

## 100Gb/s QSFP28 Active Optical Cable



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## Product Features

- ✓ Available in lengths of 1 to 50m on OM3 multimode fiber (MMF)
- ✓ 4 independent full-duplex channels up
- ✓ To 25Gbps data rate per wavelength
- ✓ Reliable VCSEL array technology using multimode fiber
- ✓ Hot-pluggable QSFP28 footprint
- ✓ Power dissipation: <3.5W per cable end
- ✓ Commercial operating case temperature range: 0°C to 70°C
- ✓ RoHS compliant and Lead Free
- ✓ UL certification optional cables

## Applications

- ✓ IEEE 802.3bm 100GBASE SR4 and 40GBASE SR4128G Fiber Channel
- ✓ InfiniBand FDR/EDR



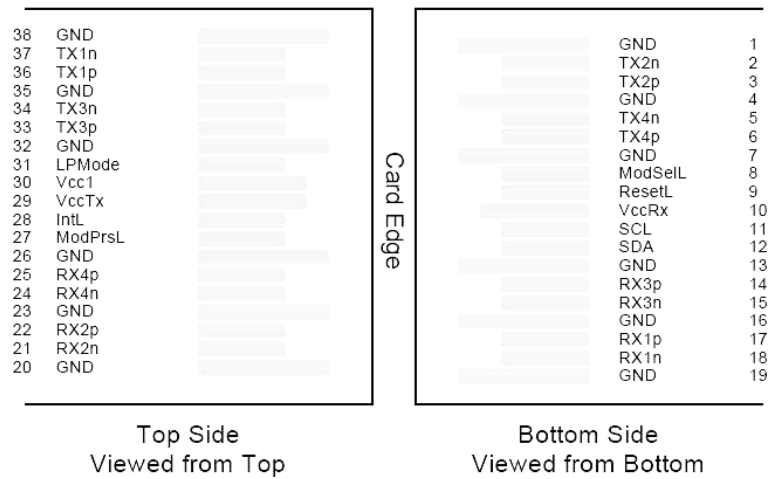
## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015
- Immunity compatible with IEC 61000-4-3
- EMI compatible with FCC Part 15 Class B EN55022 Class B
- ROHS compliant with ROHS 2 (2011/65/EU)

## Pin Descriptions

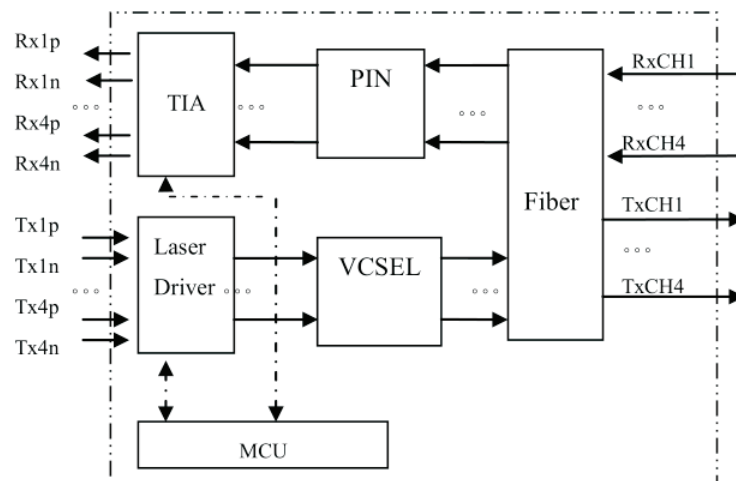
| Pin | Symbol  | Name                                                                                                                                                                                                                                                                                                                                                                                                                       | Ref. |
|-----|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 1   | GND     | Ground                                                                                                                                                                                                                                                                                                                                                                                                                     |      |
| 2   | Tx2n    | Transmitter Inverted Data Input, CML-I                                                                                                                                                                                                                                                                                                                                                                                     |      |
| 3   | Tx2p    | Transmitter Non-Inverted Data output, CML-I                                                                                                                                                                                                                                                                                                                                                                                |      |
| 4   | GND     | Ground                                                                                                                                                                                                                                                                                                                                                                                                                     |      |
| 5   | Tx4n    | Transmitter Inverted Data Input, CML-I                                                                                                                                                                                                                                                                                                                                                                                     |      |
| 6   | Tx4p    | Transmitter Non-Inverted Data output, CML-I                                                                                                                                                                                                                                                                                                                                                                                |      |
| 7   | GND     | GND                                                                                                                                                                                                                                                                                                                                                                                                                        |      |
| 8   | ModSelL | <p>The ModSelL is an input pin. When held low by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple QSFP+ modules on a single 2-wire interface bus. When the ModSelL is "High", the module shall not respond to or acknowledge any 2-wire interface communication from the host. ModSelL signal input node must be biased to the "High" state in the module</p> |      |
| 9   | ResetL  | <p>The ResetL pin must be pulled to Vcc in the QSFP+ module. A low level on the ResetL pin for longer than the minimum pulse length (t_Reset_init) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time (t_init) starts on the rising edge after the low level on the ResetL pin is released.</p>                                                        |      |

