

### QSFP28-100GB-ER4L-R1-AO

Rad® Compatible TAA 100GBase-ER4L QSFP28 Transceiver (SMF, 1295nm to 1309nm, 40km (w/host FEC), LC, DOM)

#### 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 Rad® compatible QSFP28 transceiver provides 100GBase-ER4 throughput up to 40km w/host FEC over single-mode fiber (SMF) using a wavelength of 1295nm to 1309nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Rad® 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."



## Regulatory Compliance

- ESD to the Electrical PINs: compatible with MIL-STD-883E Method 3015.4
- ESD to the LC Receptacle: compatible with IEC 61000-4-3
- EMI/EMC: compatible with FCC Part 15 Subpart B Rules, EN55022:2010
- Laser Eye Safety: compatible with FDA 21CFR, EN60950-1& EN (IEC) 60825-1,2
- RoHS compliant with EU RoHS 2.0 directive 2015/863/EU

## Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ.     | Max. | Unit |
|----------------------------|--------|------|----------|------|------|
| Storage Temperature        | Tstg   | -40  |          | 85   | °C   |
| Operating Case Temperature | Tc     | 0    | 25       | 70   | °C   |
| Power Supply Voltage       | Vcc    | -0.5 |          | 4.0  | V    |
| Relative Humidity          | RH     | 5    |          | 95   | %    |
| Data Rate Per Channel      |        |      | 25.78125 |      | Gbps |

## Electrical Characteristics

| Parameter                                  | Symbol              | Min.  | Typ. | Max.  | Unit  | Notes |
|--------------------------------------------|---------------------|-------|------|-------|-------|-------|
| Supply Voltage                             | Vcc                 | 3.135 | 3.3  | 3.465 | V     |       |
| Module Supply Current                      | Icc                 |       |      | 1350  | mA    |       |
| Power Dissipation                          | P <sub>DISS</sub>   |       |      | 4500  | mW    |       |
| Transmitter                                |                     |       |      |       |       |       |
| Single-Ended Input Voltage Tolerance       |                     | -0.3  |      | 4.0   | V     |       |
| Input Differential Impedance               | Z <sub>IN</sub>     |       | 100  |       | Ω     |       |
| Differential Data Input Swing              | V <sub>IN,pp</sub>  | 190   |      | 700   | mVp-p |       |
| AC Common-Mode Input Voltage Tolerance     |                     | 15    |      |       | mVp-p |       |
| Differential Input Voltage Swing Threshold |                     |       | 50   |       | mVp-p |       |
| Receiver                                   |                     |       |      |       |       |       |
| Single-Ended Output Voltage                |                     | -0.3  |      | 4.0   | V     |       |
| Output Differential Impedance              | Z <sub>OUT</sub>    | 90    | 100  | 110   | Ω     |       |
| Differential Data Output Swing             | V <sub>OUT,pp</sub> | 300   |      | 850   | mVp-p |       |
| AC Common-Mode Output Voltage              |                     |       |      | 7.5   | mVp-p |       |

## Optical Characteristics

| Parameter                          | Symbol           | Min.                               | Typ.    | Max.    | Unit | Notes |
|------------------------------------|------------------|------------------------------------|---------|---------|------|-------|
| Transmitter                        |                  |                                    |         |         |      |       |
| Launch Optical Power Per Lane      | Po               | -2.9                               |         | +2.9    | dBm  | 1     |
| Total Launch Optical Power         | Po               |                                    |         | +8.9    | dBm  | 1     |
| Center Wavelength Range            | L1               | 1294.53                            | 1295.56 | 1296.59 | nm   |       |
|                                    | L2               | 1299.02                            | 1300.05 | 1301.09 | nm   |       |
|                                    | L3               | 1303.54                            | 1304.58 | 1305.63 | nm   |       |
|                                    | L4               | 1308.09                            | 1309.14 | 1310.19 | nm   |       |
| Extinction Ratio                   | ER               | 8.0                                |         |         | dB   | 2     |
| Spectral Width (-20dB)             | Δλ               |                                    |         | 1       | nm   |       |
| Side-Mode Suppression Ratio        | SMSR             | 30                                 |         |         | dB   |       |
| Optical Return Loss Tolerance      | ORLT             |                                    |         | 20      | dB   |       |
| Pout @Tx_Disable Asserted          | Poff             |                                    |         | -30     | dBm  | 1     |
| Eye Mask: (X1, X2, X3, Y1, Y2, Y3) |                  | (0.25, 0.4, 0.45, 0.25, 0.28, 0.4) |         |         |      |       |
| Receiver                           |                  |                                    |         |         |      |       |
| Center Wavelength                  | L1               | 1294.53                            | 1295.56 | 1296.59 | nm   |       |
|                                    | L2               | 1299.02                            | 1300.05 | 1301.09 | nm   |       |
|                                    | L3               | 1303.54                            | 1304.58 | 1305.63 | nm   |       |
|                                    | L4               | 1308.09                            | 1309.14 | 1310.19 | nm   |       |
| Sensitivity Per Channel (OMA)      | S                |                                    |         | -16.6   | dBm  | 3     |
|                                    | S                |                                    |         | -20.5   | dBm  | 4     |
| Overload Per Channel               | P <sub>max</sub> | -4.9                               |         |         | dBm  | 3     |
| Damage Threshold Per Channel       | THd              | -3.5                               |         |         | dBm  |       |
| Receiver Reflectance               | RL               |                                    |         | -26     | dB   |       |
| LOS De-Assert                      | LOSD             |                                    |         | -21.0   | dBm  |       |
| LOS Assert                         | LOSA             | -26.0                              |         |         | dBm  |       |
| LOS Hysteresis                     | LOSH             | 0.5                                |         |         | dB   |       |

### Notes:

1. The optical power is launched into a single-mode fiber.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @25.78125Gbps.
3. Without FEC, measured with PRBS 2<sup>31</sup>-1 test pattern, 25.78125Gbps, and BER 1.0E<sup>-12</sup>.
4. With FEC, measured with PRBS 2<sup>31</sup>-1 test pattern, 25.78125Gb/s, and BER 5.0E<sup>-5</sup>.

## 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  | LVC MOS-I   | SCL     | 2-Wire Serial Interface Clock.                           | 2    |
| 12  | LVC MOS-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. Internally pulled down to GND.           |      |
| 28  | LVTTL-O     | IntL    | Interrupt output. Should be pulled up on the 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 the module chassis ground within the module.
2. Open collector. Should be pulled up with 4.7k $\Omega$ -10k $\Omega$  on the host board to a voltage between 3.15V and 3.6V.

**Electrical Pin-Out Details****Recommended Host Board Power Supply Filter Network**

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 ingrained 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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