**100G-LR-QSFP10KM-AO**

Extreme Networks® 100G-LR-QSFP10KM Compatible TAA 100GBase-LR QSFP28 Single Lambda Transceiver (SMF, 1310nm, 10km, LC, DOM, with FEC)

**Features**

- SFF-8665 Compliance
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free

**Applications**

- 100GBase Ethernet
- Access and Enterprise

**Product Description**

This Extreme Networks® 100G-LR-QSFP10KM compatible QSFP28 transceiver provides 100GBase-LR throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Extreme Networks® 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 |
|---|---|---|---|---|---|
| **Maximum Supply Voltage** | Vcc | -0.5 | | 3.6 | V |
| **Storage Temperature** | Ts | -40 | | 85 | °C |
| **Operating Case Temperature** | Top | 0 | | 70 | °C |
| **Operating Humidity** (non-condensing) | RH | 5 | | 85 | % |
| **Damage Threshold** | THd | 5.5 | | | dBm |

**Recommended Operating Conditions and Power Supply Requirements**

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Operating Case Temperature** | TOP | 0 | | 70 | degC | |
| **Power Supply Voltage** | VCC | 3.135 | 3.3 | 3.465 | V | |
| **Electrical Data Rate, each Lane (NRZ)** | | | 25.78125 | | Gb/s | |
| **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 | 0.002 | | 10 | km | 2 |

**Notes:**

1. FEC feature is embedded in the module.
2. FEC required to be turned on to support maximum transmission distance.

**Electrical Characteristics**

| Parameter | Test Point | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Power Consumption** | | | | 4.0 | W | |
| **Supply Current** | Icc | | | 1.36 | A | |
| **Transmitter (each Lane)** | | | | | | |
| **Overload Differential Voltagepk-pk** | TP1a | 900 | | | mV | |
| **Common Mode Voltage(Vcm)** | TP1 | -350 | | 2850 | mV | 1 |
| **Differential TerminationResistance Mismatch** | TP1 | | | 10 | % | At 1MHz |
| **Differential Return Loss(SDD11)** | TP1 | | | See CEI-28G-VSR Equation 13-19 | dB | |
| **Common Mode to Differential Conversion andDifferential to Common Mode Conversion (SDC11, SCD11)** | TP1 | | | See CEI-28G-VSR Equation 13-20 | dB | |
| **Stressed Input Test** | TP1a | See CEI-28G-VSR Section 13.3.11.2.1 | | | | |
| **Receiver (each Lane)** | | | | | | |
| **Differential Voltage, pk-pk** | TP4 | | | 900 | mV | |
| **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 andDifferential to Common Mode Conversion (SDC22, SCD22)** | TP4 | | | See CEI-28G-VSR Equation13-21 | dB | |
| **Common Mode Return Loss(SCC22)** | TP4 | | | -2 | dB | 2 |
| **Transition Time, 20 to 80%** | TP4 | 9.5 | | | 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 | |

**Notes:**

1. Vcm is generated by the host. Specification includes 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** | | PAVG | -1.4 | | 4.5 | dBm | 1 |
| **Outer Optical Modulation Amplitude ($OMA_{outer}$)** | | POMA | 0.7 | | 4.7 | dBm | 2 |
| **Launch Power in $OMA_{outer}$minus TDECQ** | **for ER ≥ 4.5dB** | | -0.7 | | | dBm | |
| | **for ER < 4.5dB** | | -0.6 | | | dBm | |
| **Transmitter and Dispersion Eye Closure for PAM4** | | TDECQ | | | 3.4 | dB | |
| **TDECQ – $10*\log_{10}$(Ceq)** | | | | | 3.4 | dB | 3 |
| **Extinction Ratio** | | ER | 3.5 | | | dB | |
| **$RIN_{15.6}$ OMA** | | RIN | | | -136 | dB/Hz | |
| **Optical Return Loss Tolerance** | | TOL | | | 15.6 | dB | |
| **Transmitter Reflectance** | | RT | | | -26 | dB | |
| **Transmitter Transition Time** | | | | | 17 | ps | |
| **Average Launch Power of OFF Transmitter** | | Poff | | | -15 | dBm | |
| **Receiver** | | | | | | | |
| **Center Wavelength** | | λr | 1304.5 | | 1317.5 | nm | |
| **Damage Threshold** | | THd | 5.5 | | | dBm | 4 |
| **Average Receive Power** | | | -7.7 | | 4.5 | dBm | 5 |
| **Receive Power ($OMA_{outer}$)** | | | | | 4.7 | dBm | |
| **Receiver Sensitivity ($OMA_{outer}$)** | | SEN | | | Equation (1) | dBm | 6 |
| **Stressed Receiver Sensitivity ($OMA_{outer}$)** | | SRS | | | -4.1 | dBm | 7 |
| **Receiver Reflectance** | | RR | | | -26 | dB | |
| **LOS Assert** | | LOSA | -15 | | | dBm | |
| **LOS Deassert** | | LOSD | | | -10.7 | dBm | |
| **LOS Hysteresis** | | LOSH | 0.5 | | | dB | |
| **Conditions of stressed receiver sensitivity test** | | | | | | | |
| **Stressed Eye Closure for PAM4 (SECQ)** | | | | 3.4 | | dB | |
| **SECQ – $10*\log_{10}$(Ceq)** | | | | | 3.4 | dB | |

