**MMS1V70-CM-AO-V2**

Mellanox® MMS1V70-CM Compatible TAA Compliant 100GBase-DR QSFP28 Single Lambda Transceiver (SMF, 1310nm, 500m, LC, DOM, with FEC)

**Features**

- QSFP28 MSA Compliance
- Single-mode Fiber
- Duplex LC Connector
- Hot Pluggable
- Metal with Lower EMI
- Commercial Temperature 0 to 70 Celsius
- RoHS Compliant and Lead-Free
- Excellent ESD Protection

**Applications**

- 100GBase-DR Ethernet
- Access and Enterprise

**Product Description**

This Mellanox® MMS1V70-CM compatible QSFP28 transceiver provides 100GBase-DR throughput up to 500m over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Mellanox® 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.

AddOn's 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."

TAA COMPLIANT

**Absolute Maximum Ratings**

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Maximum Supply Voltage** | Vcc | -0.5 | | 3.6 | V | |
| **Storage Temperature** | Tstg | -40 | | +85 | ℃ | |
| **Operating Case Temperature** | Tc | 0 | | 70 | ℃ | |
| **Relative Humidity (Non-Condensing)** | RH | 0 | | 85 | % | |
| **Damage Threshold** | THd | 5 | | | dBm | |
| **Data Input Voltage Differential (Pk-Pk)** | Vpp | 100 | | 900 | mV | |
| **Power Supply Noise** | Vn | | | 66 | mV | |
| **Electrical Data Rate Per Lane (NRZ)** | | | 25.78125 | | Gbps | |
| **Optical Data Rate (PAM4)** | | | 53.125 | | GBd | |
| **Data Rate Accuracy** | | -100 | | 100 | ppm | |
| **Pre-FEC Bit Error Ratio** | | | | $2.4x10^{-4}$ | | |
| **Post-FEC Bit Error Ratio** | | | | $1x10^{-12}$ | | 1 |
| **Control Input Voltage - High** | | 2 | | Vcc | V | |
| **Control Input Voltage - Low** | | 0 | | 0.8 | V | |
| **Link Distance with G.652** | D | .002 | | 500 | m | 2 |

**Notes:**

1. FEC feature is embedded in the module.

2. FEC is required to be turned on to support the maximum transmission distance.

**Electrical Characteristics**

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Power Supply Voltage** | Vcc | 3.135 | 3.3 | 3.465 | V | |
| **Power Consumption** | | | | 3.5 | W | |
| **Supply Current** | Icc | | | 1.06 | A | |
| **Power Supply Ripple** | | | | 15 | mV | |
| **Transmitter (Per Lane)** | | | | | | |
| **Overload Differential Voltage (Pk-Pk)** | TP1a | 900 | | | mV | |
| **Common-Mode Voltage (Vcm)** | TP1 | -350 | | 2850 | mV | 1 |
| **Differential Termination Resistance Mismatch** | TP1 | | | 10 | % | At 1MHz |
| **Differential Return Loss (SDD11)** | TP1 | | | See CEI- 28G-VSR Equation 13-19 | dB | |
| **Common-Mode to Differential Conversion and Differential to Common-Mode Conversion (SDC11, SCD11)** | TP1 | | | See CEI- 28G-VSR Equation 13-20 | dB | |
| **Stressed Input Test** | TP1a | See CEI- 28G-VSR Section 3.3.11.2.1 | | | | |
| **Input AC Coupling Capacitor** | TP1a | | 0.1 | | µF | |
| **Receiver (Per Lane)** | | | | | | |
| **Differential Voltage (Pk-Pk)** | TP4 | | | 900 | mV | |
| **Differential Load** | TP4 | | 100 | | Ω | |
| **Common-Mode Voltage (Vcm)** | TP4 | -350 | | 2850 | mV | 1 |
| **Common-Mode Noise (RMS)** | TP4 | | | 17.5 | mV | |
| **Differential Termination Resistance Mismatch** | TP4 | | | 10 | % | At 1MHz |
| **Differential Return Loss (SDD22)** | TP4 | | | See CEI- 28G-VSR Equation 13-19 | dB | |
| **Common-Mode to Differential Conversion and Differential to Common-Mode Conversion (SDC22, SCD22)** | TP4 | | | See CEI- 28G-VSR Equation 13-21 | dB | |
| **Common-Mode Return Loss (SCC22)** | TP4 | | | -2 | dB | 2 |
| **Transition Time (20-80%)** | TP4 | 12 | | | ps | |
| **Vertical Eye Closure (VEC)** | TP4 | | | 5.5 | dB | |
| **Eye Width at $10^{-15}$ Probability (EW15)** | TP4 | 0.57 | | | UI | |
| **Eye Height at $10^{-15}$ Probability (EH15)** | TP4 | 228 | | | mV | |
| **Output AC Coupling Capacitor** | TP4 | | 0.1 | | µF | |

