

LWO-QSFP28-ZR4

100Gbit QSFP28 ZR4, 80km OM4, LC-Duplex, Singlemode

Features

- Duplex LC receptacle optical interface
- Single +3.3V power supply
- Hot-pluggable QSFP28 MSA form factor
- 4x25G Electrical Serial Interface
- Compliant with 4x28G(CEI-28GVSR)
- Built in digital diagnostic function
- Transmitter: cooled 4x25Gb/s LAN WDM EML TOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25Gb/s SOA+PIN ROSA
- Operating case temperature range: 0°C to 70°C
- Up to 80km reach for G.652 SMF with FEC
- Power dissipation < 5.5 W

Application

- 100G BASE-ZR4 Ethernet Links
- InfiniBand QDR and DDR interconnects
- 100G Datacom connections



Functional Description

The 100G QSFP28 ZR4 optical transceiver integrates the transmit and receive path onto one module. On the transmit side, four lanes of serial data streams are retimed and passed on to four laser drivers, which control four electric-absorption modulated lasers (EML) with 1295, 1300, 1305, and 1309 nm center wavelengths. The optical signals are then multiplexed into a single-mode fiber through an industry-standard LC connector. On the receive side, four lanes of optical data streams passed on to a Semiconductor Optical Amplifier(SOA) and are optically demultiplexed by an integrated optical demultiplexer. Each data stream is recovered by a PIN photodetector and transimpedance amplifier, retimed and passed on to an output driver. This module features a hot-pluggable electrical interface, low power consumption, and 2-wire serial interface.