|    |         |                                                                                                                                                                                                                                                                |
|----|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | VccRx   | 3.3V Power Supply Receiver                                                                                                                                                                                                                                     |
| 11 | SCL     | 2-Wire Serial Interface Clock                                                                                                                                                                                                                                  |
| 12 | SDA     | 2-Wire Serial Interface Data                                                                                                                                                                                                                                   |
| 13 | GND     | GND                                                                                                                                                                                                                                                            |
| 14 | Rx3p    | Receiver Non-Inverted Data Output, CML-O                                                                                                                                                                                                                       |
| 15 | Rx3n    | Receiver Inverted Data Output, CML-O                                                                                                                                                                                                                           |
| 16 | GND     | GND                                                                                                                                                                                                                                                            |
| 17 | Rx1p    | Receiver Non-Inverted Data Output, CML-O                                                                                                                                                                                                                       |
| 18 | Rx1n    | Receiver Inverted Data Output, CML-O                                                                                                                                                                                                                           |
| 19 | GND     | Ground                                                                                                                                                                                                                                                         |
| 20 | GND     | Ground                                                                                                                                                                                                                                                         |
| 21 | Rx2n    | Receiver Inverted Data Output, CML-O                                                                                                                                                                                                                           |
| 22 | Rx2p    | Receiver Non-Inverted Data Output, CML-O                                                                                                                                                                                                                       |
| 23 | GND     | Ground                                                                                                                                                                                                                                                         |
| 24 | Rx4n    | Receiver Inverted Data Output, CML-O                                                                                                                                                                                                                           |
| 25 | Rx4p    | Receiver Non-Inverted Data Output, CML-O                                                                                                                                                                                                                       |
| 26 | GND     | Ground                                                                                                                                                                                                                                                         |
| 27 | ModPrsL | Module Present, connect to GND                                                                                                                                                                                                                                 |
| 28 | IntL    | The IntL pin is an open collector output and must be pulled to host supply voltage on the host board. The INTL pin is de-asserted "High" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of '0' and the flag field is read. |
| 29 | VccTx   | +3.3 V Power Supply transmitter                                                                                                                                                                                                                                |
| 30 | Vcc1    | +3.3 V Power Supply                                                                                                                                                                                                                                            |
| 31 | LPMode  | The LPMode pin shall be pulled up to Vcc in the QSFP+ module.<br>This function is affected by the LPMode pin and the combination of the Power_over-ride and Power_set softwarecontrol bits (Address A0h, byte 93 bits 0,1).                                    |
| 32 | GND     | Ground                                                                                                                                                                                                                                                         |
| 33 | Tx3p    | Transmitter Non-Inverted Data Input, CML-I                                                                                                                                                                                                                     |
| 34 | Tx3n    | Transmitter Inverted Data Output, CML-I                                                                                                                                                                                                                        |
| 35 | GND     | Ground                                                                                                                                                                                                                                                         |
| 36 | Tx1p    | Transmitter Non-Inverted Data Input, CML-I                                                                                                                                                                                                                     |
| 37 | Tx1n    | Transmitter Inverted Data Output, CML-I                                                                                                                                                                                                                        |
| 38 | GND     | Ground                                                                                                                                                                                                                                                         |



Pin-out of Connector Block on Host Board

## Module Block Diagram



## Absolute Maximum Ratings

| Parameter              | Symbol | Min  | Typ | Max  | Unit | Ref. |
|------------------------|--------|------|-----|------|------|------|
| Maximum Supply Voltage | Vcc    | -0.5 |     | +3.6 | V    |      |
| Storage Temperature    | TS     | -20  |     | +85  | °C   | 1    |
| Operating Humidity     | RH     | 0    |     | 85   | %    | 2    |

### Notes:

- Assumes no mechanical load force on the unit. Ensuring no mechanical load force requires a cable bend radius of >105mm within 100 mm of either cable end module and >60 mm on the rest of the cable.
- Non-condensing.

