

QDD-400GB-VSR4-OPC

MSA and TAA 400GBase-SR4 PAM4 112G QSFP-DD Transceiver (MMF, 850nm, 50m, MPO-12, DOM, CMIS 4.0)

Features

- 53.125 GBd PAM4 4 channel 400G-SR4 Optical interface
- 26.5625 GBd PAM4 8 channel 400G AUI-8 C2M Electrical interface
- Compliant with IEEE 802.3ck and IEEE 802.3db
- QSFP-DD MSA package with MPO-12 APC
- Multi-mode Fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- CMIS Rev4.0
- RoHS Compliant and Lead Free



Applications:

- 400GBase Ethernet
- Datacenter switch

Product Description

This MSA compliant QSFP-DD transceiver provides 400GBase-SR4 throughput up to 50m over multi-mode fiber (MMF) PAM4 112G using a wavelength of 850nm via an MPO-12 connector. It can operate at temperatures between 0 and 70C. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows 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.

Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|-----------------------------|--------|------|------|------|------|-------|
| Maximum Supply Voltage | Vcc | 3.1 | 3.3 | 3.5 | V | |
| Storage Temperature | Tstg | -40 | | 85 | °C | |
| Operating Case Temperature | Tc | 0 | | 70 | °C | |
| Operating Relative Humidity | RH | 5 | | 85 | % | 1 |
| Optical Input Power | PIN | | | 5 | dBm | |

Notes:

1. Non-condensing.

Electrical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|--|--------|--------|------|-------|------|-------|
| Module Supply Voltage | VCC | 3.135 | 3.3 | 3.465 | V | |
| Supply Current | ICC | | | 2640 | mA | |
| Module Power Dissipation | P | | | 8 | W | |
| Transmitter | | | | | | |
| Differential Input Impedance | ZIN | | 100 | | Ω | |
| Receiver | | | | | | |
| Differential output Impedance | Zos | 90 | 100 | 110 | Ω | |
| Common-Mode to Differential-Mode Return Loss | RLdc | Note 1 | | | dB | |
| Transition Time, 20 to 80% | Tr, Tf | 8.5 | | | ps | |

Notes:

1.
$$RLdc(f) \geq \begin{cases} 25 - 22(f/53.125) & 0.05 \leq f \leq 26.56 \\ 19 - 10(f/53.125) & 26.56 < f \leq 50 \end{cases}$$

Optical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|--|-------------|---|---------|-------------------|------------|-------|
| Transmitter | | | | | | |
| Optical Data Rate per channel (PAM4) | DR | | 53.125 | | GBd | |
| Frequency Tracking | Ft | -100 | | 100 | ppm | |
| Center Wavelength | λ_C | 844 | 850 | 863 | nm | |
| RMS Spectral Width | | | | 0.6 | nm | 1 |
| Laser Off Power | Poff | | | -30 | dBm | |
| Average Optical Power | Pavg | -4.6 | | 4 | dBm | |
| Extinction Ratio | ER | 2.5 | | | dB | |
| Transmitter and Dispersion Eye Closure | TDECQ | | | 4.4 | dB | |
| Outer Optical Modulation Amplitude | OMAouter | -2.6 | | 3.5 | dBm | 2 |
| Encircled Flux, Each Lane | | $\geq 86\% @ 19 \mu\text{m}$ $\leq 30\% @ 4.5 \mu\text{m}$ | | | dB | 3 |
| Optical Return Loss Tolerance | ORLT | | | 14 | dB | |
| Receiver | | | | | | |
| Electrical Data Rate Per Channel (PAM4) | DR | | 26.5625 | | GBd | |
| Frequency Tracking | Ft | -100 | | 100 | ppm | |
| Center Wavelength | λ_r | 842 | 850 | 948 | nm | |
| Damage Threshold | | 5 | | | dBm | |
| Average Receive Power | | -6.4 | | 4 | dBm | 4 |
| Receiver Reflectance | | | | -15 | dB | |
| Differential Data Output Voltage Peak to Peak Swing | Vopp | 600 | | 845 | mV | |
| Receiver Sensitivity (OMAouter) (max) For $\text{TECQ} \leq 1.8\text{dB}$ For $1.8\text{dB} < \text{TECQ} \leq 4.4\text{dB}$ | RS | | | -4.6 -6.4+TECQ | dBm dBm | |
| Eye Height | EH | 15 | | | mV | |
| Vertical Eye Closure | VEC | | | 12 | dB | |

Notes:

1. RMS spectral width is the standard deviation of the spectrum.
2. Even if the TDECQ<1.8dB, the OMA (min) must exceed this value.
3. If measured into type A1a.2, type A1a.3 or type A1a.4, 50 μm fiber, in accordance with IEC 61280-1-4.
4. Average receive power, each lane (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.
Receiver sensitivity is informative and is defined for a transmitter with a value of SECQ up to 4.6dB.

