

### QSFP-100GB-ER1-AR-C

Arista Networks® Compatible TAA Compliant 100GBase-ER1 QSFP28 Single Lambda Transceiver (SMF, 1310nm, 40km, LC, DOM)

#### Features:

- Supports 106.25Gb/s(PAM4)
- Compliant with QSFP28 MSA
- Aligned with IEEE 802.3bs and 100G Lambda MSA
- Single 3.3V power supply
- High Sensitivity APD Receiver
- Duplex LC Connector
- IIC management interface
- Up to 40km over single-mode fiber
- Commercial Temperature 0 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### Applications:

- 100GBase Ethernet
- Access and Enterprise

#### Product Description

This Arista Networks® compatible QSFP28 transceiver provides 100GBase-ER1 throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Arista 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.

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."



## 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. | Max. | Unit |
|-------------------------------------|-----------------|------|------|------|
| Maximum Supply Voltage              | V <sub>CC</sub> | 0    | 3.6  | V    |
| Storage Temperature                 | T <sub>S</sub>  | -40  | 85   | °C   |
| Operating Case Temperature          | T <sub>c</sub>  | 0    | 70   | °C   |
| Relative Humidity (No Condensation) | RH              | 0    | 85   | %    |
| Damage Threshold                    | THd             | 0    |      | dBm  |
| Link Distance                       | D               |      | 40   | km   |

## Electrical Characteristics

| Parameter  | Symbol            | Min.              | Typ. | Max.                 | Unit | Notes |
|--|-------------------|-------------------|------|----------------------|------|-------|
| Supply Voltage   | V <sub>CC</sub>   | 3.135             | 3.3  | 3.465                | V    |       |
| Supply Current   | I <sub>CC</sub>   |                   |      | 1.66                 | A    |       |
| Power Consumption  | P <sub>DISS</sub> |                   | 4.5  | 5.5                  | W    |       |
| <b>Transmitter High-Speed Electrical Characteristics</b> |                   |                   |      |                      |      |       |
| Signaling Rate   | Rate              | 25.78125 ± 100ppm |      |                      | Gbps |       |
| Input Differential Impedance                             | Z <sub>IN</sub>   |                   | 100  |                      | Ω    |       |
| Differential Input Voltage Per Lane                      |                   |                   |      | 900                  | mV   |       |
| Input Impedance Mismatch                                 |                   |                   |      | 10                   | %    |       |
| Input High Voltage                                       | V <sub>IH</sub>   | 2                 |      | V <sub>CC</sub> +0.3 | V    |       |
| Input Low Voltage  | V <sub>IL</sub>   | -0.3              |      | 0.8                  | V    |       |
| <b>Receiver High-Speed Electrical Characteristics</b>    |                   |                   |      |                      |      |       |
| Signaling Rate   | Rate              | 25.78125 ± 100ppm |      |                      | Gbps |       |
| Common-Mode Voltage                                      | V <sub>CM</sub>   | -350              |      | 2850                 | mV   |       |
| Common-Mode Noise (RMS)                                  |                   |                   |      | 17.5                 | mV   |       |
| Differential Termination Resistance Mismatch (At 1MHz)   |                   |                   |      | 10                   | %    |       |
| Differential Return Loss (SDD22)                         |                   |                   |      | Per CEI-28G-VSR      | dB   |       |

|   |      |      |  |                 |    |  |
|---|------|------|--|-----------------|----|--|
| <b>Common-Mode to Differential Conversion and Differential to Common-Mode Conversion (SDC22, SCD22)</b> |      |      |  | Per CEI-28G-VSR | dB |  |
| <b>Common-Mode Return Loss (SCC22): From 250MHz to 30GHz</b>  |      |      |  | -2              |    |  |
| <b>Transition Time: 20-80%</b>  |      | 9.5  |  |                 | ps |  |
| <b>Vertical Eye Closure</b>   | VEC  |      |  | 6.5             | dB |  |
| <b>Eye Width at 10-15 Probability</b>   | EW15 | 0.57 |  |                 | UI |  |
| <b>Eye Height at 10-15 Probability</b>  | EH15 | 228  |  |                 | mV |  |