**Notes:**

1. Vcm is generated by the host. Specification includes the effects of ground offset voltage.
2. From 250MHz to 30GHz.

**Optical Characteristics**

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Transmitter** | | | | | | |
| **Center Wavelength** | λT | 1304.5 | | 1317.5 | nm | |
| **Side-Mode Suppression Ratio** | SMSR | 30 | | | dB | |
| **Average Launch Power** | $P_{avg}$ | -2.4 | | 4 | dBm | 1 |
| **Outer Optical Modulation Amplitude (OMAouter)** | POMA | -0.8 | | 4.2 | dBm | 2 |
| **Launch Power in $OMA_{outer}$ Minus TDECQ**<br>**For ER≥5dB**<br>**For ER<5dB** | | <br>-2.2<br>-1.9 | | | dBm | |
| **Transmitter and Dispersion Eye Closure for PAM4 (TDECQ)** | TDECQ | | | 3.4 | dB | |
| **TDECQ – $10*log_{10}(C_{eq})$** | | | | 3.4 | dB | 3 |
| **Extinction Ratio** | ER | 3.5 | | | dB | |
| **$RIN_{15.5}OMA$** | RIN | | | -136 | dB/Hz | |
| **Optical Return Loss Tolerance** | TOL | | | 15.5 | dB | |
| **Transmitter Reflectance** | $R_T$ | | | -26 | dB | |
| **Transmitter Transition Time** | | | | 17 | ps | |
| **Average Launch Power of Off Transmitter** | Poff | | | -15 | dBm | |
| **LOS Assert Level** | LOSA | | 50 | | mV | 4 |
| **LOS De-Assert Level** | LOSD | | 100 | | mV | |
| **Receiver** | | | | | | |
| **Center Wavelength** | λR | 1304.5 | | 1317.5 | nm | |
| **Damage Threshold** | $TH_d$ | 5 | | | dBm | 5 |
| **Average Receive Power** | | -5.9 | | 4 | dBm | 6 |
| **Receive Power ($OMA_{outer}$)** | | | | 4.2 | dBm | |
| **Receiver Sensitivity ($OMA_{outer}$)** | SEN | | | Equation (1) | dBm | 7 |
| **Stressed Receiver Sensitivity ($OMA_{outer}$)** | SRS | | | -1.9 | dBm | 8 |
| **Receiver Reflectance** | $R_R$ | | | -26 | dB | |
| **LOS Assert** | LOSA | -15 | | | dBm | 9 |
| **LOS De-Assert** | LOSD | | | -8.9 | dBm | |
| **LOS Hysteresis** | LOSH | 0.5 | | | dB | |
| **Conditions of Stressed Receiver Sensitivity Test (Note 8)** | | | | | | |
| **Stressed Eye Closure for PAM4 (SECQ)** | | | 3.4 | | dB | |
| **SECQ – $10*log_{10}(C_{eq})$** | | | | 3.4 | dB | |

**Notes:**

1. Average launch power (minimum) 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<1.4dB for an extinction ratio of ≥5dB or TDECQ<1.1dB for an extinction ratio of <5dB, the OMAouter (minimum) must exceed the minimum value specified here.
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. Average receive power (minimum) 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. 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.
6. Receiver sensitivity (OMAouter) (maximum) is informative and is defined for a transmitter with a value of SECQ up to 3.4dB. It should meet Equation (1), which is illustrated in the figure below:

$$RS = \max(-3.9, SECQ - 5.3)\ dBm \quad (1)$$

Where:

RS is the receiver sensitivity, and
SECQ is the SECQ of the transmitter used to measure the receiver sensitivity.

7. Measured with conformance test signal at TP3 for the BER equal to $2.4 \times 10^{-4}$.
8. These test conditions are for measuring stressed receiver sensitivity. They are not characteristics of the receiver.

