

### **Q28-100GP4-BXD94-40-I-OPC**

MSA and TAA 100GBase-BX ER1 PAM4 QSFP28 Transceiver Single Lambda (SMF, 1309.14nmTx/1304.58nmRx, 40km, LC, DOM, -40 to 85C)

#### **Features**

- SFF-8636 Rev. 2.10a Compliant
- QSFP28 MSA Compliant
- 100G Lambda MSA 100G-ER1 Specification Compliant
- Supports 100Gbps with 4x25G Electrical Interface
- Bidi LC Receptacles
- Industrial Temperature -40 to 85 Celsius
- Single 3.3V Power Supply
- Power Dissipation:
- SMF with Inbuild KP4 FEC
- RoHS Compliant and Lead Free



#### **Applications:**

- 100GBase Ethernet
- Datacenter

#### **Product Description**

This MSA compliant QSFP28 transceiver provides 100GBase-BX ER1 throughput up to 40km over single-mode fiber (SMF) PAM4 using a wavelength of 1309.14nmTx/1304.58nmRx via an LC connector. This bidirectional unit must be used with another transceiver or network appliance of complementing wavelengths. It can operate at temperatures between -40 and 85C. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

## Absolute Maximum Ratings

| Parameter                                       | Symbol | Min. | Typ.            | Max.               | Unit | Notes |
|-------------------------------------------------|--------|------|-----------------|--------------------|------|-------|
| Storage Temperature                             | Tstg   | -40  |                 | 85                 | °C   |       |
| Operating Case Temperature                      | Tc     | -40  |                 | 85                 | °C   |       |
| Relative Humidity                               | RH     | 15   |                 | 85                 | %    |       |
| Supply Voltage                                  | Vcc    | -0.5 |                 | 3.6                | V    |       |
| Data Rate                                       | DR     |      | 53.125 ± 100ppm |                    |      |       |
| Bit Error Rate                                  | BER    |      |                 | 2.4E <sup>-4</sup> |      | 1     |
| Supported Link Length on 9/125µm SMF @53.125GBd | L      |      |                 | 40                 | km   | 2     |

## Notes:

1. Tested with a PRBS31Q test pattern for 53.125GBd operation.
2. Distance is based on FC-P1-6 Rev. 3.1 and IEEE 802.3 standards with FEC.

## Electrical Characteristics

| Parameter                     | Symbol            | Min. | Typ. | Max. | Unit  | Notes |
|-------------------------------|-------------------|------|------|------|-------|-------|
| Power Supply Voltage          | Vcc               | 3.13 | 3.3  | 3.47 | V     |       |
| Power Supply Current          | Icc               |      |      | 1435 | mA    |       |
| Power Dissipation             | P <sub>DISS</sub> |      |      | 4500 | mW    |       |
| Transmitter                   |                   |      |      |      |       |       |
| Input Differential Impedance  | ZIN               | 90   | 100  | 110  | Ω     |       |
| Differential Data Input Swing | VIN,pp            | 180  |      | 900  | mVp-p |       |
| Receiver                      |                   |      |      |      |       |       |
| Output Differential Impedance | ZOUT              | 90   | 100  | 110  | Ω     |       |
| Differential Data Input Swing | VOUT,pp           | 300  |      | 900  | mVp-p |       |

## Optical Characteristics

| Parameter                                               | Symbol      | Min.      | Typ.    | Max.       | Unit  | Notes |
|---------------------------------------------------------|-------------|-----------|---------|------------|-------|-------|
| Transmitter                                             |             |           |         |            |       |       |
| Center Wavelength Range                                 | $\lambda_C$ | 1308.09   | 1309.14 | 1310.19    | nm    |       |
| Average Launch Optical Power                            | Po          | 1.7       |         | 7.1        | dBm   | 1     |
| Launch Optical Power (OMA)                              | POMA        | 4.7       |         | 7.9        | dBm   | 2     |
|                                                         |             | 3.3+TDECQ |         |            |       | 3     |
| Extinction Ratio                                        | ER          | 5         |         |            | dB    |       |
| Transmitter and Dispersion Penalty Eye Closure for PAM4 | TDECQ       |           |         | 3.9        | dB    |       |
| RIN <sub>15</sub> OMA (Maximum)                         | RIN         |           |         | -136       | dB/Hz |       |
| Optical Return Loss Tolerance                           | ORLT        |           |         | 15         | dB    |       |
| POUT @Tx_Disable Asserted                               | Poff        |           |         | -15        | dBm   |       |
| Receiver                                                |             |           |         |            |       |       |
| Center Wavelength                                       | $\lambda_C$ | 1303.54   | 1304.58 | 1305.63    | nm    |       |
| Receiver Power (Pave)                                   |             | -16       |         | -3.4       | dBm   |       |
| Receiver Sensitivity (OMA)                              | RxSENS_OMA  |           |         | -13.8      | dBm   |       |
|                                                         |             |           |         | -15.2+TECQ | dBm   | 2     |
| Receiver Sensitivity (Pave)                             | RxSENS_Pave |           |         | -14        | dBm   | 4     |
|                                                         |             |           |         | -15.4+TECQ | dBm   |       |
| Receiver Reflectance                                    |             |           |         | -26        | dB    |       |
| LOS De-Assert                                           | LOSD        |           |         | -16        | dBm   |       |
| LOS Assert                                              | LOSA        | -24       |         |            | dBm   |       |
| LOS Hysteresis                                          |             | 0.5       |         |            | dB    |       |