## Optical Characteristics (EOL)

| Parameter  | Symbol      | Min.            | Typ.    | Max.      | Unit  | Notes |
|--|-------------|-----------------|---------|-----------|-------|-------|
| <b>Transmitter</b>   |             |                 |         |           |       |       |
| Data Rate Per Lane   |             | 53.125 ± 100ppm |         |           | Gbps  |       |
| Modulation Format  |             | PAM4            |         |           |       |       |
| Wavelength   | $\lambda$   | 1308.09         | 1309.09 | 1310.19   | nm    |       |
| Side-Mode Suppression Ratio  | SMSR        | 30              |         |           | dB    |       |
| Average Launch Power   | $P_{avg}$   | 1.7             |         | 7.1       | dBm   | 1     |
| Outer Optical Modulation Amplitude (OMA <sub>outer</sub> )               | TDP<1.4dB   | POMA            | 4.7     |           | 7.9   | dBm   |
|  | TDP>1.4dB   |                 | 3.3+TDP |           |       |       |
| Transmitter and Dispersion Penalty                                       | TDP         |                 |         | 3.9       | dB    |       |
| TECQ   | TECQ        |                 |         | 3.9       | dB    |       |
| TDP-TECQ (Maximum)   |             |                 |         | 2.7       | dB    |       |
| Extinction Ratio   | ER          | 5.0             |         |           | dB    |       |
| Optical Return Loss Tolerance  | ORLT        |                 |         | 15        | dB    |       |
| Transmitter Reflectance  | RL          |                 |         | -26       | dB    | 2     |
| Average Launch Power Off Transmitter                                     | $P_{off}$   |                 |         | -15       | dBm   |       |
| RIN <sub>15.6 OMA</sub>  | RIN         |                 |         | -136      | dB/Hz |       |
| <b>Receiver</b>  |             |                 |         |           |       |       |
| Data Rate Per Lane   |             | 53.125 ± 100ppm |         |           | Gbps  |       |
| Modulation Format  |             | PAM4            |         |           |       |       |
| Lane Wavelength  | $\lambda$   | 1304.5~1317.5   |         |           | nm    |       |
| Damage Threshold   | THd         | -2.4            |         |           | dBm   | 3     |
| Average Receive Power  |             | -16             |         | -3.4      | dBm   | 4     |
| Receive Power (OMA <sub>outer</sub> )                                    |             |                 |         | -2.6      | dBm   |       |
| Receiver Reflectance   | RL          |                 |         | -26       | dB    |       |
| Receiver Sensitivity (OMA <sub>outer</sub> )                             | TECQ<1.4 dB |                 |         | -13.8     | dBm   |       |
|  | TECQ>1.4 dB |                 |         | TECQ-15.2 |       |       |
| Stressed Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane - Maximum | SRS         |                 |         | -11.3     | dBm   | 5     |
| LOS Assert   | LOSA        | -30             |         | -19.5     | dBm   |       |
| LOS De-Assert  | LOSD        |                 |         | -16.5     | dBm   |       |
| LOS Hysteresis   | LOSH        | 0.5             |         |           | dB    |       |
| <b>Conditions of Stress Receiver Sensitivity Test</b>                    |             |                 |         |           |       |       |
| Stressed Eye Closure for PAM4 (SECQ) Lane Under Test                     |             |                 |         | 3.9       | 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. Transmitter Reflectance is defined looking into the transmitter.
3. The receiver shall be able to tolerate, without damage, continuous exposure to a modulated optical input signal having this power level on one lane.
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. Measured with a conformance test signal at TP3 for the BER specified in IEEE Std 802.3cd.