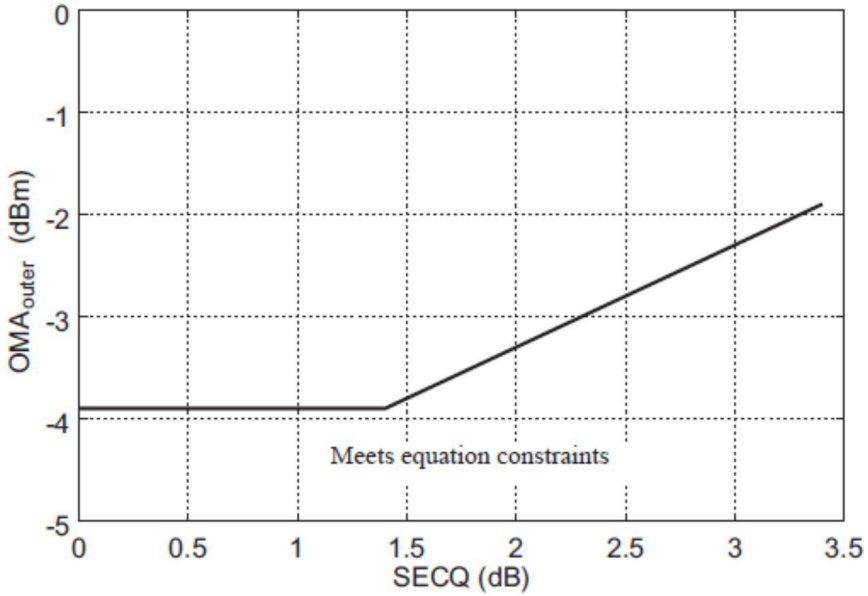



**Illustration of Receiver Sensitivity Mask for 100G-DR**

**Pin Descriptions**

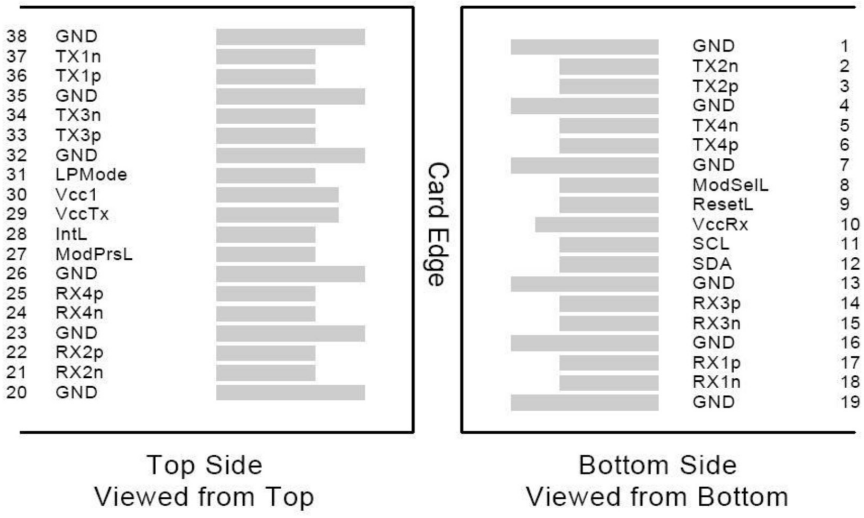
| Pin | Logic | Symbol | Name/Description | Notes |
|---|---|---|---|---|
| **1** | | GND | Module Ground. | 1 |
| **2** | CML-I | Tx2- | Transmitter Inverted Data Input. | |
| **3** | CML-I | Tx2+ | Transmitter Non-Inverted Data Input. | |
| **4** | | GND | Module Ground. | 1 |
| **5** | CML-I | Tx4- | Transmitter Inverted Data Input. | |
| **6** | CML-I | Tx4+ | Transmitter Non-Inverted Data Input. | |
| **7** | | GND | Module Ground. | 1 |
| **8** | LVTTL-I | ModSelL | Module Select. | |
| **9** | LVTTL-I | ResetL | Module Reset. | |
| **10** | | VccRx | +3.3V Receiver Power Supply. | 2 |
| **11** | LVCMOS-I | SCL | 2-Wire Serial Interface Clock. | |
| **12** | LVCMOS-I/O | SDA | 2-Wire Serial Interface Data. | |
| **13** | | GND | Module Ground. | 1 |
| **14** | CML-O | Rx3+ | Receiver Non-Inverted Data Output. | |
| **15** | CML-O | Rx3- | Receiver Inverted Data Output. | |
| **16** | | GND | Module Ground. | 1 |
| **17** | CML-O | Rx1+ | Receiver Non-Inverted Data Output. | |
| **18** | CML-O | Rx1- | Receiver Inverted Data Output. | |
| **19** | | GND | Module Ground. | 1 |
| **20** | | GND | Module Ground. | 1 |
| **21** | CML-O | Rx2- | Receiver Inverted Data Output. | |
| **22** | CML-O | Rx2+ | Receiver Non-Inverted Data Output. | |
| **23** | | GND | Module Ground. | 1 |
| **24** | CML-O | Rx4- | Receiver Inverted Data Output. | |
| **25** | CML-O | Rx4+ | Receiver Non-Inverted Data Output. | |
| **26** | | GND | Module Ground. | 1 |
| **27** | LVTTL-O | ModPrsL | Module Present. Internally pulled down to the GND. | |
| **28** | LVTTL-O | IntL | Interrupt Output. Should be pulled up on the host board. | |
| **29** | | VccTx | +3.3V Transmitter Power Supply. | 2 |
| **30** | | Vcc1 | +3.3V Power Supply. | 2 |
| **31** | LVTTL-I | LPMode | Low-Power Mode. | |
| **32** | | GND | Module Ground. | 1 |
| **33** | CML-I | Tx3+ | Transmitter Non-Inverted Data Input. | |
| **34** | CML-I | Tx3- | Transmitter Inverted Data Input. | |
| **35** | | GND | Module Ground. | 1 |

