

## QDD-4X100G-FR-S-C

Cisco® QDD-4X100G-FR-S Compatible TAA 400GBase-DR4+ QSFP-DD Transceiver (SMF, 1310nm, MPO, 2km, DOM)

### Features:

- INF-8628 Compliance
- MPO Connector
- Single-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



### Applications:

- 400GBase Ethernet
- Access, Metro and Enterprise

### Product Description

This Cisco® QDD-4X100G-FR-S compatible QSFP-DD transceiver provides 400GBase-DR4+ throughput up to 2km over single-mode fiber (SMF) using a wavelength of 1310nm via an MPO connector. It is guaranteed to be 100% compatible with the equivalent Cisco® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

ProLabs' transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products."



## Absolute Maximum Ratings

| Parameter                          | Symbol | Min. | Max. | Unit |
|------------------------------------|--------|------|------|------|
| Maximum Power Supply Voltage       | VCC    | -0.5 | 3.6  | V    |
| Storage Temperature                | Ts     | -40  | 85   | °C   |
| Case Operating Temperature         | Top    | 0    | 70   | °C   |
| Relative Humidity                  | RH     | 15   | 85   | %    |
| Receiver Damage Threshold per lane | PRdmg  | 5    |      | dBm  |

## Optical Characteristics

| Parameter  | Symbol         | Min.                   | Typ. | Max.   | Unit  | Notes |
|--|----------------|------------------------|------|--------|-------|-------|
| <b>Transmitter</b>   |                |                        |      |        |       |       |
| PAM4 Signaling rate  |                | 53.125 ± 100 ppm       |      |        | GBaud |       |
| Lane wavelength (range)                                      |                | 1304.5                 | 1311 | 1317.5 | nm    |       |
| Side Mode Suppression Ratio                                  | SMSR           | 30                     |      |        | dB    |       |
| Total average launch power                                   |                |                        |      | 9.3    | dBm   |       |
| Average launch power   |                | -3.3                   |      | 3.5    | dBm   | 1     |
| Outer Optical Modulation Amplitude                           | OMAouter       | -0.3                   |      | 3.7    | dBm   | 2     |
| Difference in launch power between any two lanes (OMAouter)  |                |                        |      | 4      | dB    |       |
| Launch power in OMAouter minus TDECQ, for ER≥4.5dB           | OMAouter-TDECQ | -1.7                   |      |        | dBm   |       |
| Launch power in OMAouter minus TDECQ, for ER < 4.5dB         | OMAouter-TDECQ | -1.6                   |      |        | dBm   |       |
| Transmitter and dispersion penalty Eye Closure for PAM4      | TDECQ          |                        |      | 3.4    | dB    |       |
| TDECQ – 10*log10(Ceq), each lane                             |                |                        |      | 3.4    | dB    | 3     |
| Extinction Ratio   | ER             | 3.5                    |      |        | dB    |       |
| Average Launch Power of OFF Transmitter per lane             |                |                        |      | -20    | dBm   |       |
| Transmitter transition time                                  |                |                        |      | 17     | ps    |       |
| RIN17.1 OMA  | RIN            |                        |      | -136   | dB/Hz |       |
| Optical Return Loss Tolerance                                |                |                        |      | 17.1   | dB    |       |
| Transmitter Reflectance                                      |                |                        |      | -26    | dB    | 4     |
| <b>Receiver</b>  |                |                        |      |        |       |       |
| PAM4 Signaling rate (range)                                  |                | 53.125 ± 100 ppm       |      |        | GBaud |       |
| Lane wavelength (range)                                      |                | 1304.5                 | 1311 | 1317.5 | nm    |       |
| Damage Threshold   |                | 5                      |      |        | dBm   | 5     |
| Average Receive Power  |                | -7.3                   |      | 3.5    | dBm   | 6     |
| Receive Power (OMAouter)                                     | RxOMAouter     |                        |      | 3.7    | dBm   |       |
| Difference in receive power between any two lanes (OMAouter) |                |                        |      | 4.1    | dB    |       |
| Receiver reflectance   |                |                        |      | -26    | dB    |       |
| Receiver sensitivity (OMAouter)                              |                | max(-4.6,SSSSSSSS-6.0) |      |        | dBm   | 7     |
| Stressed Receiver Sensitivity (OMAouter)                     |                |                        |      | -2.6   | dBm   | 8     |
| <b>Stressed Conditions for Stress Receiver Sensitivity</b>   |                |                        |      |        |       |       |
| Stressed eye closure for PAM4 (SECQ), lane under test        |                |                        |      | 3.4    | dB    |       |
| SECQ – 10*log10 (Ceq), lane under test (max)                 |                |                        |      | 3.4    | dB    | 9     |
| OMAouter of each aggressor lane                              |                | 1.5                    |      |        | dBm   |       |
| LOS Assert   |                | -30                    |      | -7.5   | dBm   |       |
| LOS De-Assert  |                | -29.5                  |      | -7.0   | dBm   |       |
| LOS Hysteresis   |                | 0.5                    |      |        | dB    |       |

