



Features

- 4 independent full-duplex channels
- Up to 28Gb/s data rate per channel
- QSFP28MSA compliant
- Compliant to IEEE 802.3bm 100GBASE PSM4
- Up to 2km reach for G.652 SMF
- Maximum power consumption 3.5W
- Single +3.3V power supply
- Operating case temperature: 0 to 70oC
- RoHS-6 compliant

Applications

- 100G Ethernet links
- Infiniband QDR and DDR interconnects
- Datacenter and Enterprise networking

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Units | Note |
|--------------------------------------|-----------------|------|------|-------|------|
| 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 | 4.5 | | dBm | |

Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Units | Note |
|----------------------------|-----------------|-------|----------|-----------------|-------|------|
| Operating Temperature | T _{op} | 0 | | 70 | °C | |
| Power Supply Voltage | V _{cc} | 3.135 | 3.3 | 3.465 | V | |
| Data Rate, each Lane | | | 25.78125 | | Gb/s | |
| Control Input Voltage High | | 2 | | V _{cc} | V | |
| Control Input Voltage Low | | 0 | | 0.8 | V | |
| Link Distance with G.652 | D | 0.002 | | 2 | km | |

Diagnostics Monitoring

| Parameter | Symbol | Accuracy | Unit | Notes |
|---|--------------|----------|------|---------------------------|
| Temperature monitor absolute error | DMI_Temp | ± 3 | °C | Over operating temp |
| Supply voltage monitor absolute error | DMI_VCC | ± 0.1 | V | Over full operating range |
| Channel RX power monitor absolute error | DMI_RX_Ch | ± 2 | dB | 1 |
| Channel Bias current monitor | DMI_Ibias_Ch | ± 10% | mA | |
| Channel TX power monitor absolute error | DMI_TX_Ch | ± 2 | dB | 1 |

Notes:

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

Transmitter Electro-Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Units | Note |
|--|---------------|------|------|------|-------|----------------------------------|
| Power Consumption | | | | 3.5 | W | |
| Supply Current | I_{CC} | | | 1.1 | A | |
| Transceiver Power-on Initialization Time | | | | 2000 | ms | 1 |
| Single-ended Input Voltage Tolerance (Note 2) | | -0.3 | | 4.0 | V | Referred to TP1 signal common |
| AC Common Mode Input Voltage Tolerance | | 15 | | | mV | RMS |
| Differential Input Voltage Swing Threshold | $V_{in,pp}$ | 50 | | | mVpp | |
| Differential Input Impedance | Z_{in} | 90 | 100 | 110 | Ohm | |
| Center Wavelength | λ_C | 1260 | 1310 | 1355 | nm | |
| Side Mode Suppression Ratio | $SMSR$ | 30 | | | dB | |
| Total Average Launch Power | P_T | | | 9.5 | dBm | |
| Average Launch Power, each Lane | P_{AVG} | 1.0 | | 3.5 | dBm | |
| Optical Modulation Amplitude (OMA), each Lane | P_{OMA} | 2.0 | | 4.5 | dBm | 3 |
| 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 | | 1.0 | | | dBm | |
| TDP, each Lane | TDP | | | 3.2 | dB | |
| Extinction Ratio | ER | 3.5 | | | dB | |
| Relative Intensity Noise | RIN | | | -128 | dB/Hz | |
| Optical Return Loss Tolerance | TOL | | | 12 | dB | |
| Transmitter Reflectance | R_T | | | -12 | dB | |
| Average Launch Power OFF Transmitter, each Lane | P_{off} | | | -30 | dBm | |

| <i>Parameter</i> | <i>Symbol</i> | <i>Min.</i> | <i>Typ.</i> | <i>Max.</i> | <i>Units</i> | <i>Note</i> |
|---------------------------------|---------------|-------------|-------------|-------------|--------------|------------------------------------|
| Transmitter Eye Mask Definition | | | | | | |
| {X1, X2, X3, Y1, Y2, Y3} | | | | | | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |

Note:

1. Power-on Initialization Time is the time from when the power supply voltages reach and remain above the minimum recommended operating supply voltages to the time when the module is fully functional.
2. The single ended input voltage tolerance is the allowable range of the instantaneous input signals.
3. Even if the TDP < 1 dB, the OMA min must exceed the minimum value specified here.

