

## QDD-400G-DR4-S-C

Cisco® QDD-400G-DR4-S Compatible TAA 400GBase-DR4 QSFP-DD Transceiver (SMF, 1310nm, 500m, MPO, 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 and Enterprise

### Product Description

This Cisco® QDD-400G-DR4-S compatible QSFP-DD transceiver provides 400GBase-DR4 throughput up to 500m 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 | Notes |
|---|--------|------|-----------|------|-------|
| Maximum Power Supply Voltage            | VCC    | 0    | 3.6       | V    | 1, 2  |
| Storage Temperature                     | Ts     | -40  | +85       | °C   | 1, 2  |
| Low-speed Input                         | Vin    | -0.5 | Vcc + 0.3 | V    | 1, 2  |
| <b>Recommended Operating Conditions</b> |        |      |           |      |       |
| Case Operating Temperature              | Top    | 0    | +70       | °C   |       |
| Relative Humidity (non-condensing)      | RH     | 5    | 85        | %    |       |

### Notes:

1. Absolute Maximum Ratings are those beyond which damage to the device may occur.
2. Between the Recommended Operating conditions and Absolute Maximum ratings, prolonged operation is not intended, and permanent device degradation may occur.

## Electrical Characteristics

| Parameter                             | Symbol  | Min.    | Typ. | Max.    | Unit | Notes           |
|---------------------------------------|---|---------|------|---------|------|-----------------|
| Power Supply Voltage                  | Vcc   | 3.10    | 3.3  | 3.47    | V    |                 |
| Power Consumption                     |   |         |      | 10      | W    | 1               |
| <b>Low Speed Electrical Interface</b> |   |         |      |         |      |                 |
| Low Speed Outputs: ModPrsL, IntL      | VOL   | 0       |      | 0.4     | V    | Iol = 2mA       |
|                                       | VOH   | Vcc-0.5 |      | Vcc+0.3 | V    |                 |
| Low Speed Inputs: ModSelL, ResetL     | VIL   | -0.3    |      | 0.8     | V    |                 |
|                                       | VIH   | 2       |      | Vcc+0.3 | V    |                 |
| SCL, SDA Input                        | VIL   | -0.3    |      | Vcc*0.3 | V    |                 |
|                                       | VIH   | Vcc*0.7 |      | Vcc+0.5 | V    |                 |
| SCL, SDA Output                       | VOL   | 0       |      | 0.4     | V    |                 |
|                                       | VOH   | Vcc-0.5 |      | Vcc+0.3 | V    |                 |
| <b>ESD Specifications</b>             |   |         |      |         |      |                 |
| Electro-Static Discharge              | Human Body Model (HBM, MIL_STD 883 Method 3015.7) |         |      | 1000    | V    | high speed pins |
| Electro-Static Discharge              |   |         |      | 2000    | V    | all other pins  |

## High Speed Electrical Specifications

| Parameter   | Min  | Typ     | Max  | Units |
|---|------|---------|------|-------|
| <b>Module Electrical Input Characteristics</b>    |      |         |      |       |
| Signaling rate per lane $\pm$ 100 ppm             |      | 26.5625 |      | GBd   |
| Differential peak-to-peak input voltage tolerance | 900  |         |      | mV    |
| Differential termination mismatch                 |      |         | 10   | %     |
| Single-ended voltage tolerance range              | -0.4 |         | 3.3  | V     |
| DC common mode voltage                            | -350 |         | 2850 | mV    |
| <b>Module Electrical Output Characteristics</b>   |      |         |      |       |
| Signaling rate per lane $\pm$ 100 ppm             |      | 26.5625 |      | GBd   |
| AC common-mode output voltage RMS                 |      |         | 17.5 | mV    |
| Differential peak-to-peak output voltage          |      |         | 900  | mV    |
| Near-end eye symmetry mask width (ESMW)           |      | 0.265   |      | ul    |
| Near-end eye height, differential                 | 70   |         |      | mV    |
| Far-end eye symmetry mask width (ESMW)            |      | 0.2     |      | ul    |
| Far-end eye height, differential                  | 30   |         |      | mV    |
| Far-end pre-cursor ISI ratio                      | -4.5 |         | 2.5  | %     |
| Differential termination mismatch                 |      |         | 10   | %     |
| Transition time, 20-80%                           | 9.5  |         |      | ps    |
| DC common mode voltage                            | -350 |         | 2850 | mV    |

