

QSFP28-100G-ER4

Optical SFP Module

100Gbps QSFP28 ER4 Transceiver, SM, 40KM



Features

- Support line rates from 103.125 Gbps to 111.81 Gbps
- Transmitter: cooled 4x25Gb/s LAN WDM EML TOSA (1295.56, 1300.05, 1304.58, 1309.14nm)
- Receiver: 4x25Gb/s SOA+PIN
- 4x25G electrical interface
- LC duplex receptacle
- Up to 40km reach for SMF
- Compliant with QSFP28 MSA
- Hot Pluggable QSFP28 form factor
- Digital Diagnostics Monitoring Interface
- Power dissipation < 4.0 W
- Compatible with RoHS
- Commercial operating case temperature: 0 to +70° C

Application

- Ethernet 100GBASE-ER4
- Infiniband QDR and DDR interconnects
- Client-side 100G Telecom connections
- Data Center

Standard

- Compliant with IEEE 802.3bm
- Compliant with QSFP28 MSA
- Compliant with SFF-8436

Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|-----------------------------|--------|------|-----|------|
| Power Supply Voltage | Vcc | -0.5 | 3.6 | V |
| Damage Threshold, each Lane | THd | -3 | | dBm |
| Storage Temperature | Ts | -40 | +85 | °C |
| Operating Humidity | - | 5 | 95 | % |

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|--------------------------------------|--------|-------|----------|-------|------|
| Operating Case Temperature | Tc | 0 | | 70 | °C |
| Power Supply Voltage | Vcc | 3.135 | 3.3 | 3.465 | V |
| Power Supply Current | Icc | | | 1360 | mA |
| Data Rate,each Lane | | | 25.78125 | | Gbps |
| Control Input Voltage High | | 2 | | Vcc | V |
| Control Input Voltage Low | | 0 | | 0.8 | V |
| Data Rate Accuracy | | -100 | | 100 | ppm |
| Link Distance with SMF (without FEC) | D1 | - | | 30 | km |
| Link Distance with SMF (with FEC) | D2 | | | 40 | km |

Optical and Electrical Characteristics

| Optical Transmitter Characteristics | | | | | | |
|---|------------------------------------|---------|---------|---------|------|-------------------------------|
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Launched Power (avg.) | Pavg | -2.5 | | 4.5 | dBm | |
| Total Output. Power | Pout | | | 10.5 | dBm | |
| OMA, each Lane | POMA | 0.1 | | 4.5 | dBm | |
| Difference in Launch Power between any Two Lanes (OMA) | Ptx,diff | | | 3.6 | dB | |
| Launch Power in OMA minus Transmitter and Dispersion Penalty (TDP), each Lane | | -0.65 | | | dBm | |
| Wavelength Assignment | λ_0 | 1294.53 | 1295.56 | 1296.59 | nm | |
| | λ_1 | 1299.02 | 1300.05 | 1301.09 | | |
| | λ_2 | 1303.54 | 1304.58 | 1305.63 | | |
| | λ_3 | 1308.09 | 1309.14 | 1310.19 | | |
| TDP, each Lane | TDP | | | 2.5 | dB | |
| Spectral Width(-20dB) | $\Delta\lambda$ | | | 1 | nm | |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Extinction Ratio | ER | 7 | | | dB | |
| Transmitter OFF Output Power | POff | | | -30 | dBm | |
| RIN20 OMA | RIN | | | -130 | Ohm | |
| Output Eye Mask definition {X1, X2, X3, Y1, Y2, Y3} | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} | | | | | |
| Optical Receiver Characteristics | | | | | | |
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Damage Threshold, each Lane | THd | -3 | | | dBm | |
| Average Receive Power, each Lane | | -16.9 | | -4.9 | dBm | @30km |
| Average Receive Power, each Lane | | -20.9 | | -4.9 | dBm | @40km |
| Receive Power (OMA), each Lane | | | | -1.9 | dBm | |
| Receiver Sensitivity (OMA), each Lane | SEN1 | | | -14.5 | dBm | For BER = 1×10^{-12} |
| Stressed Receiver Sensitivity (OMA), each Lane | | | | -12.5 | dBm | For BER = 1×10^{-12} |
| Receiver Sensitivity (OMA), each Lane | SEN2 | | | -18.5 | dBm | For BER = 5×10^{-5} |
| Stressed Receiver Sensitivity (OMA), each Lane | | | | -16.65 | dBm | For BER = 5×10^{-5} |
| Receiver reflectance | | | | -26 | dB | |