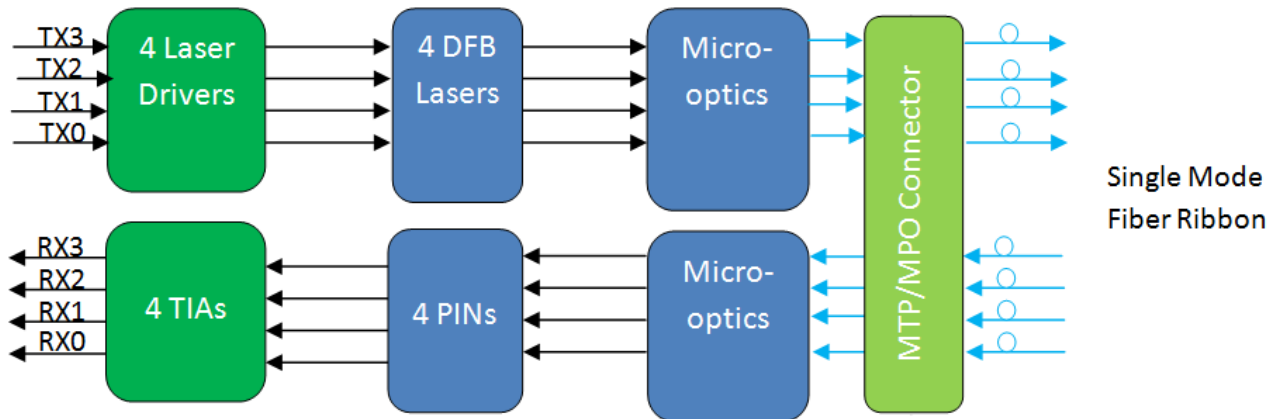
Receiver Electro-Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Units | Note |
|--|--------------|------|------|------|-------|---------------------------|
| Single-ended Output Voltage | | -0.3 | | 4.0 | V | Referred to signal common |
| AC Common Mode Output Voltage | | | | 7.5 | mV | RMS |
| Differential Output Voltage Swing | $V_{out,pp}$ | 300 | | 850 | mVpp | |
| Differential Output Impedance | Z_{out} | 90 | 100 | 110 | Ohm | |
| Center Wavelength | λ_c | 1260 | 1310 | 1355 | nm | |
| Damage Threshold, each Lane | TH_d | 4.5 | | | dBm | 1 |
| Average Receive Power, each Lane | | -9.0 | | 3.5 | dBm | |
| Receiver Reflectance | R_R | | | -12 | dB | |
| Receive Power (OMA), each Lane | | | | 4.5 | dBm | |
| Receiver Sensitivity (OMA), each Lane | SEN | | | -9.0 | dBm | Informative |
| Difference in Receive Power between any Two Lanes (OMA) | $Prx,diff$ | | | 5.5 | dB | |
| LOS Assert | $LOSA$ | | -18 | | dBm | |
| LOS Deassert | $LOSD$ | | -15 | | dBm | |
| LOS Hysteresis | $LOSH$ | 0.5 | | DB | | |
| Receiver Electrical 3 dB upper Cutoff Frequency, each Lane | F_c | | | 31 | GHz | |

Notes:

