

QSFP28 100GBASE-LR4 1310nm 10km Transceiver

QSFP28-LR4-LL



Application

- 100GBASE-LR4 100G Ethernet

Features

- Hot Pluggable QSFP28 form factor
- Supports 103.1Gb/s aggregate bit rate
- Compliant with IEEE 802.3ba 100GBASE-LR4
- Maximum link length of 10km on Single Mode Fiber (SMF)
- Single 3.3V power supply
- Maximum power consumption 3.5W
- LAN WDM DML laser and PIN Receiver Array
- QSFP28 MSA package with duplex LC connector
- Commercial operating case temperature range: 0° C to 70° C
- RoHS-6 compliant
- Class 1 Laser

Product Specifications

I. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|--------------------------------------|----------|------|------|-----|------|------|
| Storage Temperature | T_S | -40 | | 85 | °C | |
| Operating Case Temperature | T_{OP} | 0 | | 70 | °C | |
| Power Supply Voltage | V_{CC} | -0.5 | | 3.6 | V | |
| Relative Humidity (non-condensation) | RH | 0 | | 85 | % | |
| Damage Threshold, each Lane | TH_d | 5.5 | | | dBm | |

II. Recommended Operating Environment

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|----------------------------|----------|-------|------|----------|------|------|
| Operating Case Temperature | T_{OP} | 0 | | 70 | °C | |
| Power Supply Voltage | V_{CC} | 3.135 | 3.3 | 3.465 | V | |
| Data Rate, each Lane | | 25.78 | | 27.95 | Gb/s | |
| Control Input Voltage High | | 2 | | V_{CC} | V | |
| Control Input Voltage Low | | 0 | | 0.8 | V | |
| Link Distance with G.652 | D | 2 | | 10000 | m | |

III. Electrical Characteristics (Defined over the Recommended Operating Environment)

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|----------------------------------|-------------|-----|------|------|------|------|
| Power Consumption | | | | 3.5 | W | |
| Supply Current | I_{CC} | | | 1.12 | A | |
| Transmitter (each Lane) | | | | | | |
| Differential Input Voltage Swing | $V_{in,pp}$ | | | 900 | mVpp | |
| Differential Input Impedance | Z_{in} | 90 | 100 | 110 | Ohm | |

Receiver (each Lane)

| | | | | | | |
|--|--------------|-----|------|------|-----|---|
| Differential Output Voltage Swing | $V_{out,pp}$ | 100 | 400 | | | |
| | | 300 | 600 | | | |
| | | 400 | 800 | mVpp | | 1 |
| | | 600 | 1200 | | | |
| Differential Output Impedance | Z_{out} | 90 | 100 | 110 | Ohm | |

Notes:

1. Output voltage is settable in 4 discrete ranges via I2C. Default range is 400 – 800 mV.

IV. Electrical Characteristics (Defined over the Recommended Operating Environment)

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|--|---------------|---------|----------|---------|-------|------|
| Signaling Speed per Channel | | | 25.78125 | | Gbps | |
| Lane Wavelength | L0 | 1294.53 | / | 1296.59 | nm | |
| | L1 | 1299.02 | / | 1301.09 | nm | |
| | L2 | 1303.54 | / | 1305.63 | nm | |
| | L3 | 1308.09 | / | 1310.19 | nm | |
| Transmitter | | | | | | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Total Average Launch Power | P_T | | | 10.5 | dBm | |
| Average Launch Power, each Lane | P_{AVG} | -4.3 | | 4.5 | dBm | |
| OMA, each Lane | P_{OMA} | -1.3 | | 4.5 | dBm | |
| Difference in Launch Power between any Two Lanes (OMA) | $P_{tx,diff}$ | | | 5 | dB | |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane | | -2.3 | | | dBm | |
| TDP, each Lane | TDP | | | 2.2 | dB | |
| Extinction Ratio | ER | 4 | | | dB | |
| RIN₂₀OMA | RIN | | | -130 | dB/Hz | |

| | | | | | | |
|--|---------------|---------|------------------------------------|---------|------|---|
| Optical Return Loss Tolerance | TOL | | 25.78125 | | Gbps | |
| Transmitter Reflectance | R_T | | | -12 | dB | |
| Eye Mask {X1, X2, X3, Y1, Y2, Y3} | | | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} | | | 1 |
| Average Launch Power OFF Transmitter, each Lane | P_{off} | | | -30 | dBm | |
| Receiver | | | | | | |
| Signaling Speed per Channel | | | 25.78125 | | Gbps | |
| Lane Wavelength | L0 | 1294.53 | / | 1296.59 | nm | |
| | L1 | 1299.02 | / | 1301.09 | nm | |
| | L2 | 1303.54 | / | 1305.63 | nm | |
| | L3 | 1308.09 | / | 1310.19 | nm | |
| Total Average Receive Power | | | | 10.5 | dBm | |
| Average Receive Power, each Lane | | -10.6 | | 4.5 | dBm | |
| Receive Power (OMA), each Lane | | | | 4.5 | dBm | |
| Receiver Sensitivity (OMA), each Lane | SEN | | | -8.6 | dBm | 2 |
| Stressed Receiver Sensitivity (OMA), each Lane | | | | -6.8 | dBm | |
| Difference in Receive Power between any Two Lanes (OMA) | $P_{rx,diff}$ | | | 5.5 | dB | |
| LOS Assert | LOSA | -25 | | | dBm | |
| LOS De-assert | LOSD | | | -13 | dBm | |
| LOS Hysteresis | LOSH | 0.5 | | 6 | dB | |