## Optical Characteristics

| Parameter  | Symbol              | Min.   | Typ.   | Max.   | Unit  | Notes |
|--|---------------------|--------|--------|--------|-------|-------|
| <b>Transmitter</b>   |                     |        |        |        |       |       |
| PAM4 Signaling rate, each lane ( $\pm 100$ ppm)            | Boptic              |        | 53.125 |        | GBd   |       |
| Lane Wavelength  | $\lambda_0$         | 1304.5 |        | 1317.5 | nm    |       |
| Side-mode Suppression ratio                                | SMSR                | 30     |        |        | dB    |       |
| Average Launch Power                                       | PAVG                | -2.9   |        | 4.0    | dBm   | 1     |
| Optical Modulation Amplitude (OMA <sub>outer</sub> )       | POMA                | -0.8   |        | 4.2    | dBm   |       |
| Launch Power in OMA minus TDECQ                            |                     | -2.2   |        |        | dB    |       |
| Transmitter and Dispersion Eye Closure for PAM4, each lane | TDECQ               |        |        | 3.4    | dB    | 2     |
| Average Launch Power OFF Transmitter, each lane            | Poff                |        |        | -15    | dBm   |       |
| Extinction Ratio, each lane                                | ER                  | 3.5    |        |        | dB    |       |
| Optical Return Loss Tolerance                              |                     |        |        | 21.4   | dB    |       |
| Transmitter Reflectance                                    | RL                  |        |        | -26    | dB    |       |
| RIN <sub>21.4</sub> OMA                                    |                     |        |        | -136   | dB/Hz |       |
| <b>Receiver</b>  |                     |        |        |        |       |       |
| PAM4 Signaling rate, each lane ( $\pm 100$ ppm)            | Boptic              |        | 53.125 |        | GBd   |       |
| Lane Wavelength  | $\lambda_0$         | 1304.5 |        | 1317.5 | nm    |       |
| Damage Threshold   | THd                 | 5      |        |        | dBm   | 3     |
| Average Receive power                                      | ROP                 | -5.9   |        | 4      | dBm   | 4     |
| Receiver Power (OMA <sub>outer</sub> )                     |                     |        |        | 4.2    | dBm   |       |
| Receiver Reflectance                                       | RR                  |        |        | -26    | dB    |       |
| Receiver Sensitivity (OMA <sub>outer</sub> )               |                     |        |        | -4.4   | dBm   |       |
| Stressed Receiver Sensitivity (OMA <sub>outer</sub> )      | SRS <sub>mask</sub> |        |        | -1.9   | dBm   | 5     |
| <b>Stressed Conditions for Stress Receiver Sensitivity</b> |                     |        |        |        |       |       |
| Stressed eye closure for PAM4 (SECQ), lane under test      | SECQ                | 0.9    |        | 3.4    | dB    |       |
| OMA <sub>outer</sub> of each aggressor lane                |                     |        |        | 4.2    | dBm   |       |
| Rx_LOS Assert Level  | LOSA                | -16    |        |        | dBm   |       |
| Rx_LOS De-Assert Level                                     | LOSD                |        |        | -7.5   | dBm   |       |
| Rx_LOS Hysteresis  | LOSHys              | 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. Transmitter reflectance is defined looking into the transmitter.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical signal having this average power level.
4. 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.