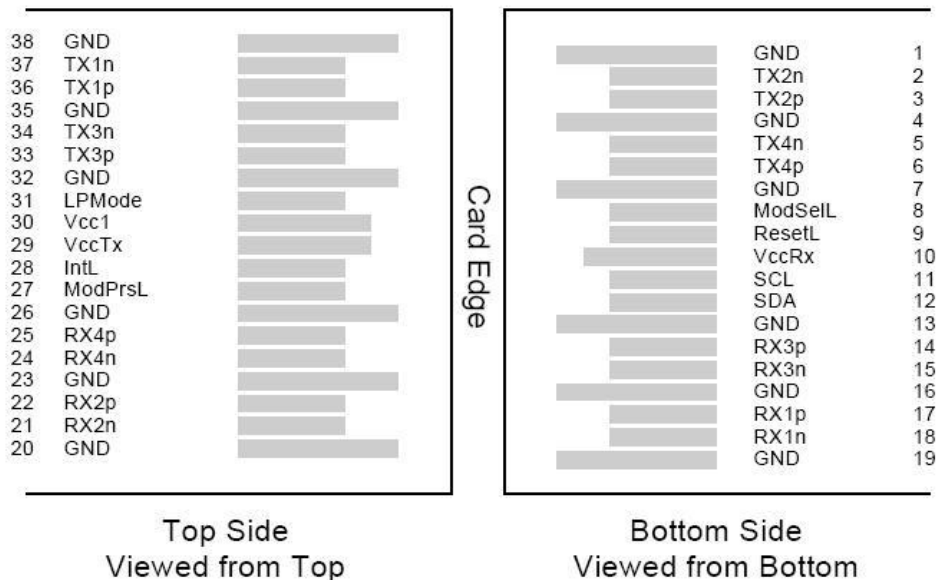
1. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane. The receiver does not have to operate correctly at this input power.

Block Diagram of Transceiver



Transceiver Block Diagram

Pin Assignment



QSFP28 Transceiver Electrical Layout

Pin Description

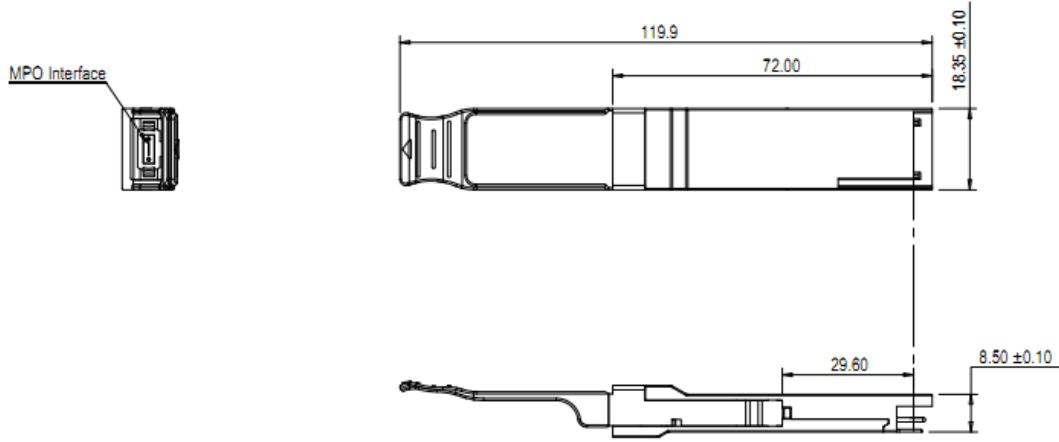
| PIN | Logic | Symbol | Name/Description | Note |
|-----|-------------|---------|--------------------------------------|------|
| 1 | | GND | Ground | 1 |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data output | |
| 4 | | GND | Ground | 1 |
| 5 | CML-I | Tx4n | Transmitter inverted Data Input | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data output | |
| 7 | | GND | Ground | 1 |
| 8 | LVTLL-I | ModSelL | Module Select | |
| 9 | LVTLL-I | ResetL | Module Reset | |
| 10 | | VccRx | +3.3V Power Supply Receiver | 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 | 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 | |