Pin Descriptions

| Pin | Logic | Symbol | Name/Descriptions | Notes |
|-----|-------------|----------|--|-------|
| 1 | | GND | Ground | |
| 2 | CML-I | Tx2n | Transmitter Inverted Data Input | |
| 3 | CML-I | Tx2p | Transmitter Non-Inverted Data Input | |
| 4 | | GND | Ground | 1 |
| 5 | CML-I | Tx4n | Transmitter Inverted Data Input | |
| 6 | CML-I | Tx4p | Transmitter Non-Inverted Data Input | |
| 7 | | GND | Ground | 1 |
| 8 | LVTTTL-I | ModSelL | Module Select | |
| 9 | LVTTTL-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 | 1 |
| 14 | CML-O | Rx3n | Transmitter Inverted Data Output | |
| 15 | CML-O | Rx3p | Transmitter Non-Inverted Data Output | |
| 16 | | GND | Ground | 1 |
| 17 | CML-O | Rx1n | Transmitter Inverted Data Output | |
| 18 | CML-O | Rx1p | Transmitter Non-Inverted Data Output | |
| 19 | | GND | Ground | 1 |
| 20 | | GND | Ground | 1 |
| 21 | CML-O | Rx2n | Transmitter Inverted Data Output | |
| 22 | CML-O | Rx2p | Transmitter Non-Inverted Data Output | |
| 23 | | GND | Ground | 1 |
| 24 | CML-O | Rx4n | Transmitter Inverted Data Output | |
| 25 | CML-O | Rx4p | Transmitter Non-Inverted Data Output | |
| 26 | | GND | Ground | 1 |
| 27 | LVTTTL-O | ModPrsL | Module Present | |
| 28 | LVTTTL-O | IntL | Interrupt | |
| 29 | | VccRx | 3.3V Power Supply Transmitter | 2 |
| 30 | | Vcc I | 3.3V Power Supply | 2 |
| 31 | LVTTTL-I | InitMode | Initialization mode. In legacy QSFP applications, the InitMode pad is called LPMODE. | |
| 32 | | GND | Ground | 1 |
| 33 | CML-I | Tx1n | Transmitter Inverted Data Input | |
| 34 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | |
| 35 | | GND | Ground | 1 |
| 36 | CML-I | Tx1n | Transmitter Inverted Data Input | |