Transceiver Block Diagram

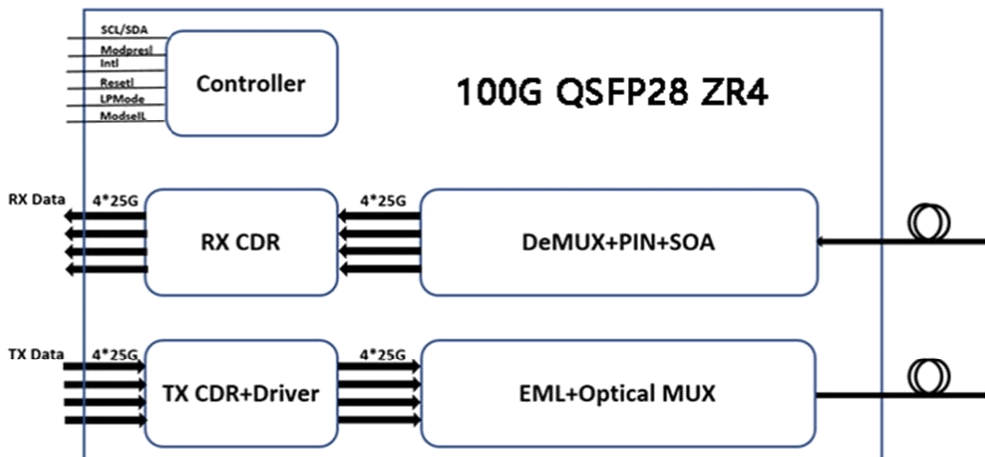


Figure 1. Transceiver Block Diagram

LWO-QSFP28-ZR4

100Gbit QSFP28 ZR4, 80km OM4, LC-Duplex, Singlemode

Pin Assignment and Description

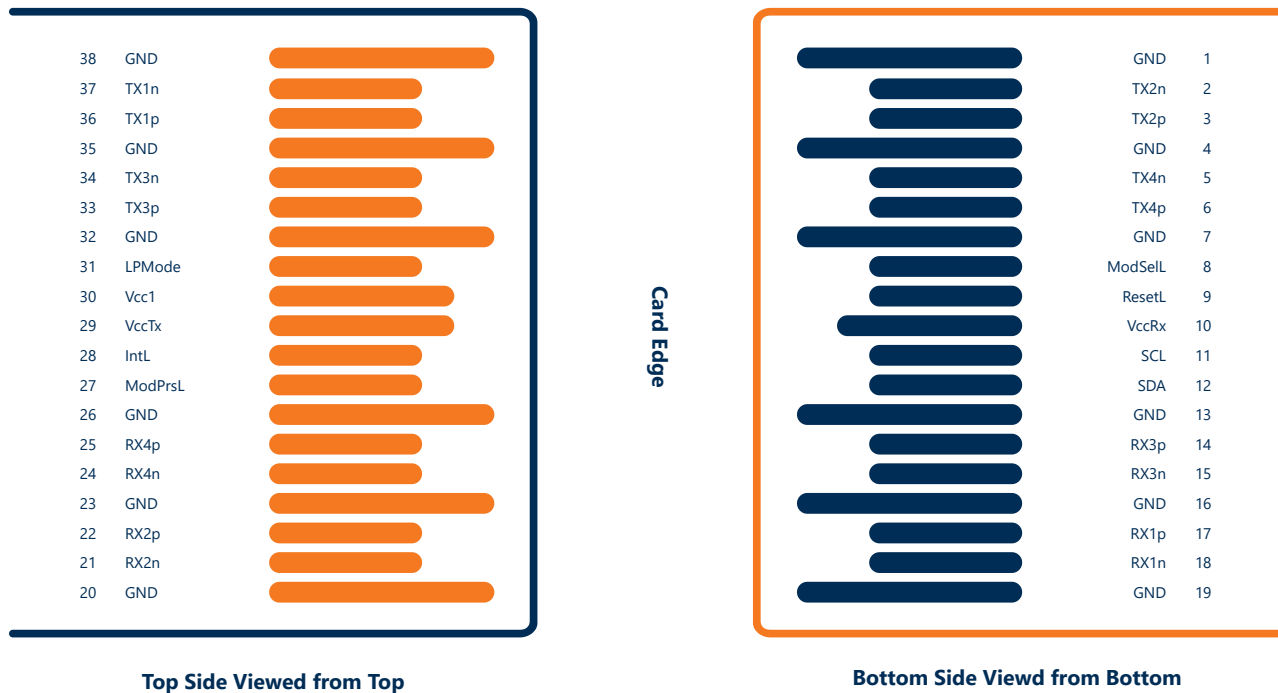


Figure 2. MSA Compliant Connector

PIN Definition 1/2

| PIN | Logic | Symbol | Name/Description | Notes |
|-----|------------|---------|--------------------------------------|-------|
| 1 | | GND | Ground | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data Output | |
| 4 | | GND | Ground | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data Output | |
| 7 | | GND | Ground | 1 |
| 8 | LVTTTL-I | ModSelL | Module Select | |
| 9 | LVTTTL-I | ResetL | Module Reset | |
| 10 | | VccRx | +3.3V Power Supply Receiver | 2 |
| 11 | LVCNOS-I/O | SCL | 2-Wire Serial Interface Clock | |
| 12 | LVCNOS-I/O | SDA | 2-Wire Serial Interface Data | |
| 13 | | GND | Ground | |
| 14 | CML-O | Rx3p | Receiver Non-Inverted Data Output | |
| 15 | CML-O | Rx3n | Receiver Inverted Data Output | |
| 16 | | GND | Ground | 1 |
| 17 | CML-O | Rx1p | Receiver Non-Inverted Data Output | |
| 18 | CML-O | Rx1n | Receiver Inverted Data Output | |
| 19 | | GND | Ground | 1 |

LWO-QSFP28-ZR4

100Gbit QSFP28 ZR4, 80km OM4, LC-Duplex, Singlemode

PIN Definition 2/2

| | | | | |
|----|---------|--------------|--|---|
| 20 | | GND | Ground | 1 |
| 21 | CML-O | Rx2n | Receiver Inverted Data Output | |
| 22 | CML-O | Rx2p | Receiver Non-Inverted Data Output | |
| 23 | | GND | Ground | 1 |
| 24 | CML-O | Rx4n | Receiver Inverted Data Output | 1 |
| 25 | CML-O | Rx4p | Receiver Non-Inverted Data Output | |
| 26 | | GND | Ground | |
| 27 | LVTTL-O | ModPrsL | Module Present | |
| 28 | LVTTL-O | IntL/RxLOSL | Interrupt. Optionally configurable as RxLOSL via the management interface (SFF-8636) | |
| 29 | | VccTx | +3.3 V Power Supply transmitter | 2 |
| 30 | | Vcc1 | +3.3 V Power Supply | 2 |
| 31 | LVTTL-I | LPMode/TxDis | Low Power Mode. Optionally configurable as TxDis via the management interface (SFF-8636) | |
| 32 | | GND | Ground | 1 |
| 33 | CML-I | Tx3p | Transmitter Non-Inverted Data Input | |
| 34 | CML-I | Tx3n | Transmitter Inverted Data Input | |
| 35 | | GND | Ground | 1 |
| 36 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | |
| 37 | CML-I | Tx1n | Transmitter Inverted Data Input | |
| 38 | | GND | Ground | 1 |

Notes

- GND is the symbol for signal and supply (power) common for the QSFP28 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.
- VccRx, Vcc1 and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, Vcc1 and Vcc Tx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Recommended Power Supply Filter