| PIN | Logic | Symbol | Name/Description | Note |
|-----|---------|---------|-------------------------------------|------|
| 19 | | GND | Ground | 1 |
| 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 | 1 |
| 27 | LVTTL-O | ModPrsL | Module Present | |
| 28 | LVTTL-O | IntL | Interrupt | |
| 29 | | VccTx | +3.3V Power Supply transmitter | 2 |
| 30 | | Vcc1 | +3.3V Power Supply | 2 |
| 31 | LVTTL-I | LPMode | Low Power Mode | |
| 32 | | GND | Ground | 1 |
| 33 | CML-I | Tx3p | Transmitter Non-Inverted Data Input | |
| 34 | CML-I | Tx3n | Transmitter Inverted Data Output | |
| 35 | | GND | Ground | 1 |
| 36 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | |
| 37 | CML-I | Tx1n | Transmitter Inverted Data Output | |
| 38 | | GND | Ground | 1 |

Notes:

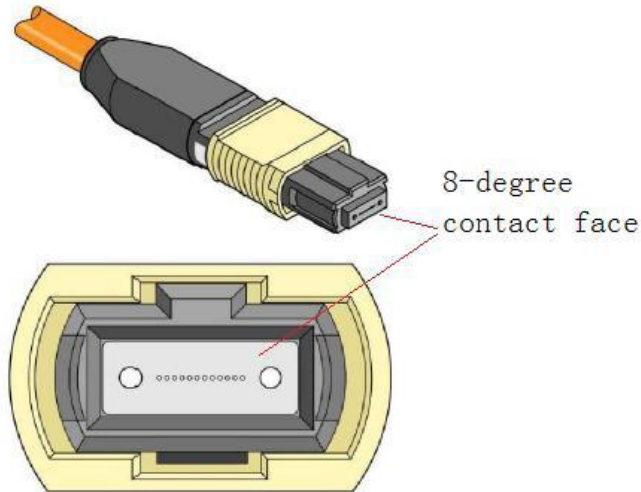
1. GND is the symbol for signal and supply (power) common for QSFP28 modules. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal common ground plane.
2. VccRx, Vcc1 and VccTx are the receiver and transmitter power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown in Figure 3 below. Vcc Rx, 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.

Dimensions



Mechanical Outline


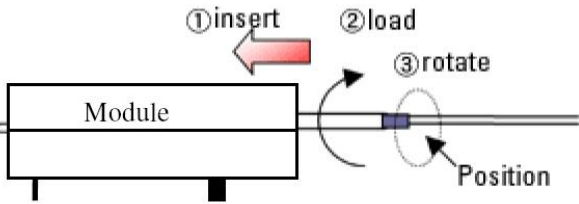
Attention: To minimize MPO connection induced reflections, an MPO receptacle with 8-degree angled end-face is utilized for this product. A female MPO connector with 8-degree end-face should be used with this product as illustrated as below.



