

### **Q28-100GP4-BXD3327-10-CX-OPC**

Calix® Compatible TAA 100GBase-BX QSFP28 Single Lambda Transceiver (SMF, 1331nmTx/1271nmRx, 10km, LC, DOM, with FEC)

#### **Features**

- Compliant with QSFP28 MSA
- Compliant with SFF-8636 Rev 2.10a
- Supports 100Gbps
- Single 3.3V Power Supply
- 4x25G Electrical Interface Compliant with OIF CEI-28G-VSR
- Bidi LC Connectors
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- RoHS Compliant and Lead Free



#### **Applications:**

- 100GBase Ethernet
- Datacenter

#### **Product Description**

This Calix® compatible QSFP28 transceiver provides 100GBase-BX throughput up to 10km over single-mode fiber (SMF) using wavelengths of 1331nmTx/1271nmRx via an LC connector. It is guaranteed to be 100% compatible with the equivalent Calix® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4.
- ESD to the LC Receptacle: compatible with IEC 61000-4-3.
- EMI/EMC: compatible with FCC Part 15 Subpart B Rules, EN55022:2010.
- Laser Eye Safety: compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1, 2.
- RoHS: compliant with EU RoHS 2.0 directive 2015/863/EU.

## Absolute Maximum Ratings

| Parameter                  | Symbol            | Min. | Typ. | Max. | Unit | Notes |
|----------------------------|-------------------|------|------|------|------|-------|
| Maximum Supply Voltage     | V <sub>CC</sub>   | -0.5 |      | 3.6  | V    |       |
| Storage Temperature        | T <sub>stg</sub>  | -40  |      | 85   | °C   |       |
| Operating Case Temperature | T <sub>c</sub>    | 0    |      | 70   | °C   |       |
| Relative Humidity          | RH                | 5    |      | 85   | %    |       |
| Damage Threshold           | RX <sub>dmg</sub> | 5.5  |      |      | dBm  |       |

## Electrical Characteristics

| Parameter                                 | Symbol                         | Min.  | Typ. | Max.  | Unit  | Notes                   |
|-------------------------------------------|--------------------------------|-------|------|-------|-------|-------------------------|
| Power Supply Voltage                      | V <sub>CC</sub>                | 3.135 | 3.3  | 3.465 | V     |                         |
| Power Dissipation                         | P <sub>DISS</sub>              |       |      | 4.5   | W     |                         |
| Transmitter                               |                                |       |      |       |       |                         |
| Differential Data Input Swing Per Lane    |                                | 900   |      |       | mVp-p |                         |
| Differential Input Impedance              | Z <sub>IN</sub>                | 90    | 100  | 110   | Ω     |                         |
| DC Common-Mode Voltage (V <sub>cm</sub> ) |                                | -350  |      | 2850  | mV    |                         |
| Receiver                                  |                                |       |      |       |       |                         |
| Differential Output Amplitude             |                                |       |      | 900   | mVp-p |                         |
| Differential Output Impedance             | Z <sub>OUT</sub>               | 90    | 100  | 110   | Ω     |                         |
| Output Rise/Fall Time                     | T <sub>r</sub> /T <sub>f</sub> | 12    |      |       | ps    | 20-80%                  |
| Eye Width                                 |                                | 0.57  |      |       | UI    |                         |
| Eye Height Differential                   |                                | 228   |      |       | mV    | @TP4, 1E <sup>-15</sup> |
| DC Common-Mode Voltage (V <sub>cm</sub> ) |                                | -350  |      | 2850  | mV    | 1                       |