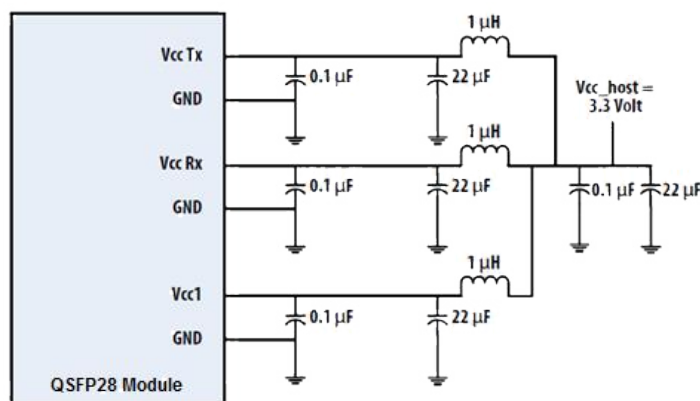


Figure 3. Recommended Power Supply Filter

LWO-QSFP28-ZR4

100Gbit QSFP28 ZR4, 80km OM4, LC-Duplex, Singlemode

Electrical Characteristics

Tested under recommended operating conditions, unless otherwise noted

| Parameter | Symbol | Min. | Typical | Max. | Units | Notes |
|--------------------------------|-------------------|--------------|---------|----------------|----------|-------|
| Supply Voltage | V_{CC} | 3.13 | 3.3 | 3.47 | V | |
| Transceiver | | | | | | |
| Input differential impedance | R_{in} | | 100 | | Ω | 1 |
| Differential data input swing | $V_{in, pp}$ | 180 | | 1000 | mV | |
| Transmit Disable Voltage | VD | $V_{CC}-1.3$ | | V_{CC} | V | |
| Transmit Enable Voltage | VEN | Vee | | $V_{ee}+0.8$ | V | 2 |
| Receiver | | | | | | |
| Differential data output swing | $V_{out, pp}$ | 300 | | 850 | mV | 3 |
| LOS Fault | $V_{LOS_{fault}}$ | $V_{CC}-1.3$ | | V_{CC_HOST} | V | 4 |
| LOS Normal | $V_{LOS_{norm}}$ | V_{ee} | | $V_{ee}+0.8$ | V | 4 |

Notes

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Optional for TX disable
3. Into 100 ohms differential termination
4. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

Optical Characteristics 1/2

Tested under recommended operating conditions, unless otherwise noted

| Parameter | Symbol | Min. | Typical | Max. | Units | Notes |
|--|-------------|---------|---------|---------|-------|-------|
| Transceiver | | | | | | |
| Center Wavelength Lane 0 | λ_0 | 1294.53 | 1295.56 | 1296.59 | nm | |
| Center Wavelength Lane 1 | λ_1 | 1299.02 | 1300.05 | 1301.09 | nm | |
| Center Wavelength Lane 2 | λ_2 | 1301.54 | 1304.58 | 1305.63 | nm | |
| Center Wavelength Lane 3 | λ_3 | 1308.09 | 1309.14 | 1310.19 | nm | |
| Total Launch Power, 100GE | P_{AVG} | 7 | - | 12.5 | dBm | 1 |
| Average Launch Power per Lane, 100GE | P_{lane} | 1 | - | 6.5 | dBm | 1 |
| Difference in launch power between lanes | $P\Delta$ | - | - | 3 | dB | |
| Average Output Power (Laser OFF) | P_{off} | - | - | -30 | dBm | |
| Side Mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Extinction Ratio, 100GE & OTU4 | ER | 8 | - | - | dB | |

LWO-QSFP28-ZR4

100Gbit QSFP28 ZR4, 80km OM4, LC-Duplex, Singlemode

Optical Characteristics 2/2

| Parameter | Symbol | Min. | Typical | Max. | Units | Notes |
|--|----------------|---------|---------|---------|-------|-------|
| Receiver | | | | | | |
| Center Wavelength Lane 0 | λ_0 | 1294.53 | 1295.56 | 1296.59 | nm | |
| Center Wavelength Lane 1 | λ_1 | 1299.02 | 1300.05 | 1301.09 | nm | |
| Center Wavelength Lane 2 | λ_2 | 1301.54 | 1304.58 | 1305.63 | nm | |
| Center Wavelength Lane 3 | λ_3 | 1308.09 | 1309.14 | 1310.19 | nm | |
| Damage threshold | P_{DAM} | - | - | 5.5 | dBm | |
| Average receive power, each lane (max) | P_{SAT} | - | - | 3.5 | dBm | |
| Average receive power, each lane (min) | P_{RX_Lane} | -28 | - | | dBm | |
| Receiver sensitivity per Lane (OMA) | | | | -26.4 | dBm | 2 |
| LOS Assert | LOS_A | -40 | | | dBm | |
| LOS De-assert | LOS_{DA} | | | -29 | dBm | |
| LOS hysteresis | LOS_H | 0.5 | | | dB | |

Notes

- The optical power is launched into SMF.
- Measured with a PRBS 2³¹-1 test pattern @25.78125 Gb/s, BER≤5E-5.