Female MPO Connector with 8-degree End-face

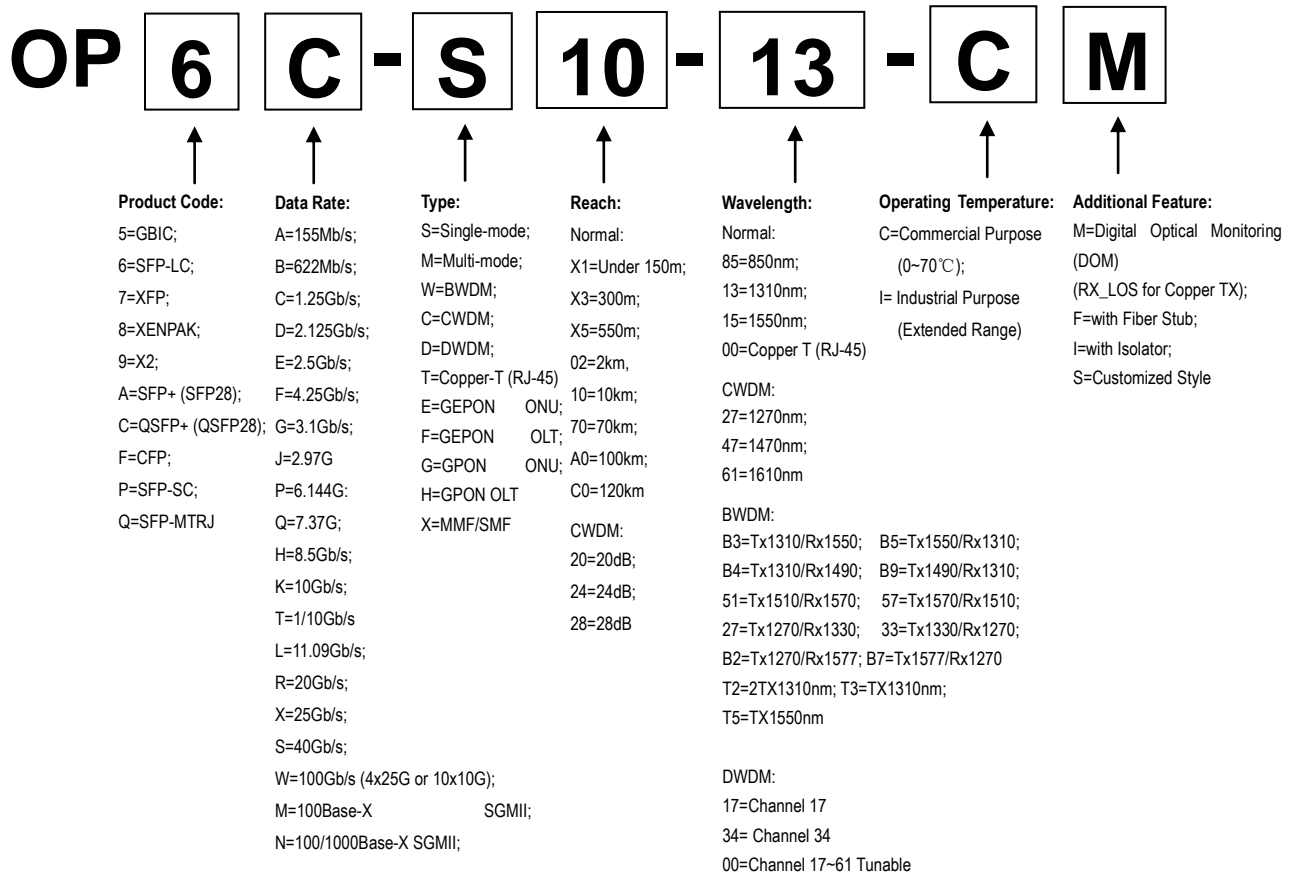
Optical Receptacle Cleaning Recommendations :

All fiber stubs inside the receptacle portions were cleaned before shipment. In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop® stick type and HFE7100 cleaning fluid. Before the mating of patch-cord, the fiber end should be cleaned up by using Cletop® cleaning cassette.

| | |
|---|---|
| <p>Cleaning of patch-cord</p>  | <p>Cleaning of fiber stub</p>  <ol style="list-style-type: none"> 1. Insert Ensure that stick is held straight when inserting into sleeve. 2. Load Apply sufficient pressure (approx 600-700g) to ensure ferrule a little depressed in sleeve. 3. Rotate Rotate stick clockwise 4-5 times, while ensuring direct contact with ferrule end-face is maintained. <p><i>Notice: Number of possible wipes: Maintenance (repair) ~1 use / piece Equipment construction: 4 uses / piece (max.)</i></p> |
|---|---|

Note: The pictures were extracted from NTT-ME website. And the Cletop® is a trademark registered by NTT-ME

Ordering Information



| Model Number | Part Number | Voltage | Temperature |
|----------------|-----------------|---------|--------------|
| QSFP-100G-PSM4 | OPCW-S02-13-CBS | 3.3V | 0°C to 70 °C |

Note: All information contained in this document is subject to change without notice.