**Notes:**

1. Average launch power, each lane 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 < 1.4dB for an extinction ratio of ≥ 4.5dB or TDECQ < 1.3dB for an extinction ratio of < 4.5dB, the $OMA_{outer}$ (min) 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 (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. 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 ($OMA_{outer}$) (max) is informative and is defined for a transmitter with a value of SECQ up to 3.4 dB. It should meet Equation (1), which is illustrated in the figure in note 8.

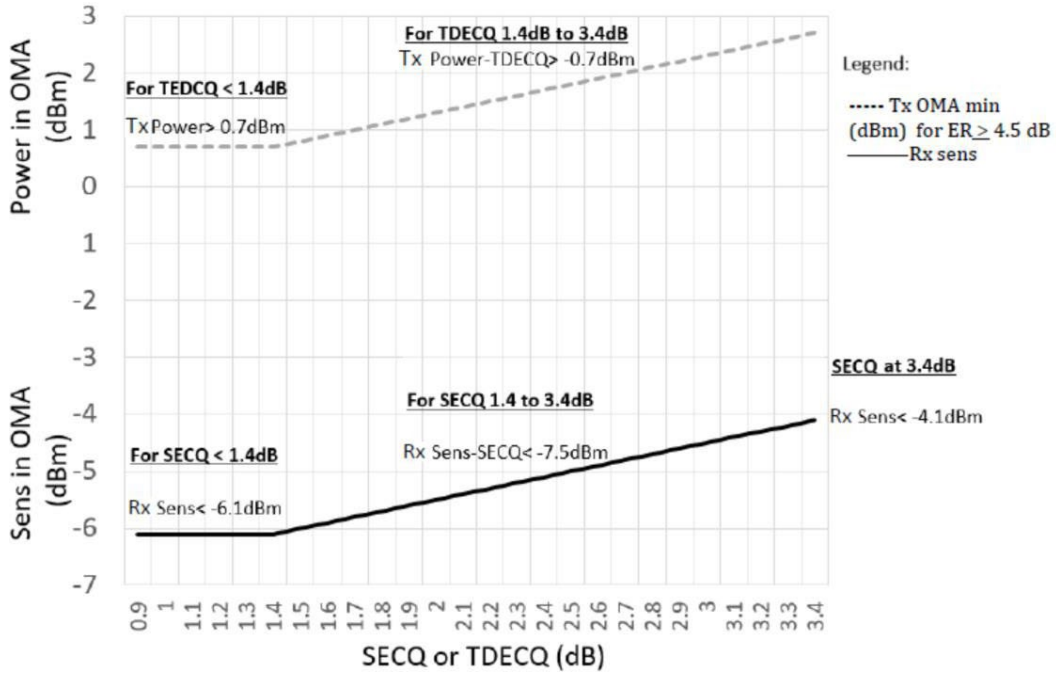
$$RRRR = \max(-6.1, RRSSSSSS - 7.5)\ dddddd \quad (1)$$

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.