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

| Parameter | Symbol | Min. | Typical | Max. | Units | Notes |
|--------------------------------------|------------|------|---------|------|-------|-------|
| Storage Temperature | T_S | -40 | 85 | degC | | |
| Operating Case Temperature | T_{OP} | 0 | 70 | degC | | |
| Power Supply Voltage | V_{CC} | -0.5 | 03. Jun | V | | |
| Relative Humidity (non-condensation) | RH | 5 | 85 | % | | |
| Rx Damage Threshold, per Lane | P_{Rdmg} | 5.5 | | dBm | | |

Recommended Operating Conditions and Power Supply Requirements

| Parameter | Symbol | Min. | Typical | Max. | Units | Notes |
|-------------------------------------|----------|-------|-----------|-------|-------|-------|
| Operating Case Temperature | T_{OP} | 0 | | 70 | degC | |
| Power Supply Voltage | V_{CC} | 3.135 | 3.3 | 3.465 | V | |
| Data Rate, Each Lane | | | 2.578.125 | | Gb/s | |
| Supply Current | I_{CC} | | | 1.66 | A | |
| Power Consumption | P | | | 5.5 | W | |
| Link Distance with G.652 (with FEC) | D | | | 80 | km | |

LWO-QSFP28-ZR4

100Gbit QSFP28 ZR4, 80km OM4, LC-Duplex, Singlemode

Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8436.

| Parameter | Symbol | Min. | Max. | Units | Notes |
|---|--------------|-------|------|-------|----------------------------------|
| Temperature monitor absolute error | DMI_Temp | -3 | 3 | degC | Over operating temperature range |
| Supply voltage monitor absolute error | DMI_VCC | -0.15 | 0.15 | V | Over full operating range |
| Channel RX power monitor absolute error | DMI_RX_Ch | -2 | 2 | dB | 1 |
| Channel Bias current monitor | DMI_lbias_Ch | -10% | 10% | mA | Ch1 ~ Ch4 |
| Channel TX power monitor absolute error | DMI_TX_Ch | -2 | 2 | dB | 1 |

Notes

- Due to measurement accuracy of different single mode fibers, there could be an additional +/-1 dB fluctuation, or a +/- 3 dB total accuracy.

Mechanical Dimensions

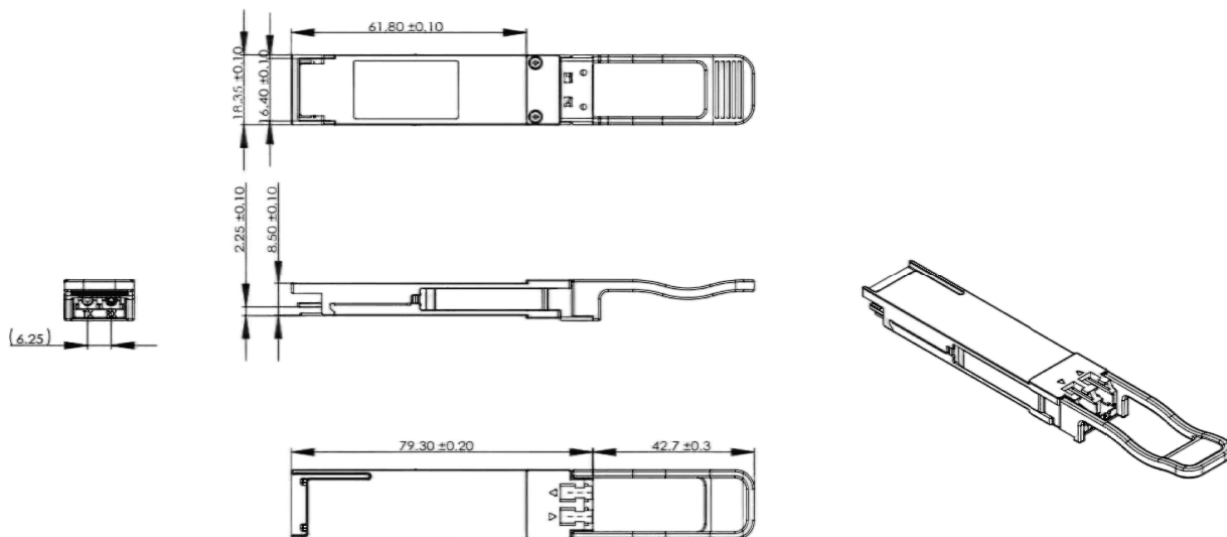


Figure 4. Mechanical Outline

ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 / JESD22- A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.