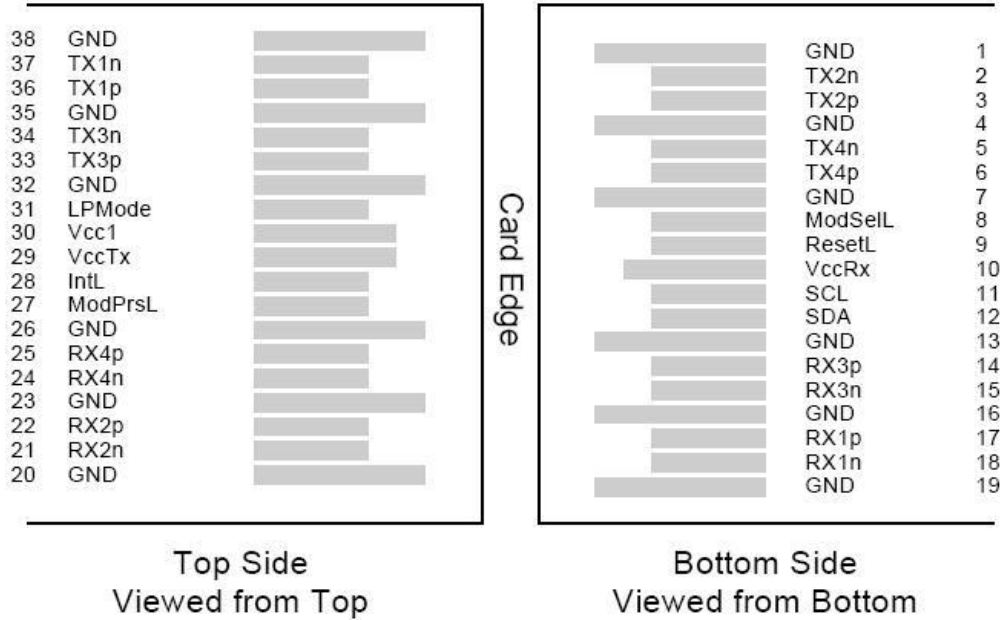
| | | | | | | | |
|---|-------------------|----------|-----|-----|------|-----|--|
| Difference in Receive Power between any Two Lanes (Average and OMA) | | Ptx,diff | | | 3.6 | dB | |
| LOS Hysteresis | | LOSH | 0.5 | | | dB | |
| LOS | Optical De-assert | Pd | | -24 | | dBm | |
| | Optical Assert | Pa | | -26 | | | |
| Receiver Electrical 3 dB upper Cutoff Frequency, each Lane | | Fc | | | 31 | GHz | |
| Vertical Eye Closure Penalty, each Lane | | | | | 1.5 | dB | |
| Stressed Eye J2 Jitter, each Lane | | | | | 0.3 | UI | |
| Stressed Eye J9 Jitter, each Lane | | | | | 0.47 | UI | |

| Electrical Transmitter Characteristics | | | | | | |
|--|--------|------|-------------------------------------|--------------------------------|------|-------|
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Power Consumption | | | | 4.0 | W | |
| Overload Differential Voltage pk-pk | TP1a | 900 | | | mV | |
| Common Mode Voltage (Vcm) | TP1 | -350 | | 2850 | mV | |
| Differential Termination Resistance Mismatch | TP1 | | | 10 | % | |
| Differential Return Loss (SDD11) | TP1 | | | See CEI-28G-VSR Equation 13-19 | dB | |
| Common Mode to Differential conversion and Differential to Common Mode conversion (SDC11, SCD11) | TP1 | | | See CEI-28G-VSR Equation 13-20 | dB | |
| Stressed Input Test | TP1a | | See CEI-28G-VSR Section 13.3.11.2.1 | | | |
| Electrical Receiver Characteristics | | | | | | |
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Differential Voltage, pk-pk | TP4 | | | 900 | mV | |
| Common Mode Voltage (Vcm) | TP4 | -350 | | 2850 | mV | |
| Common Mode Noise, RMS | TP4 | | | 17.5 | mV | |
| Differential Termination Resistance Mismatch | TP4 | | | 10 | % | |
| Differential Return Loss (SDD11) | TP4 | | | See CEI- | dB | |

| | | | | | | |
|---|-----|------|--|--|----|--|
| | | | | 28G-VSR Equation 13-19 | | |
| Common Mode to Differential conversion and Differential to Common Mode conversion (SDC22, SCD22) | TP4 | | | See CEI- 28G-VSR Equation 13-21 | dB | |
| Common Mode Return Loss (SCC22) | TP4 | | | -2 | dB | |
| Transition Time, 20 to 80% | TP4 | 9.5 | | | ps | |
| Vertical Eye Closure (VEC) | TP4 | | | 5.5 | dB | |
| Eye Width at 10 ⁻¹⁵ probability (EW15) | tr | 0.57 | | | UI | |
| Eye Height at 10 ⁻¹⁵ probability (EH15) | tf | 228 | | | mV | |