### Notes:

1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. TDECQ < 1.4dB.
3.  $1.4\text{dB} \leq \text{TDECQ} \leq \text{TDECQ (maximum)}$ .
4.  $1.4\text{dB} \leq \text{TDECQ} \leq 3.9\text{dB}$ .
5. Measured with PRBS31Q test pattern @53.125GBd with BER<2.4E<sup>-4</sup>.

## Pin Descriptions

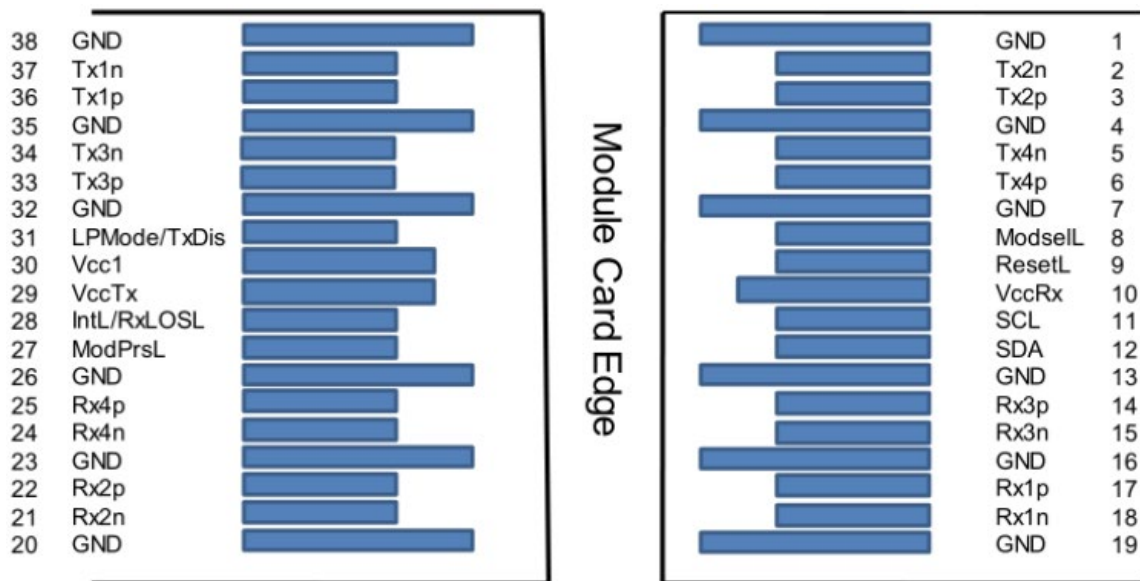
| Pin | Logic | Symbol       | Name/Description                                                                          | Notes |
|-----|-------|--------------|-------------------------------------------------------------------------------------------|-------|
| 1   |       | GND          | Module Ground.                                                                            | 1     |
| 2   | CML-I | Tx2-         | Transmitter Inverted Data Input.                                                          |       |
| 3   | CML-I | Tx2+         | Transmitter Non-Inverted Data Input.                                                      |       |
| 4   |       | GND          | Module Ground.                                                                            | 1     |
| 5   | CML-I | Tx4-         | Transmitter Inverted Data Input.                                                          |       |
| 6   | CML-I | Tx4+         | Transmitter Non-Inverted Data Input.                                                      |       |
| 7   |       | GND          | Module Ground.                                                                            | 1     |
| 8   |       | ModSelL      | Module Select.                                                                            | 2     |
| 9   |       | ResetL       | Module Reset.                                                                             | 2     |
| 10  |       | VccRx        | +3.3V Receiver Power Supply.                                                              |       |
| 11  |       | SCL          | 2-Wire Serial Interface Clock.                                                            | 2     |
| 12  |       | SDA          | 2-Wire Serial Interface Data.                                                             | 2     |
| 13  |       | GND          | Module Ground.                                                                            | 1     |
| 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 Non-Inverted Data Output.                                                        |       |
| 22  | CML-O | Rx2+         | Receiver Inverted Data Output.                                                            |       |
| 23  |       | GND          | Module Ground.                                                                            | 1     |
| 24  | CML-O | Rx4-         | Receiver Inverted Data Output.                                                            |       |
| 25  | CML-O | Rx4+         | Receiver Non-Inverted Data Output.                                                        |       |
| 26  |       | GND          | Module Ground.                                                                            | 1     |
| 27  |       | ModPrsL      | Module Present.                                                                           |       |
| 28  |       | IntL/RxLOSL  | Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636).     | 2     |
| 29  |       | VccTx        | +3.3V Transmitter Power Supply.                                                           |       |
| 30  |       | Vcc1         | +3.3V Power Supply.                                                                       |       |
| 31  |       | LPMode/TxDis | Low Power Mode. Optionally configurable as TxDis via the management interface (SFF-8636). | 2     |
| 32  |       | GND          | Module Ground.                                                                            | 1     |
| 33  | CML-I | Tx3+         | Transmitter Non-Inverted Data Input.                                                      |       |