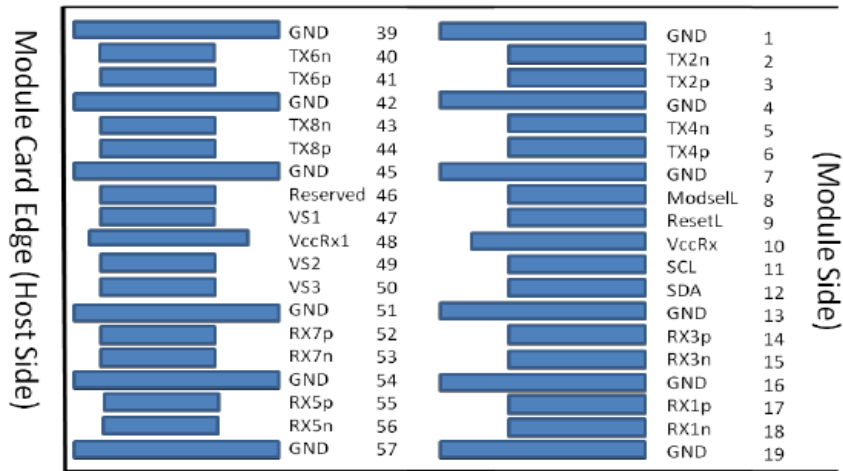
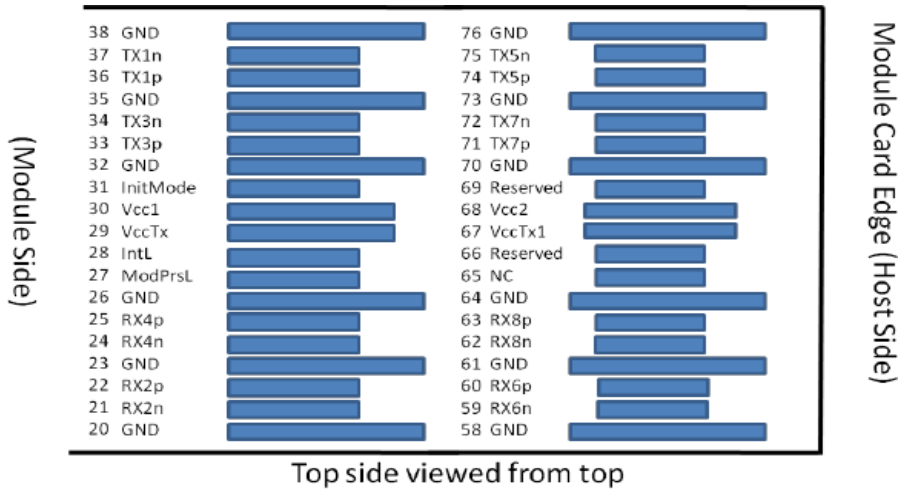
5. Measured with conformance test signal at TP3 for BER =  $2.4 \times 10^{-4}$ . A compliant receiver shall have stressed receiver sensitivity (OMA outer), each lane values below the mask, for SECQ values between 0.9 and 3.4 dB.

### Pin Descriptions

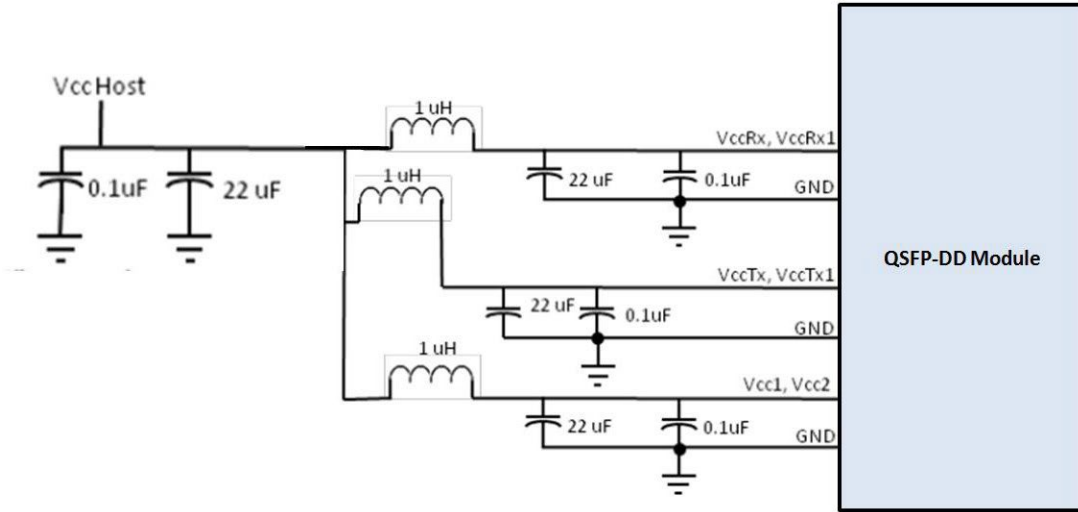
| Pin | Logic       | Symbol   | Name/Descriptions   | Plug Sequence |
|-----|-------------|----------|---|---------------|
| 1   |             | GND      | Ground  | 1B            |
| 2   | CML-I       | Tx2n     | Transmitter Inverted Data Input   | 3B            |
| 3   | CML-I       | Tx2p     | 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  | LVC MOS-I/O | SCL      | 2-wire serial interface clock   | 3B            |
| 12  | LVC MOS-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