## Notes:

1. V<sub>cm</sub> is generated by the host. Specification includes effects of ground offset voltage.

## Optical Characteristics

| Parameter                                        | Symbol      | Min.   | Typ.   | Max.                 | Unit  | Notes |
|--------------------------------------------------|-------------|--------|--------|----------------------|-------|-------|
| <b>Transmitter</b>                               |             |        |        |                      |       |       |
| Signaling Speed                                  |             |        | 53.125 |                      | GBd   |       |
| Modulation Format                                |             | PAM4   |        |                      |       |       |
| Center Wavelength                                | $\lambda_C$ | 1324.5 | 1331   | 1337.5               | Nm    |       |
| Side-Mode Suppression Ratio                      | SMSR        | 30     |        |                      | dB    |       |
| Extinction Ratio                                 | ER          | 3.5    |        |                      | dB    |       |
| Transmit OMA                                     | TxOMA       | 0.7    |        | 4.7                  | dBm   |       |
| Transmit Average Power                           | TxAVG       | -1.4   |        | 4.5                  | dBm   | 1     |
| Launch Power in OMA <sub>outer</sub> Minus TDECQ |             | -0.7   |        |                      | dBm   | 2     |
| Launch Power in OMA <sub>outer</sub> Minus TDECQ |             | -0.6   |        |                      | dBm   | 3     |
| Transmitter and Dispersion Eye Closure           | TDECQ       |        |        | 3.4                  | dB    |       |
| Launch Power of Off Transmitter Per Lane         |             |        |        | -30                  | dBm   |       |
| Relative Intensity Noise                         | RIN         |        |        | -136                 | dB/Hz |       |
| Optical Return Loss Tolerance                    |             |        |        | 15.6                 | dB    | 4     |
| Transmitter Reflectance                          |             |        |        | -26                  | dB    |       |
| <b>Receiver</b>                                  |             |        |        |                      |       |       |
| Signaling Speed                                  |             |        | 53.125 |                      | GBd   |       |
| Center Wavelength                                | $\lambda_C$ | 1264.5 | 1271   | 1277.5               | Nm    |       |
| Damage Threshold                                 |             | 5.5    |        |                      | dBm   |       |
| Receive Power (OMA <sub>outer</sub> )            | RxOMA       |        |        | 4.7                  | dBm   |       |
| Average Receive Power                            | RxAVG       | -7.7   |        | 4.5                  | dBm   |       |
| Receiver Sensitivity (OMA <sub>outer</sub> )     | SenOMA      |        |        | MAX (-6.1, SECQ-7.5) | dBm   | 5     |
| Stressed Sensitivity                             | SRS         |        |        | -4.1                 | dBm   |       |
| Receiver Reflectance                             |             |        |        | -26                  | dB    |       |
| LOS Assert                                       | LOSA        | -26    |        | -12                  | dBm   |       |
| LOS De-Assert                                    | LOSD        |        |        | -10                  | dBm   |       |

### Notes:

1. Average launch power (minimum) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. For ER $\geq$ 4.5dB.
3. For ER<4.5dB.
4. Transmitter reflectance is defined looking into the transmitter.
5. Sensitivity is specified at  $2.4 \times 10^{-4}$  BER.