**Notes:**

1. Average launch power, (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
2. Even if the TDECQ < 1.4 dB for an extinction ratio of  $\geq 4.5$ dB or TDECQ < 1.3 dB for an extinction ratio of < 4.5dB, the OMAouter (min) must exceed this value
3. Ceq is a coefficient defined in IEEE Std 802.3-2018 clause 121.8.5.3 which accounts for reference equalizer noise enhancement.
4. Transmitter reflectance is to look into the transmitter.
5. The receiver shall be able to tolerate, without damage, continuous exposure to an optical signal having this average power level. The receiver does not have to operate correctly at this input power.
6. Average receive power, (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
7. Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB. Receiver sensitivity should meet Equation:  $RRSS = \max(-4.6, SSSSSSS - 6.0) dddddd$ ,

Where:

RS is the receiver sensitivity, and

SECQ is the SECQ of the transmitter used to measure the receiver sensitivity. The normative requirement for receivers is stressed receiver sensitivity.

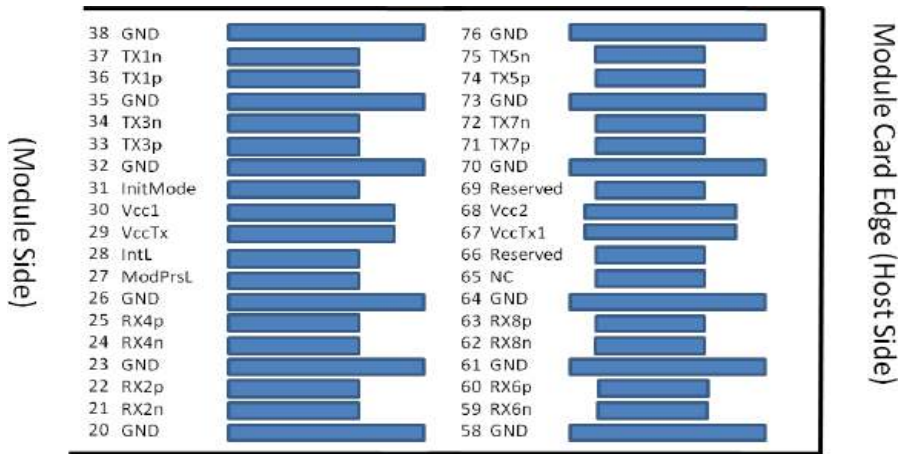
8. Measured with conformance test signal at TP3 for BER specified in IEEE Std 802.3-2018 clause 124.1.1
9. Ceq is a coefficient defined in IEEE Std 802.3-2018 clause 121.8.5.3 which accounts for reference equalizer noise enhancement.