## Recommended Power Supply Filter



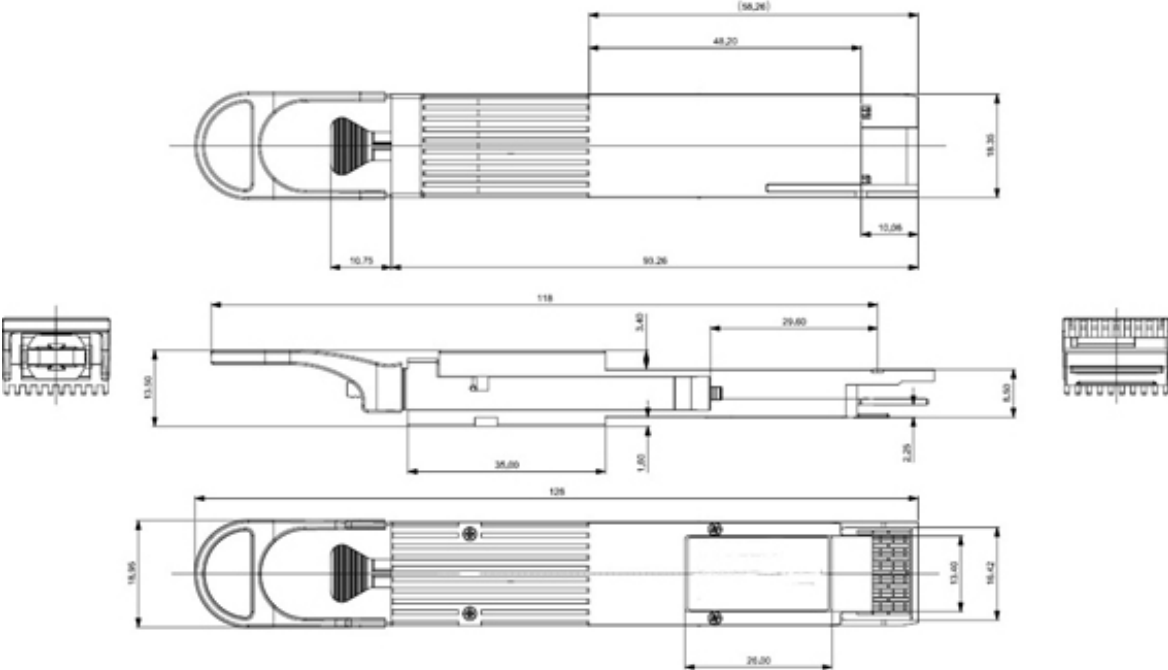
## Digital Diagnostic Functions

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

| Parameter                             | Accuracy    |
|---------------------------------------|-------------|
| Module Monitor 1: Temperature         | $\pm 3$ C   |
| Module Monitor 2: Supply 3.3 voltage  | $\pm 0.1$ V |
| Lane Monitor: TX output optical power | $\pm 3$ dB  |
| Lane Monitor: TX bias current         | $\pm 10$ %  |
| Lane Monitor: RX input optical power  | $\pm 3$ 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.



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