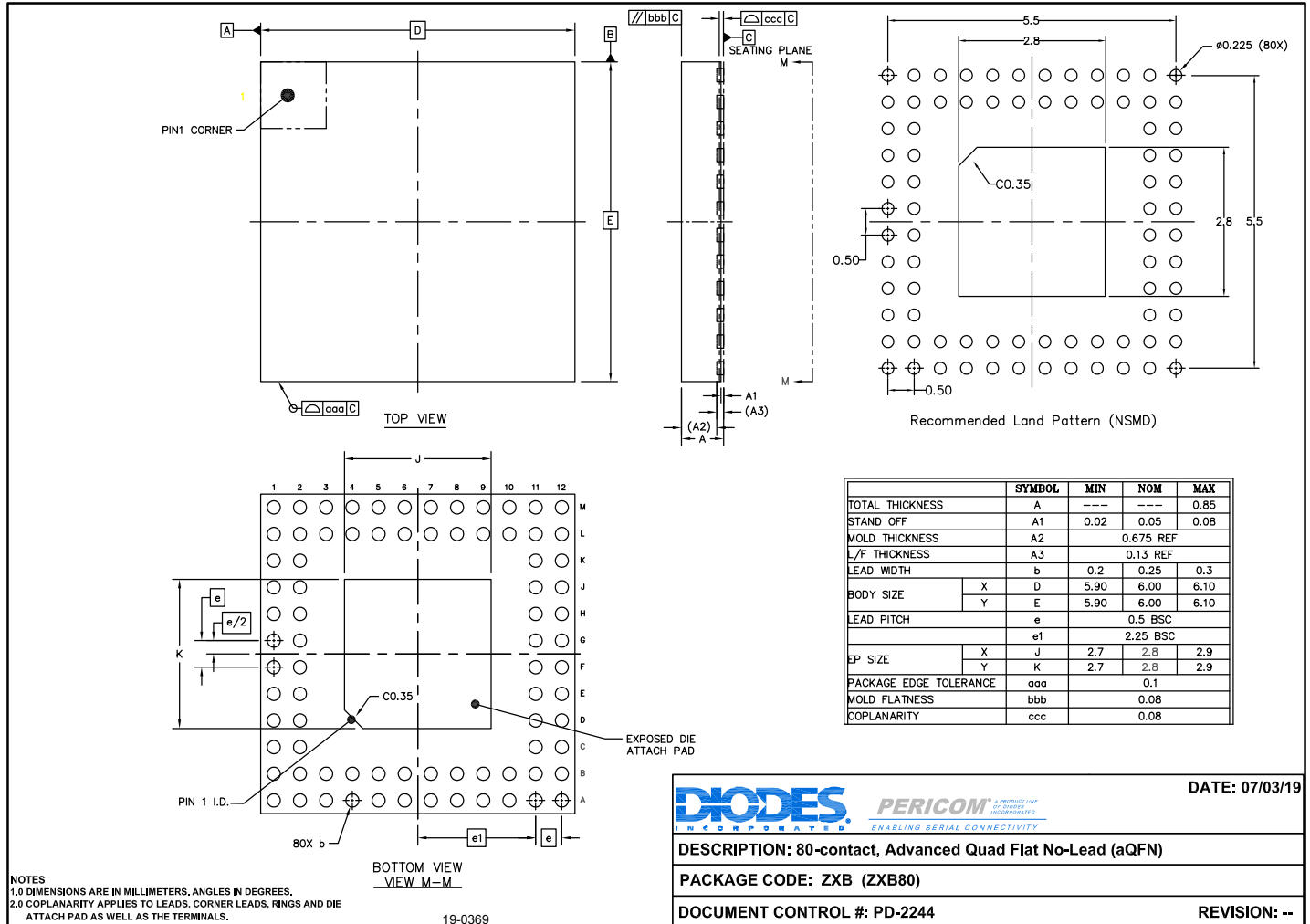


| Suffix | Tape Orientation |
|--------|------------------|
| -13R   |                  |
| -13RA  |                  |

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## Packaging Mechanical

### 80-aQFN (ZXB)



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 Description    | Pin 1 Location   | Tape Pitch |
|-----------------------|--------------|------------------------|------------------|------------|
| PI6CB332001ZXBIE      | ZXB          | 80-contact, aQFN 6x6mm | Top Right Corner | 12mm       |
| PI6CB332001ZXBIE-13R  | ZXB          | 80-contact, aQFN 6x6mm | Top Left Corner  | 12mm       |
| PI6CB332001ZXBIE-13RA | ZXB          | 80-contact, aQFN 6x6mm | Top Left Corner  | 8mm        |

### 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. I = Industrial
5. E = Pb-free and Green
6. X suffix = Tape/Reel
7. For packaging detail, go to our website at: <https://www.diodes.com/assets/MediaList-Attachments/Diodes-Package-Information.pdf>

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