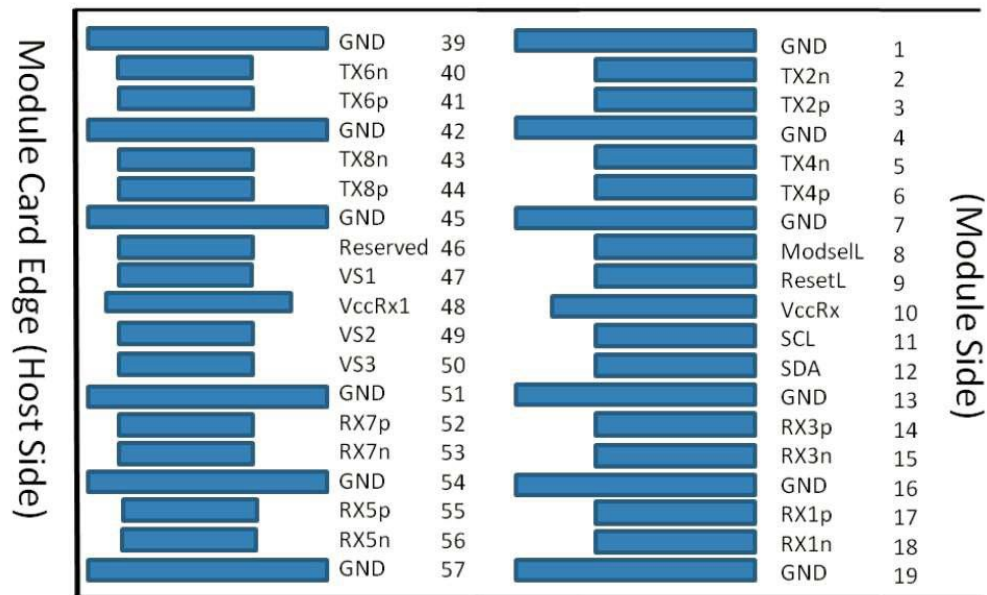
| | | | | |
|----|-------|----------|--------------------------------------|---|
| 37 | CML-I | Tx1p | Transmitter Non-Inverted Data Input | |
| 38 | | GND | Ground | 1 |
| 39 | | GND | Ground | 1 |
| 40 | CML-I | Tx6n | Transmitter Inverted Data Input | |
| 41 | CML-I | Tx6p | Transmitter Non-Inverted Data Input | |
| 42 | | GND | Ground | 1 |
| 43 | CML-I | Tx8n | Transmitter Inverted Data Input | |
| 44 | CML-I | Tx8p | Transmitter Non-Inverted Data Input | |
| 45 | | GND | Ground | 1 |
| 46 | | Reserved | NC | 3 |
| 47 | | VS1 | NC | 3 |
| 48 | | VccRx1 | 3.3V Power Supply | 2 |
| 49 | | VS2 | NC | 3 |
| 50 | | VS3 | NC | 3 |
| 51 | | GND | Ground | 1 |
| 52 | CML-O | Rx7n | Transmitter Inverted Data Output | |
| 53 | CML-O | Rx7p | Transmitter Non-Inverted Data Output | |
| 54 | | GND | Ground | 1 |
| 55 | CML-O | Rx5n | Transmitter Inverted Data Output | |
| 56 | CML-O | Rx5p | Transmitter Non-Inverted Data Output | |
| 57 | | GND | Ground | 1 |
| 58 | | GND | Ground | 1 |
| 59 | CML-O | Rx6n | Transmitter Inverted Data Output | |
| 60 | CML-O | Rx6p | Transmitter Non-Inverted Data Output | |
| 61 | | GND | Ground | 1 |
| 62 | CML-O | Rx8n | Transmitter Inverted Data Output | |
| 63 | CML-O | Rx8p | Transmitter Non-Inverted Data Output | |
| 64 | | GND | Ground | 1 |
| 65 | | NC | NC | 3 |
| 66 | | Reserved | NC | 3 |
| 67 | | VccTx1 | 3.3V Power Supply | 2 |
| 68 | | Vcc2 | 3.3V Power Supply | 2 |
| 69 | | Reserved | NC | 3 |
| 70 | | GND | Ground | 1 |
| 71 | CML-I | Tx7n | Transmitter Inverted Data Input | |
| 72 | CML-I | Tx7p | Transmitter Non-Inverted Data Input | |
| 73 | | GND | Ground | 1 |
| 74 | CML-I | Tx5n | Transmitter Inverted Data Input | |
| 75 | CML-I | Tx5p | Transmitter Non-Inverted Data Input | |

| | | | | |
|----|--|-----|--------|---|
| 76 | | GND | Ground | 1 |
|----|--|-----|--------|---|

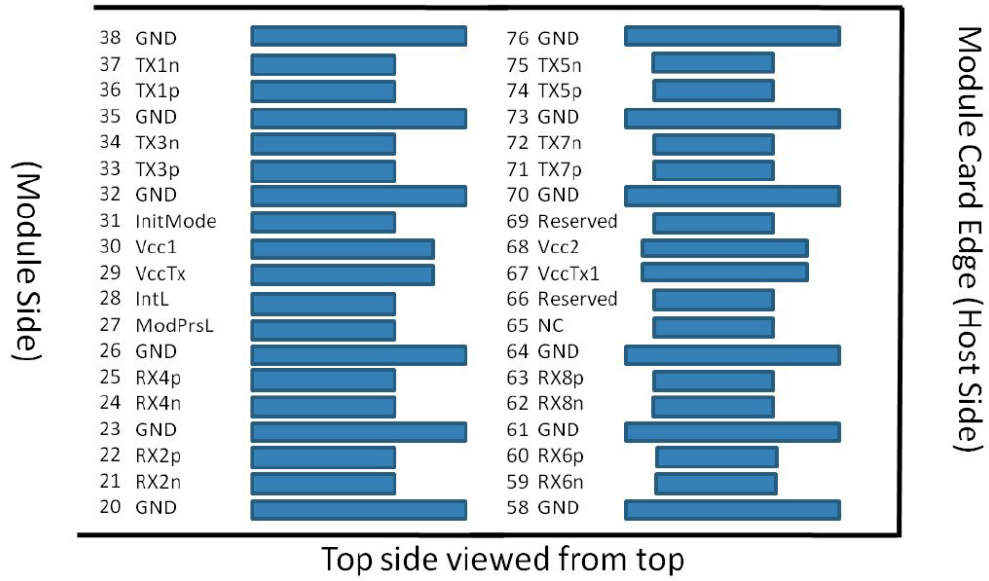
Notes:

1. QSFP-DD uses common ground (GND) for all signals and supply (power). All are common within the QSFP-DD 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, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 shall be applied concurrently. Requirements defined for the host side of the Host Card Edge Connector are listed in Table 6. VccRx, VccRx1, Vcc1, Vcc2, VccTx and VccTx1 may be internally connected within the module in any combination. The connector Vcc pins are each rated for a maximum current of 1000mA.
3. All Vendor Specific, Reserved and No Connect pins may be terminated with 50 ohms to ground on the host. Pad 65 (No Connect) shall be left unconnected within the module. Vendor specific and reserved pads shall have an impedance to GND that is greater than 10kΩ and less than 100pF.
4. Plug Sequence specifies the mating sequence of the host connector and module. The sequence is 1A, 2A, 3A, 1B, 2B, 3B. (see Figure 2 for pad locations) Contact sequence A will make, then break contact with additional QSFP-DD pads. Sequence 1A, 1B will then occur simultaneously, followed by 2A, 2B, followed by 3A, 3B.

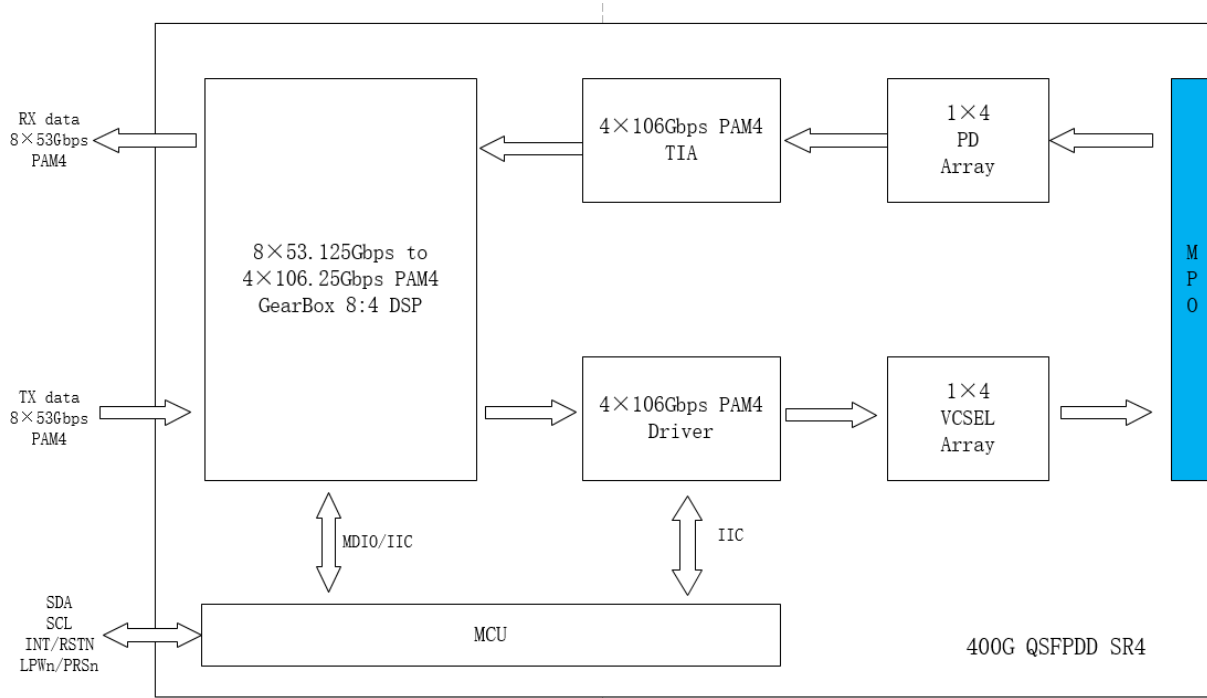
Electrical Pin-Out Details



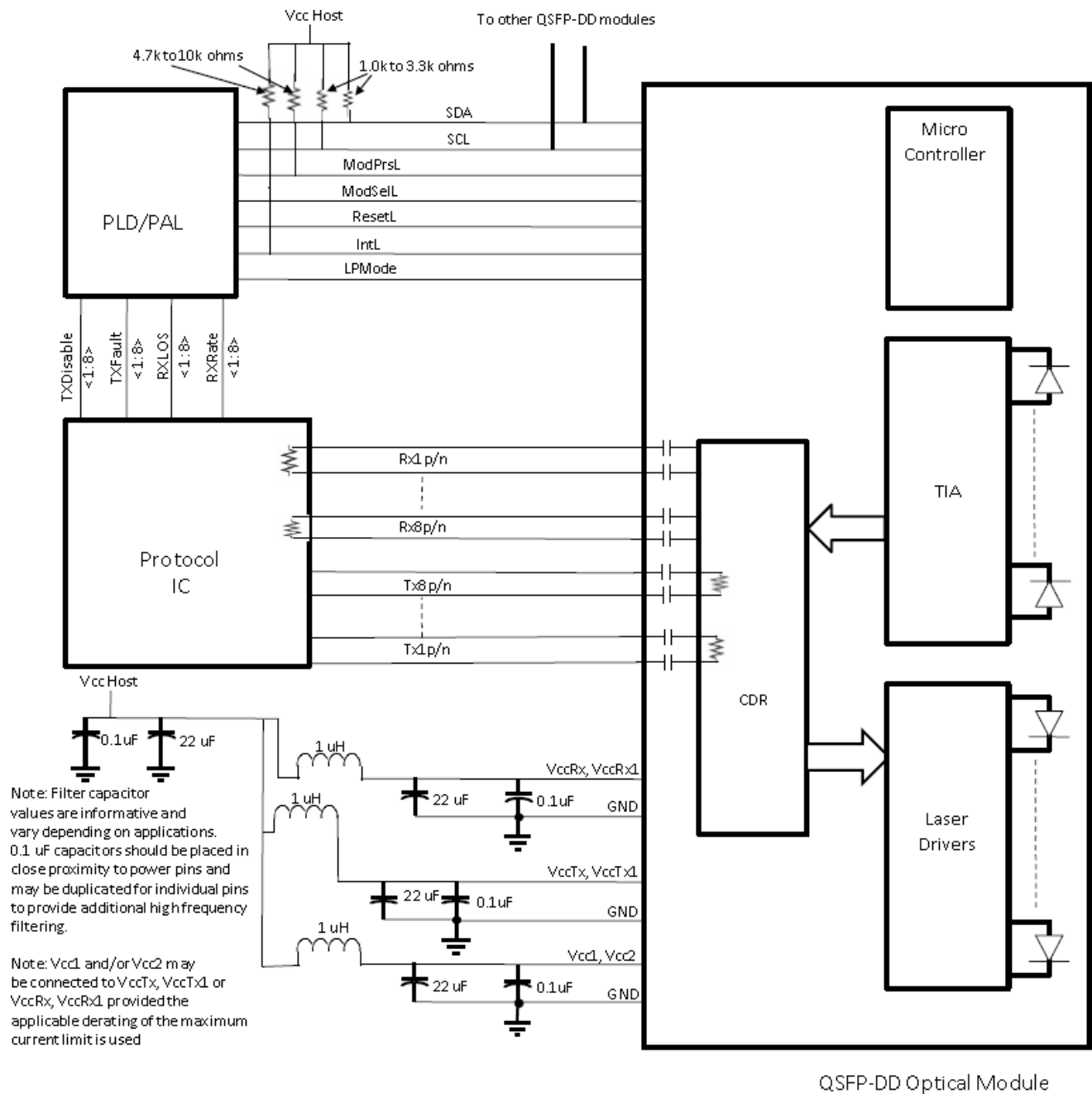
Bottom side viewed from bottom



Transceiver Block Diagram



Recommended Interface Circuit



Mechanical Specifications