Notes:

1. Compliant to IEEE 802.3ba.
2. Measured with conformance test signal at receiver input for BER = 1×10^{-12} .

V. Digital Diagnostic Functions (Defined over the Recommended Operating Environment)

| Parameter | Symbol | Min | Typ. | Max | Unit | Ref. |
|--|--------------|------|------|-----|------|----------------------------------|
| Temperature Monitor Absolute Error | DMI_Temp | -3 | | 3 | °C | Over operating temperature range |
| Supply Voltage Monitor Absolute Error | DMI_VCC | -3% | | +3% | V | Over full operating range |
| Channel RX Power Monitor Absolute Error | DMI_RX_Ch | -2 | | 2 | dB | |
| Channel Bias Current Monitor | DMI_Ibias_Ch | -10% | | 10% | mA | Ch1~Ch4 |
| Channel TX Power Monitor Absolute Error | DMI_TX_Ch | -2 | | 2 | dB | |

VI. Pin Description

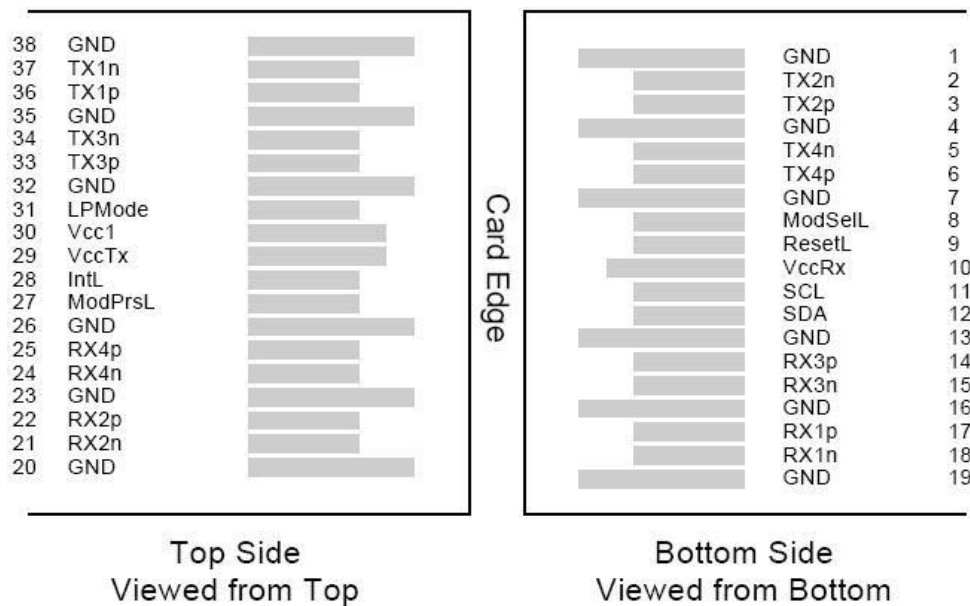


Figure 1 – QSFP+ MSA-Compliant 38-Pin Connector

| Pin | Symbol | Name/Description | Ref. |
|-----|---------|-------------------------------------|------|
| 1 | GND | Ground | 1 |
| 2 | Tx2n | Transmitter Inverted Data Input | |
| 3 | Tx2p | Transmitter Non-Inverted Data Input | |
| 4 | GND | Ground | 1 |
| 5 | Tx4n | Transmitter Inverted Data Input | |
| 6 | Tx4p | Transmitter Non-Inverted Data Input | |
| 7 | GND | Ground | 1 |
| 8 | ModSelL | Module Select | |
| 9 | ResetL | Module Reset | |
| 10 | VccRx | +3.3 V Power Supply Receiver | 2 |
| 11 | SCL | 2-Wire Serial Interface Clock | |
| 12 | SDA | 2-Wire Serial Interface Data | |
| 13 | GND | Ground | |
| 14 | Rx3p | Receiver Non-Inverted Data Output | |
| 15 | Rx3n | Receiver Inverted Data Output | |
| 16 | GND | Ground | 1 |
| 17 | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | Rx1n | Receiver Inverted Data Output | |
| 19 | GND | Ground | 1 |
| 20 | GND | Ground | 1 |
| 21 | Rx2n | Receiver Inverted Data Output | |
| 22 | Rx2p | Receiver Non-Inverted Data Output | |
| 23 | GND | Ground | 1 |
| 24 | Rx4n | Receiver Inverted Data Output | |
| 25 | Rx4p | Receiver Non-Inverted Data Output | |
| 26 | GND | Ground | 1 |
| 27 | ModPrsL | Module Present | |

| | | | |
|----|--------|-------------------------------------|---|
| 28 | IntL | Interrupt | |
| 29 | VccTx | +3.3 V Power Supply Transmitter | 2 |
| 30 | Vcc1 | +3.3 V Power Supply | 2 |
| 31 | LPMode | Low Power Mode | |
| 32 | GND | Ground | 1 |
| 33 | Tx3p | Transmitter Non-Inverted Data Input | |
| 34 | Tx3n | Transmitter Inverted Data Input | |
| 35 | GND | Ground | 1 |
| 36 | Tx1p | Transmitter Non-Inverted Data Input | |
| 37 | Tx1n | Transmitter Inverted Data Input | |
| 38 | GND | Ground | 1 |

Notes:

- 1.GND is the symbol for signal and supply (power) common for QSFP28 modules. 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 suppliers and shall be applied concurrently. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

VII. Mechanical Specifications

The mechanical specifications are compliant to the QSFP+ MSA transceiver module specifications.