## Pin Descriptions

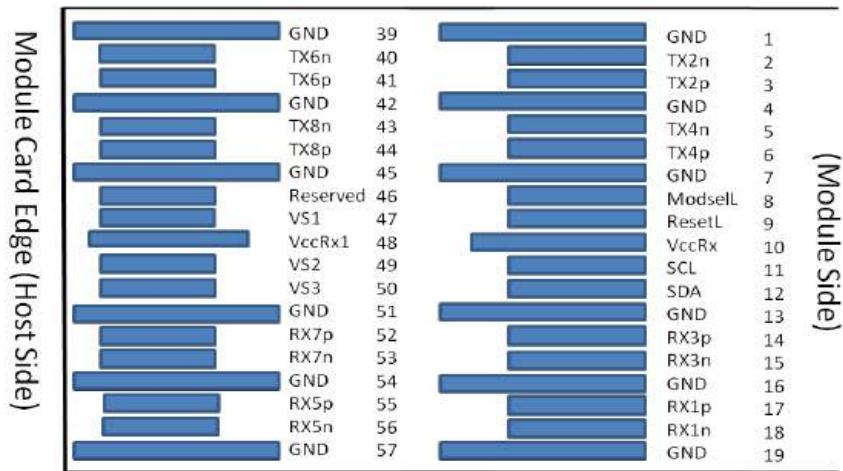
| Pin | Logic      | Symbol   | Name/Descriptions   | Plug Sequence |
|-----|------------|----------|---|---------------|
| 1   |            | GND      | Ground  | 1B            |
| 2   | CML-I      | Tx2n     | Transmitter Inverted Data Input   | 3B            |
| 3   | CML-I      | Tx2p     | Transmitter Non-Inverted Data Input   | 3B            |
| 4   |            | GND      | Ground  | 1B            |
| 5   | CML-I      | Tx4n     | Transmitter Inverted Data Input   | 3B            |
| 6   | CML-I      | Tx4p     | Transmitter Non-Inverted Data Input   | 3B            |
| 7   |            | GND      | Ground  | 1B            |
| 8   | LVTTL-I    | ModSelL  | Module Select   | 3B            |
| 9   | LVTTL-I    | ResetL   | Module Reset  | 3B            |
| 10  |            | VccRx    | +3.3V Power Supply Receiver   | 2B            |
| 11  | LVCMOS-I/O | SCL      | 2-wire serial interface clock   | 3B            |
| 12  | LVCMOS-I/O | SDA      | 2-wire serial interface data  | 3B            |
| 13  |            | GND      | Ground  | 1B            |
| 14  | CML-O      | Rx3p     | Receiver Non-Inverted Data Output   | 3B            |
| 15  | CML-O      | Rx3n     | Receiver Inverted Data Output   | 3B            |
| 16  |            | GND      | Ground  | 1B            |
| 17  | CML-O      | Rx1p     | Receiver Non-Inverted Data Output   | 3B            |
| 18  | CML-O      | Rx1n     | Receiver Inverted Data Output   | 3B            |
| 19  |            | GND      | Ground  | 1B            |
| 20  |            | GND      | Ground  | 1B            |
| 21  | CML-O      | Rx2n     | Receiver Inverted Data Output   | 3B            |
| 22  | CML-O      | Rx2p     | Receiver Non-Inverted Data Output   | 3B            |
| 23  |            | GND      | Ground  | 1B            |
| 24  | CML-O      | Rx4n     | Receiver Inverted Data Output   | 3B            |
| 25  | CML-O      | Rx4p     | Receiver Non-Inverted Data Output   | 3B            |
| 26  |            | GND      | Ground  | 1B            |
| 27  | LVTTL-O    | ModPrsL  | Module Present  | 3B            |
| 28  | LVTTL-O    | IntL     | Interrupt   | 3B            |
| 29  |            | VccTx    | +3.3V Power supply transmitter  | 2B            |
| 30  |            | Vcc1     | +3.3V Power supply  | 2B            |
| 31  | LVTTL-I    | InitMode | Initialization mode; In legacy QSFP applications, the InitMode pad is called LPMODE | 3B            |
| 32  |            | GND      | Ground  | 1B            |
| 33  | CML-I      | Tx3p     | Transmitter Non-Inverted Data Input   | 3B            |
| 34  | CML-I      | Tx3n     | Transmitter Inverted Data Input   | 3B            |
| 35  |            | GND      | Ground  | 1B            |
| 36  | CML-I      | Tx1p     | Transmitter Non-Inverted Data Input   | 3B            |
| 37  | CML-I      | Tx1n     | Transmitter Inverted Data Input   | 3B            |
| 38  |            | GND      | Ground  | 1B            |
| 39  |            | GND      | Ground  | 1A            |
| 40  | CML-I      | Tx6n     | Transmitter Inverted Data Input   | 3A            |