| | | | | |
|---|---|---|---|---|
| **36** | CML-I | Tx1+ | Transmitter Non-Inverted Data Input. | |
| **37** | CML-I | Tx1- | Transmitter Inverted Data Input. | |
| **38** | | GND | Module Ground. | 1 |

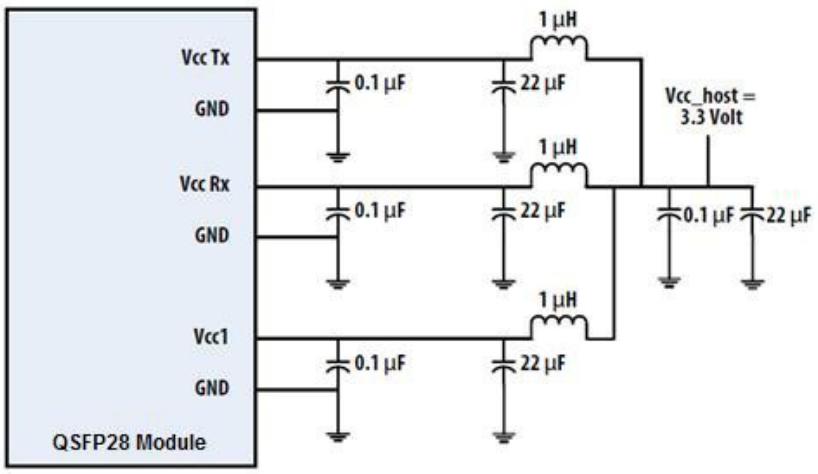
**Notes:**

1. GND is the symbol for signal and supply (power) common for the QSFP28 module. 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. Open collector. Should be pulled up with 4.7kΩ to 10kΩ on the host board to a voltage between 3.15V and 3.6V.
2. VccRx, Vcc1, and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. VccRx, Vcc1, and VccTx may be internally connected within the QSFP28 module in any combination. The connector pins are each rated for a maximum current of 1000mA.