Pin Definitions

Pin Diagram



QSFP MSA-compliant 38-pin connector

| Pin | Symbol | Name/Description | Notes |
|-----|---------|--|-------|
| 1 | GND | Transmitter Ground (Common with Receiver 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 | Vcc Rx | +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 | Transmitter Inverted Data Input | |
| 15 | RX3N | Transmitter Non-Inverted Data Input | |
| 16 | GND | Ground | 1 |

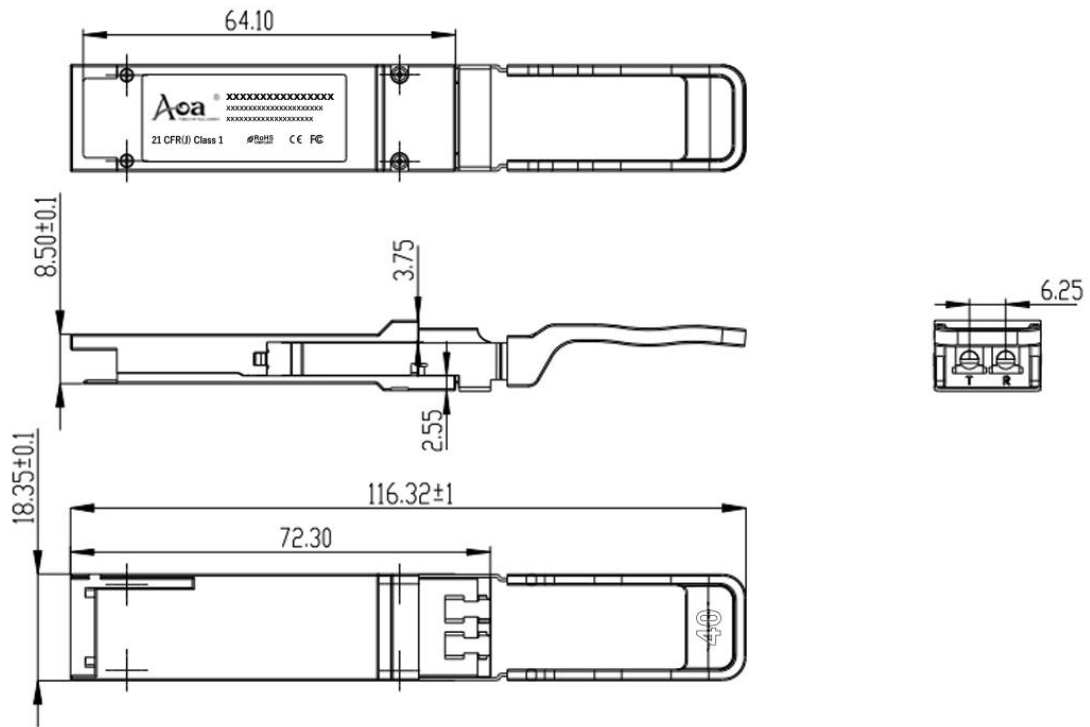
| | | | |
|----|---------|-------------------------------------|---|
| 17 | RX1P | Transmitter Inverted Data Input | |
| 18 | RX1N | Transmitter Non-Inverted Data Input | |
| 19 | GND | Ground | 1 |
| 20 | GND | Ground | 1 |
| 21 | RX2N | Transmitter Inverted Data Input | |
| 22 | RX2P | Transmitter Non-Inverted Data Input | |
| 23 | GND | Ground | 1 |
| 24 | RX4N | Transmitter Inverted Data Input | 1 |
| 25 | RX4P | Transmitter Non-Inverted Data Input | |
| 26 | GND | Ground | 1 |
| 27 | ModPrsL | Module Present | |
| 28 | IntL | Interrupt | |
| 29 | Vcc Tx | +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 Inverted Data Input | |
| 34 | TX3N | Transmitter Non-Inverted Data Input | |
| 35 | GND | Ground | 1 |
| 36 | TX1P | Transmitter Inverted Data Input | |
| 37 | TX1N | Transmitter Non-Inverted Data Input | |
| 38 | GND | Ground | 1 |

QSFP Module PIN Definition

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 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 QSFP28 transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

Mechanical Dimensions



Ordering information

| Part. No | Specifications | | | | | | | | |
|-----------------|----------------|-------------|-------------|----------|-------------|-----------|-----------|------------|-----|
| | Pack | Rate (Gbps) | Tx (nm) | Po (dBm) | RX | Sen (dBm) | Temp (°C) | Reach (km) | DDM |
| QSFP28-100G-ER4 | QSFP28 | 100G | EML LWDM | -2.5~4.5 | SOA+ PIN | <-18.5 | 0~70 | 40 | Y |



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