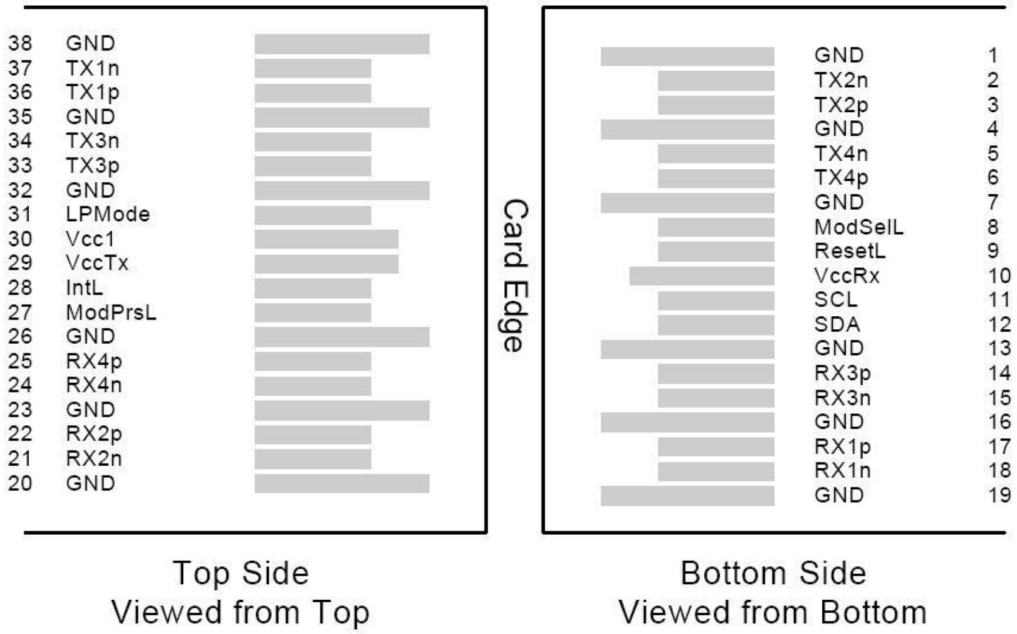
**Pin Descriptions**

| Pin | Logic | Symbol | Name/Descriptions | Ref. |
|---|---|---|---|---|
| **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 | MODSEIL | Module Select | 2 |
| **9** | LVTTL-I | ResetL | Module Reset | 2 |
| **10** | | VCCRx | +3.3v Receiver Power Supply | |
| **11** | LVCMOS-I | SCL | 2-wire Serial interface clock | 2 |
| **12** | LVCMOS-I/O | SDA | 2-wire Serial interface data | 2 |
| **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, internal pulled down to GND | |
| **28** | LVTTL-O | IntL | Interrupt output, should be pulled up on host board | 2 |
| **29** | | VCCTx | +3.3v Transmitter Power Supply | |
| **30** | | VCC1 | +3.3v Power Supply | |
| **31** | LVTTL-I | LPMode | Low Power Mode | 2 |
| **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 |

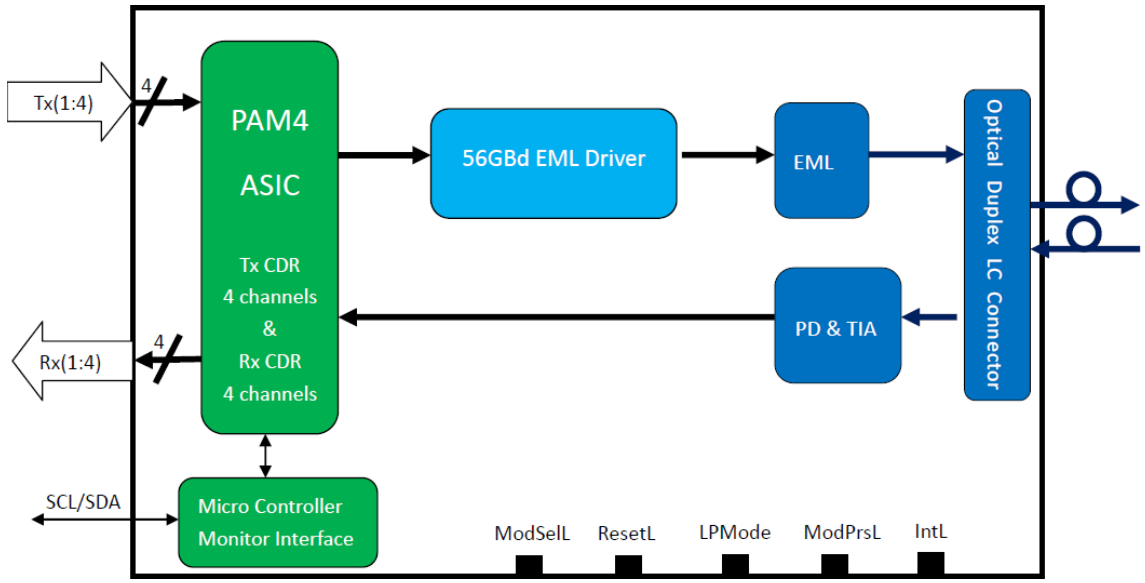
**Notes:**

1. Module circuit ground is isolated from module chassis ground with in the module.
2. Open collector; should be pulled up with 4.7k-10k ohms on host board to a voltage between 3.15V and 3.6V.