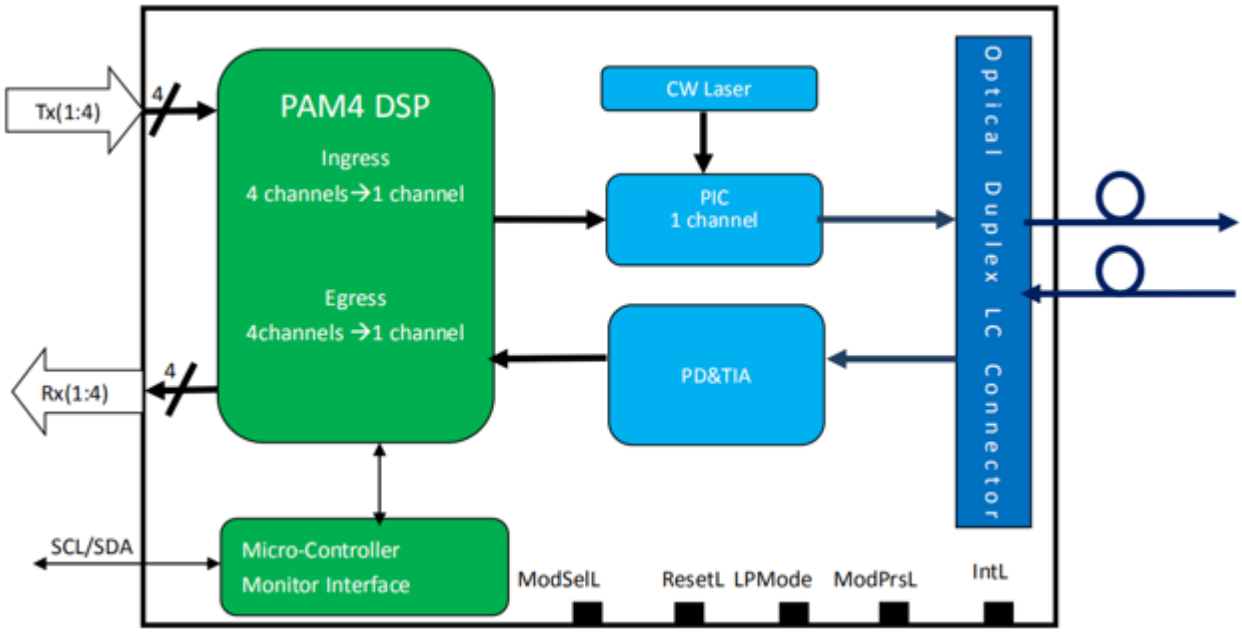
**Electrical Pin-Out Details**



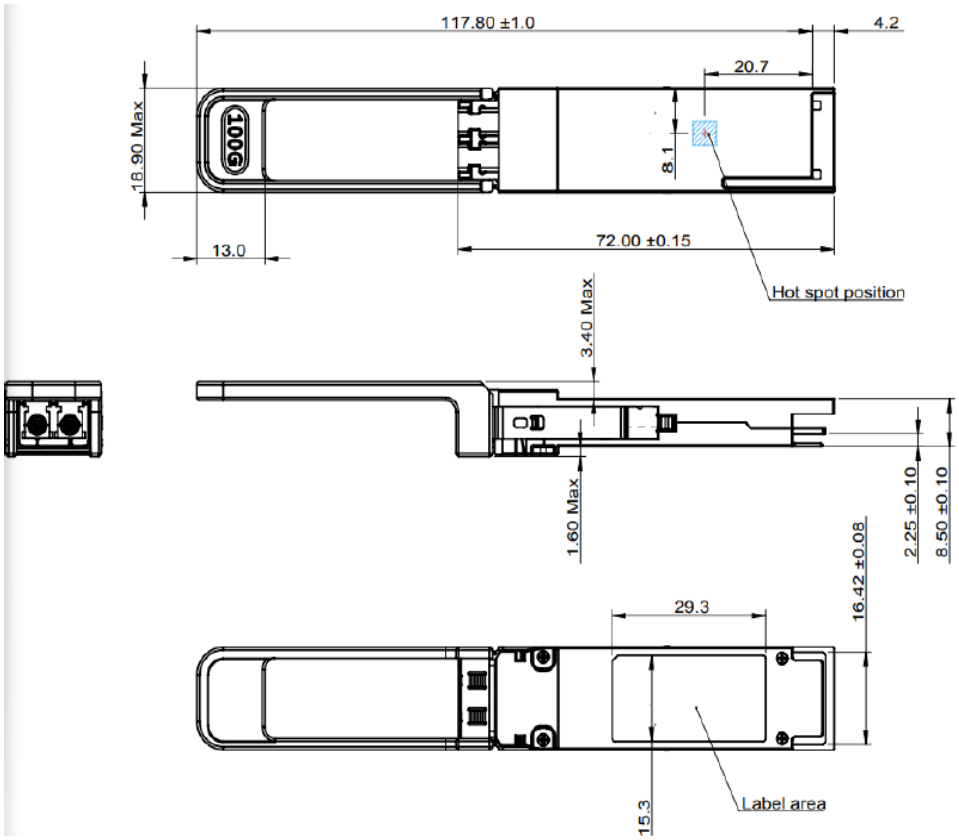

**Recommended Power Supply Filter**



**Transceiver Block Diagram**




**Mechanical Specifications**



**About AddOn Networks**

In 1999, AddOn Networks entered the market with a single product. Our founders fulfilled a severe shortage for compatible, cost-effective optical transceivers that compete at the same performance levels as leading OEM manufacturers. Adhering to the idea of redefining service and product quality not previously had in the fiber optic networking industry, AddOn invested resources in solution design, production, fulfillment, and global support.

Combining one of the most extensive and stringent testing processes in the industry, an exceptional free tech support center, and a consistent roll-out of innovative technologies, AddOn has continually set industry standards of quality and reliability throughout its history.

Reliability is the cornerstone of any optical fiber network and is in engrained in AddOn's DNA. It has played a key role in nurturing the long-term relationships developed over the years with customers. AddOn remains committed to exceeding industry standards with certifications from ranging from NEBS Level 3 to ISO 9001:2005 with every new development while maintaining the signature reliability of its products.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