## Pin Descriptions

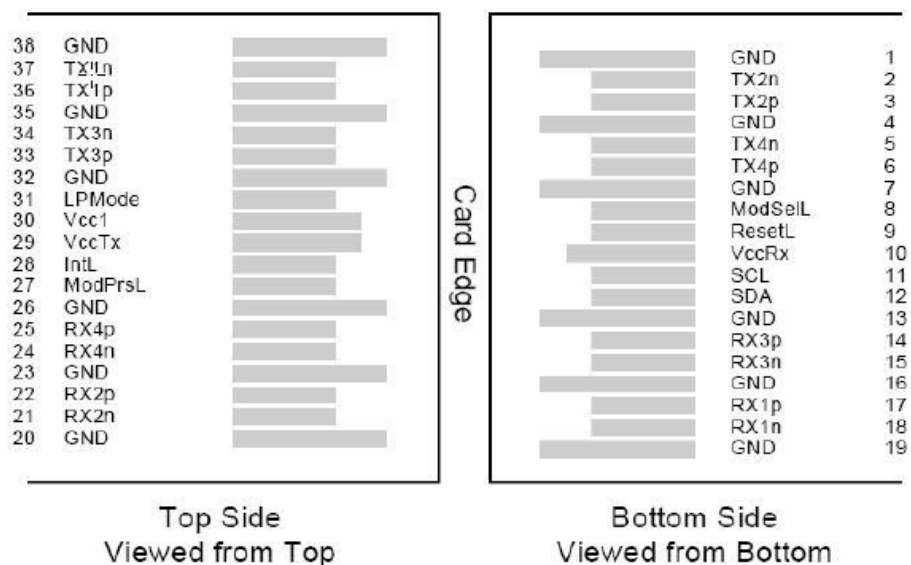
| Pin | Logic       | Symbol  | Name/Descriptions                     | Notes |
|-----|-------------|---------|---------------------------------------|-------|
| 1   |             | GND     | Module Ground.                        | 1     |
| 2   | CML-I       | Tx2-    | Transmitter Inverted Data Input.      |       |
| 3   | CML-I       | Tx2+    | Transmitter Non-Inverted Data Output. |       |
| 4   |             | GND     | Module Ground.                        | 1     |
| 5   | CML-I       | Tx4-    | Transmitter Inverted Data Input.      |       |
| 6   | CML-I       | Tx4+    | Transmitter Non-Inverted Data Output. |       |
| 7   |             | GND     | Module Ground.                        | 1     |
| 8   | LVTLL-I     | ModSelL | Module Select.                        |       |
| 9   | LVTLL-I     | ResetL  | Module Reset.                         |       |
| 10  |             | VccRx   | +3.3V Receiver Power Supply.          | 2     |
| 11  | LVC MOS-I/O | SCL     | 2-Wire Serial Interface Clock.        |       |
| 12  | LVC MOS-I/O | SDA     | 2-Wire Serial Interface Data.         |       |
| 13  |             | GND     | Module Ground.                        |       |
| 14  | CML-O       | Rx3+    | Receiver Non-Inverted Data Output.    |       |
| 15  | CML-O       | Rx3-    | Receiver Inverted Data Output.        |       |
| 16  |             | GND     | Module Ground.                        | 1     |
| 17  | CML-O       | Rx1+    | Receiver Non-Inverted Data Output.    |       |
| 18  | CML-O       | Rx1-    | Receiver Inverted Data Output.        |       |
| 19  |             | GND     | Module Ground.                        | 1     |
| 20  |             | GND     | Module Ground.                        | 1     |
| 21  | CML-O       | Rx2-    | Receiver Inverted Data Output.        |       |
| 22  | CML-O       | Rx2+    | Receiver Non-Inverted Data Output.    |       |
| 23  |             | GND     | Module Ground.                        | 1     |
| 24  | CML-O       | Rx4-    | Receiver Inverted Data Output.        | 1     |
| 25  | CML-O       | Rx4+    | Receiver Non-Inverted Data Output.    |       |
| 26  |             | GND     | Module Ground.                        | 1     |
| 27  | LVTTL-O     | ModPrsL | Module Present.                       |       |
| 28  | LVTTL-O     | IntL    | Interrupt.                            |       |
| 29  |             | VccTx   | +3.3V Transmitter Power Supply.       | 2     |
| 30  |             | Vcc1    | +3.3V Power Supply.                   | 2     |
| 31  | LVTTL-I     | LPMode  | Low-Power Mode.                       |       |
| 32  |             | GND     | Module Ground.                        | 1     |
| 33  | CML-I       | Tx3+    | Transmitter Non-Inverted Data Input.  |       |
| 34  | CML-I       | Tx3-    | Transmitter Inverted Data Output.     |       |
| 35  |             | GND     | Module Ground.                        | 1     |

|    |       |      |                                      |   |
|----|-------|------|--------------------------------------|---|
| 36 | CML-I | Tx1+ | Transmitter Non-Inverted Data Input. |   |
| 37 | CML-I | Tx1- | Transmitter Inverted Data Output.    |   |
| 38 |       | GND  | Module Ground.                       | 1 |

#### Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module, and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, Vcc1, and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. Recommended host board power supply filtering is shown below. VccRx, Vcc1, and VccTx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

#### Electrical Pin-Out Details



Mechanical Specifications