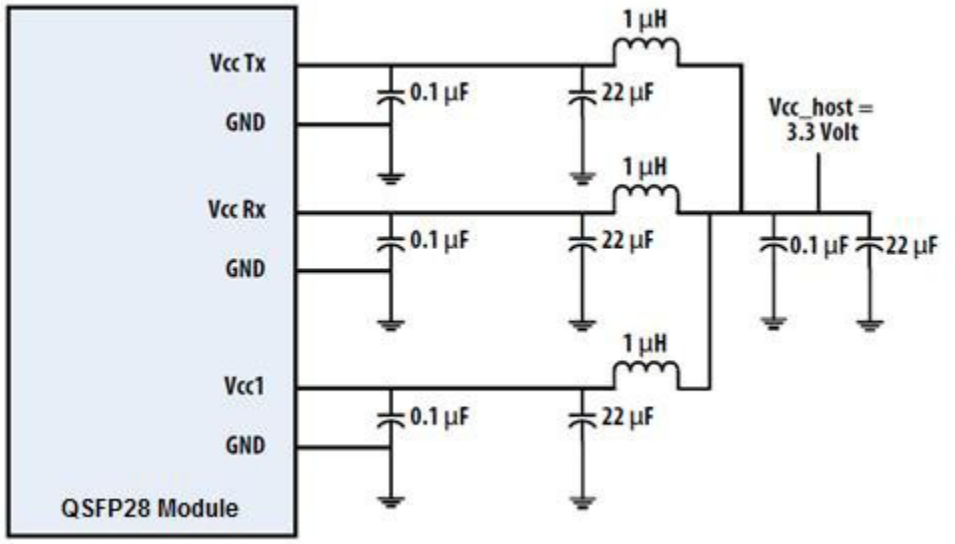
**Electrical Pin-out Details**



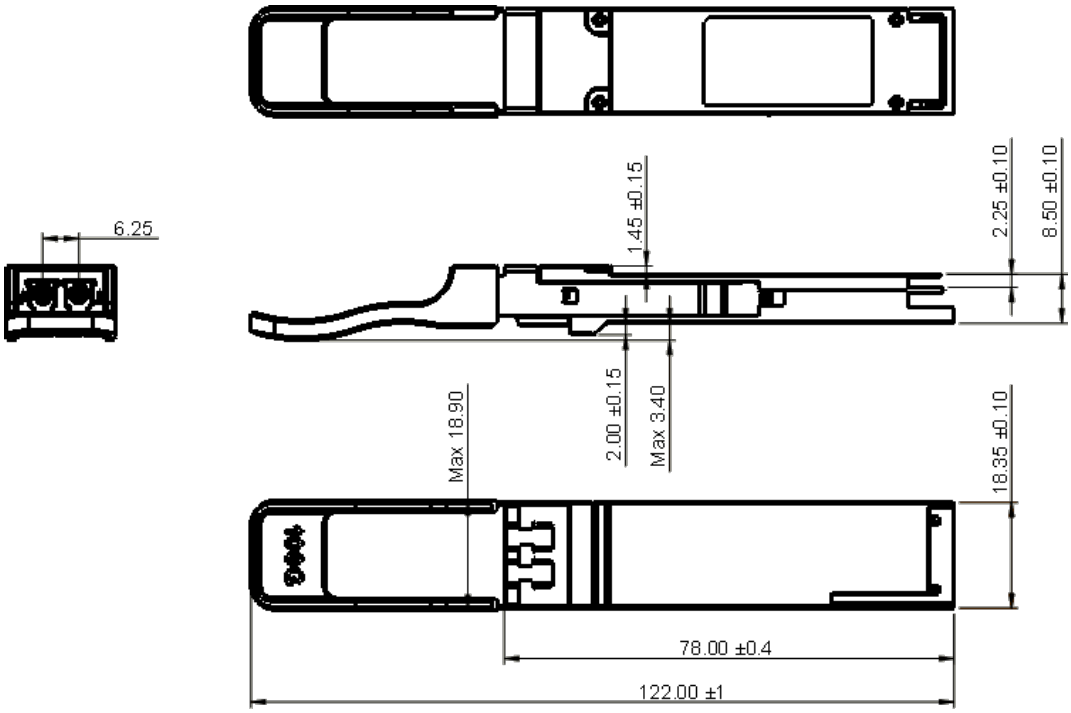

**Transceiver Block Diagram**



**Recommended Power Supply Filter**




**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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