|    |       |      |                                      |   |
|----|-------|------|--------------------------------------|---|
| 34 | CML-I | Tx3- | Transmitter Inverted Data Input.     |   |
| 35 |       | GND  | Module Ground.                       | 1 |
| 36 | CML-I | Tx1+ | Transmitter Non-Inverted Data Input. |   |
| 37 | CML-I | Tx1- | Transmitter Inverted Data Input.     |   |
| 38 |       | GND  | Module Ground.                       | 1 |

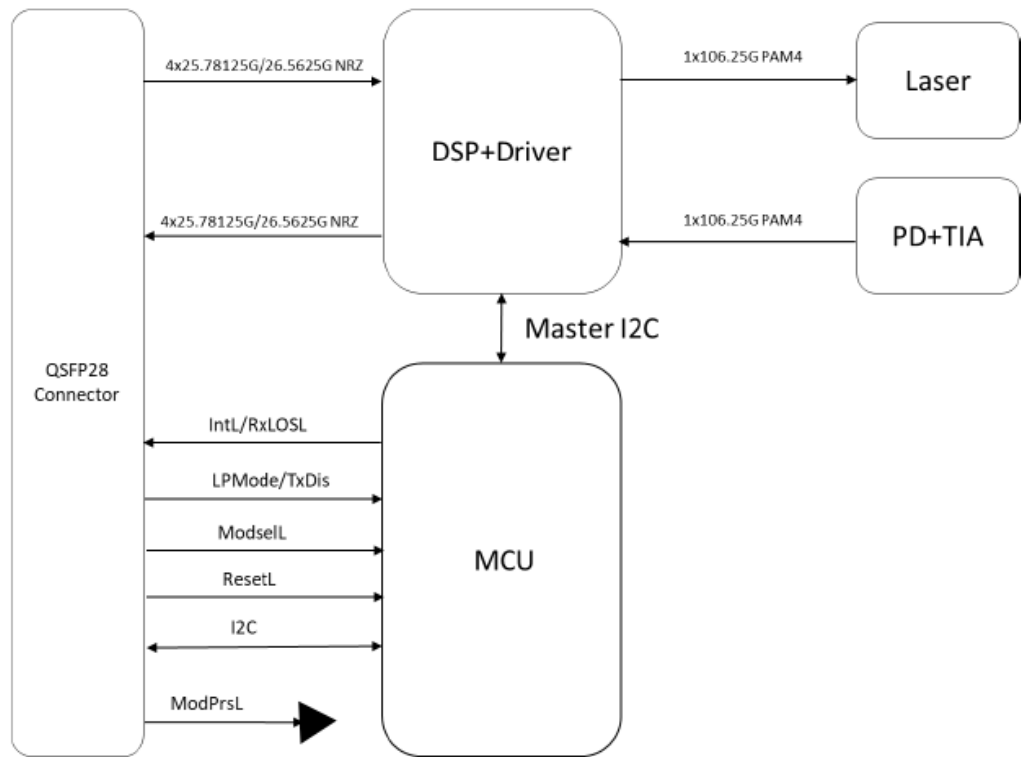
#### Notes:

1. GND is the symbol for signal and supply (power) common for the module. All are common within the 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 applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8662 and SFF-8672 each have a steady state current rating of 1A.

#### Module Pad Layout



Block Diagram of Transceiver



Mechanical Specifications