|    |       |          |                                     |    |
|----|-------|----------|-------------------------------------|----|
| 41 | CML-I | Tx6p     | Transmitter Non-Inverted Data Input | 3A |
| 42 |       | GND      | Ground                              | 1A |
| 43 | CML-I | Tx8n     | Transmitter Inverted Data Input     | 3A |
| 44 | CML-I | Tx8p     | Transmitter Non-Inverted Data Input | 3A |
| 45 |       | GND      | Ground                              | 1A |
| 46 |       | Reserved | For future use                      | 3A |
| 47 |       | VS1      | Module Vendor Specific 1            | 3A |
| 48 |       | VccRx1   | 3.3V Power Supply                   | 2A |
| 49 |       | VS2      | Module Vendor Specific 2            | 3A |
| 50 |       | VS3      | Module Vendor Specific 3            | 3A |
| 51 |       | GND      | Ground                              | 1A |
| 52 | CML-O | Rx7p     | Receiver Non-Inverted Data Output   | 3A |
| 53 | CML-O | Rx7n     | Receiver Inverted Data Output       | 3A |
| 54 |       | GND      | Ground                              | 1A |
| 55 | CML-O | Rx5p     | Receiver Non-Inverted Data Output   | 3A |
| 56 | CML-O | Rx5n     | Receiver Inverted Data Output       | 3A |
| 57 |       | GND      | Ground                              | 1A |
| 58 |       | GND      | Ground                              | 1A |
| 59 | CML-O | Rx6n     | Receiver Inverted Data Output       | 3A |
| 60 | CML-O | Rx6p     | Receiver Non-Inverted Data Output   | 3A |
| 61 |       | GND      | Ground                              | 1A |
| 62 | CML-O | Rx8n     | Receiver Inverted Data Output       | 3A |
| 63 | CML-O | Rx8p     | Receiver Non-Inverted Data Output   | 3A |
| 67 |       | GND      | Ground                              | 1A |
| 68 |       | NC       | No Connect                          | 3A |
| 69 |       | Reserved | For future use                      | 3A |
| 70 |       | VccTx1   | 3.3V Power Supply                   | 2A |
| 71 |       | Vcc2     | 3.3V Power Supply                   | 2A |
| 72 |       | Reserved | For Future Use                      | 3A |
| 73 |       | GND      | Ground                              | 1A |
| 74 | CML-I | Tx7p     | Transmitter Non-Inverted Data Input | 3A |
| 75 | CML-I | Tx7n     | Transmitter Inverted Data Input     | 3A |
| 76 |       | GND      | Ground                              | 1A |