## Recommended Operating Conditions

| Parameter                  | Symbol | Min              | Typ  | Max  | Unit | Ref.       |
|----------------------------|--------|------------------|------|------|------|------------|
| Power Supply Voltage       | Vcc    | 3.13             | 3.30 | 3.47 | V    |            |
| Case Operating Temperature | Tc     | 0                | -    | 70   | °C   | Commercial |
| Bit Rate Each Lane         | Br     | 25.78125 ± 100pm |      |      | Gbps |            |
| Humidity                   | Rh     | 5                | -    | 85   | %    |            |
| Fiber Bend Radius          | Rb     | 3                |      |      | cm   |            |

## Electrical Characteristics (TOP=25°C, Vcc=3.3Volts)

NOTE: The module requires an electrical connector compliant with SFF-8662 or SFF-8672 be used on the host board to guarantee its electrical interface specification. Please check with your connector supplier

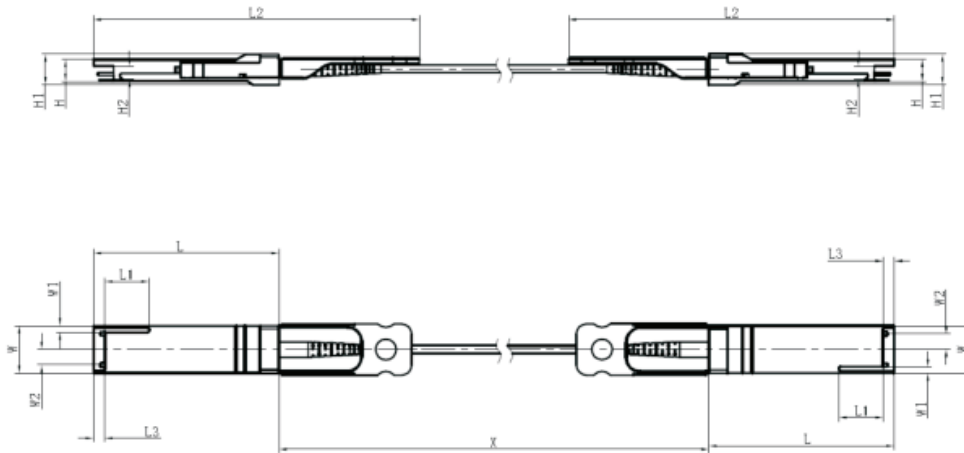
| Parameter                                    | Symbol | Min  | Typ | Max               | Unit | Ref. |
|----------------------------------------------|--------|------|-----|-------------------|------|------|
| Supply Voltage                               | Vcc    | 3.15 |     | 3.45              | V    |      |
| Supply Current                               | Icc    |      |     | 1010              | mA   |      |
| Module total power                           | P      |      |     | 3.5               | W    | 1 2  |
| Input electrical specifications (per Lane)   |        |      |     |                   |      |      |
| Differential Voltage pk-pk                   |        |      |     | 900               | mV   |      |
| Differential Termination Resistance Mismatch |        |      |     | 10                | %    |      |
| Transition Time, 20 to 80%                   | Tr, Tf | 10   |     |                   | Ps   |      |
| Output electrical specifications (per Lane)  |        |      |     |                   |      |      |
| Differential Voltage pk-pk                   |        |      |     | 900               | mV   |      |
| Differential Termination Resistance Mismatch |        |      |     | 10                | %    |      |
| Transition Time, 20 to 80%                   | Tr, Tf |      |     |                   | Ps   |      |
| Bit Error Ration                             | BER    | 10   |     | 10 <sup>-12</sup> |      | 3    |

### Notes:

1. Maximum total power value is specified across the full temperature and voltage range.
2. Settable in various discrete steps via the I2C interface.
3. BER=10<sup>-12</sup>; PRBS 2<sup>31</sup>-1@25.78125Gbps

## Mechanical Specifications

The module mechanical specifications are compliant with the QSFP28 transceiver module specifications (as defined in SFF-8661), substituting the MPO12 receptacle with a fiber optics cable connecting both ends



Unit: mm

|         | L    | L1   | L2  | L3   | W     | W1  | W2  | H   | H1   | H2   |
|---------|------|------|-----|------|-------|-----|-----|-----|------|------|
| MAX     | 72.2 | —    | 122 | 4.35 | 18.45 | —   | 6.2 | 8.6 | 12.0 | 5.35 |
| Typical | 72.0 | —    | —   | 4.20 | 18.35 | —   | —   | 8.5 | 11.8 | 5.2  |
| MIN     | 68.8 | 16.5 | 118 | 4.05 | 18.25 | 2.2 | 5.8 | 8.4 | 11.6 | 5.05 |

## Cable Length

| Cable Length | Unit: m | Tolerant | Unit: cm |
|--------------|---------|----------|----------|
| 1.0          |         | +5/-0    |          |
| 1.0~4.5      |         | +15/-0   |          |
| 5.0~14.5     |         | +30/-0   |          |
| 15.0         |         | +2%/-0   |          |