# QSFPDD Connector Pin Definition



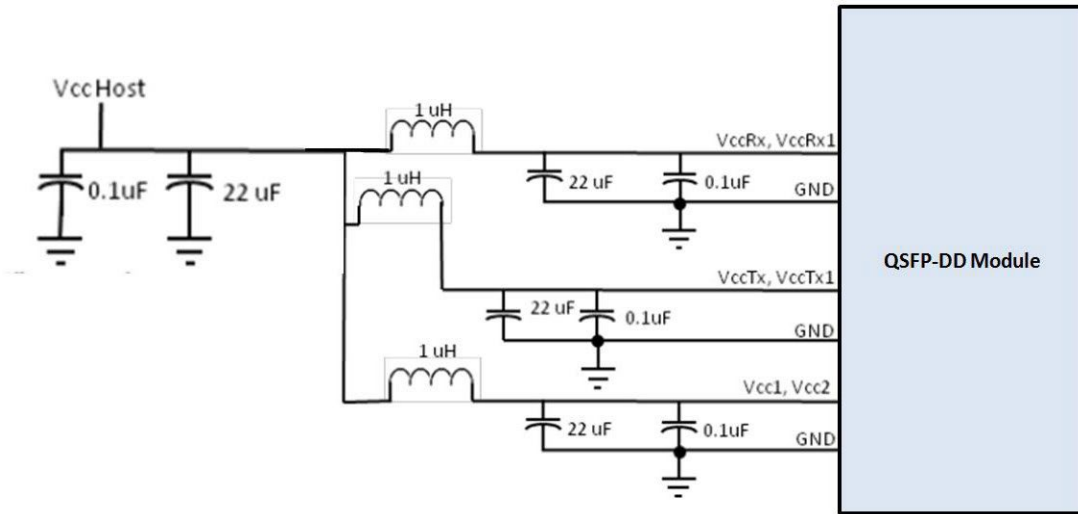
Top side viewed from top



Bottom side viewed from bottom



## Recommended Power Supply Filter



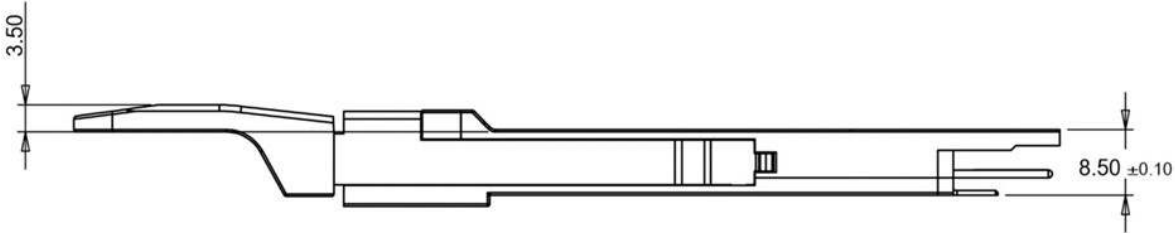
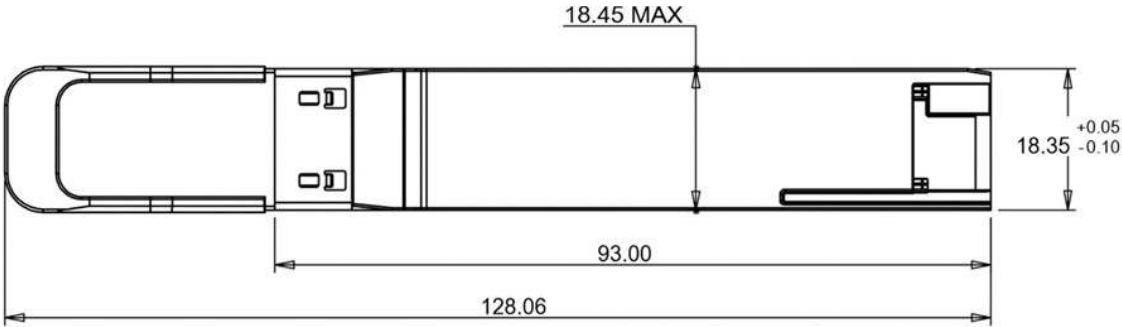
## Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the normal operating conditions unless otherwise specified.

| Parameter                    | Symbol       | Min  | Max | Units | Notes                     |
|------------------------------|--------------|------|-----|-------|---------------------------|
| Temperature monitor          | DMI_Temp     | -3   | 3   | degC  | 0-70 degC                 |
| Supply voltage monitor       | DMI_VCC      | -0.1 | 0.1 | V     | Over full operating range |
| Channel RX power monitor     | DMI_RX_Ch    | -2   | 2   | dB    |                           |
| Channel Bias current monitor | DMI_Ibias_Ch | -10% | 10% | mA    |                           |
| Channel TX power monitor     | DMI_TX_Ch    | -2   | 2   | dB    |                           |



**Mechanical Specifications**



## About ProLabs

Our experience comes as standard; for over 15 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with over 90 optical switching and transport platforms.

## Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 400G while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure that you get immediate answers to your questions and compatible product when needed. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



## Contact Information

ProLabs US

Email: [sales@prolabs.com](mailto:sales@prolabs.com)

Telephone: 952-852-0252

ProLabs UK

Email: [salessupport@prolabs.com](mailto:salessupport@prolabs.com)

Telephone: +44 1285 719 600