## Pin Descriptions

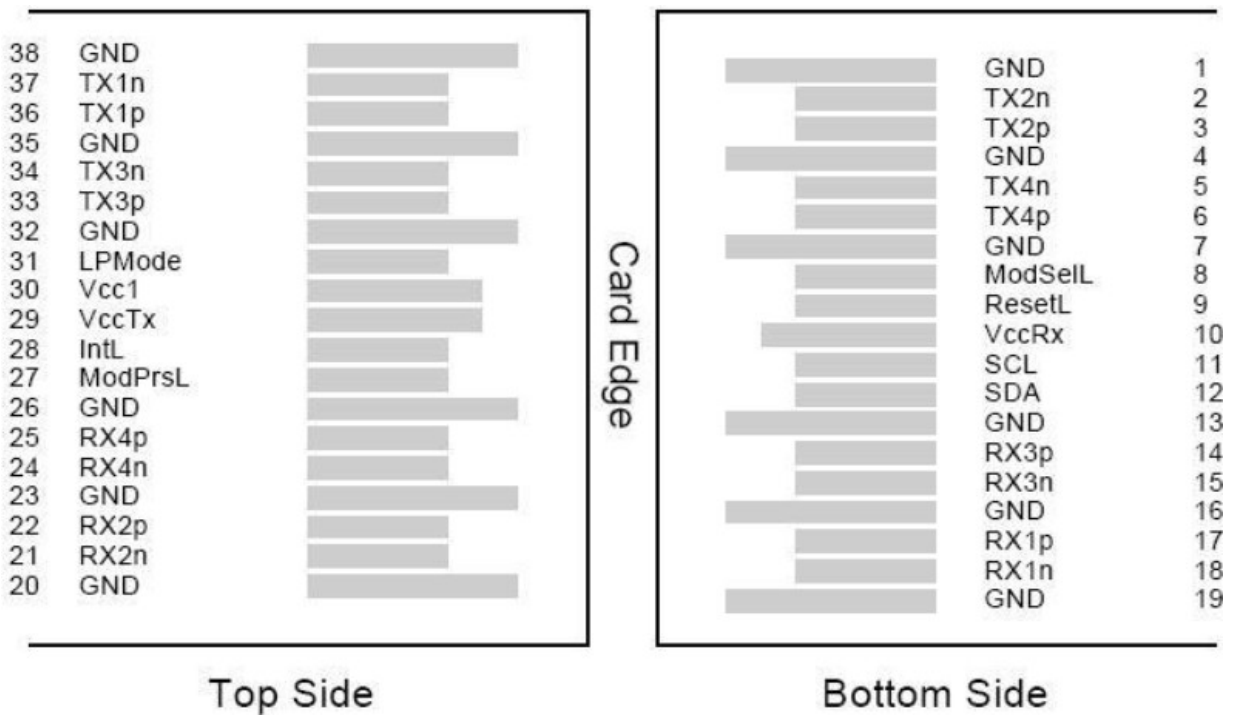
| Pin | Symbol  | Name/Descriptions                                 | Ref. |
|-----|---------|---|------|
| 1   | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 2   | Tx2-    | Transmitter Inverted Data Input.                  |      |
| 3   | Tx2+    | Transmitter Non-Inverted Data Output.             |      |
| 4   | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 5   | Tx4-    | Transmitter Inverted Data Input.                  |      |
| 6   | Tx4+    | Transmitter Non-Inverted Data Output.             |      |
| 7   | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 8   | ModSelL | Module Select.                                    | 2    |
| 9   | ResetL  | Module Reset.                                     | 2    |
| 10  | VccRx   | +3.3V Power Supply Receiver.                      |      |
| 11  | SCL     | 2-Wire Serial Interface Clock.                    | 2    |
| 12  | SDA     | 2-Wire Serial Interface Data.                     | 2    |
| 13  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 14  | Rx3+    | Receiver Non-Inverted Data Output.                |      |
| 15  | Rx3-    | Receiver Inverted Data Output.                    |      |
| 16  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 17  | Rx1+    | Receiver Non-Inverted Data Output.                |      |
| 18  | Rx1-    | Receiver Inverted Data Output.                    |      |
| 19  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 20  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 21  | Rx2-    | Receiver Inverted Data Output.                    |      |
| 22  | Rx2+    | Receiver Non-Inverted Data Output.                |      |
| 23  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 24  | Rx4-    | Receiver Inverted Data Output.                    | 1    |
| 25  | Rx4+    | Receiver Non-Inverted Data Output.                |      |
| 26  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 27  | ModPrsl | Module Present.                                   |      |
| 28  | IntL    | Interrupt.  | 2    |
| 29  | VccTx   | +3.3V Power Supply Transmitter.                   |      |
| 30  | Vcc1    | +3.3V Power Supply.                               |      |
| 31  | LPMODE  | Low-Power Mode.                                   | 2    |
| 32  | GND     | Transmitter Ground (Common with Receiver Ground). | 1    |
| 33  | Tx3+    | Transmitter Non-Inverted Data Input.              |      |
| 34  | Tx3-    | Transmitter Inverted Data Output.                 |      |

|    |      |   |   |
|----|------|---|---|
| 35 | GND  | Transmitter Ground (Common with Receiver Ground). | 1 |
| 36 | Tx1+ | Transmitter Non-Inverted Data Input.              |   |
| 37 | Tx1- | Transmitter Inverted Data Output.                 |   |
| 38 | GND  | Transmitter Ground (Common with Receiver Ground). | 1 |

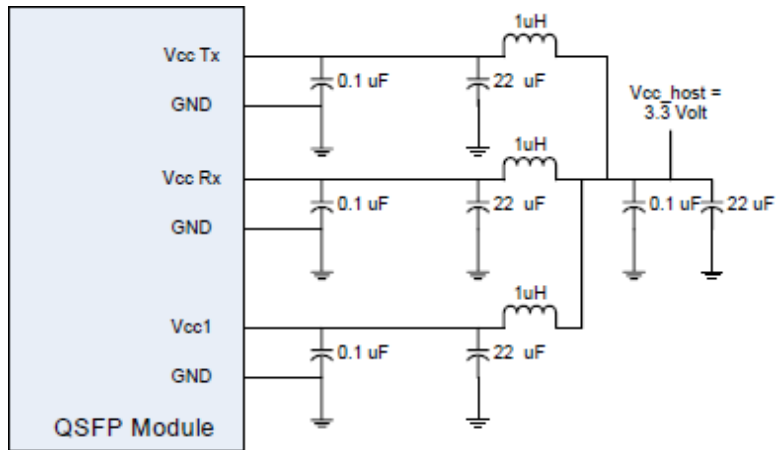
**Notes:**

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that, on the host board, requires a 4.7KΩ to 10KΩ pull-up resistor to Host\_Vcc.

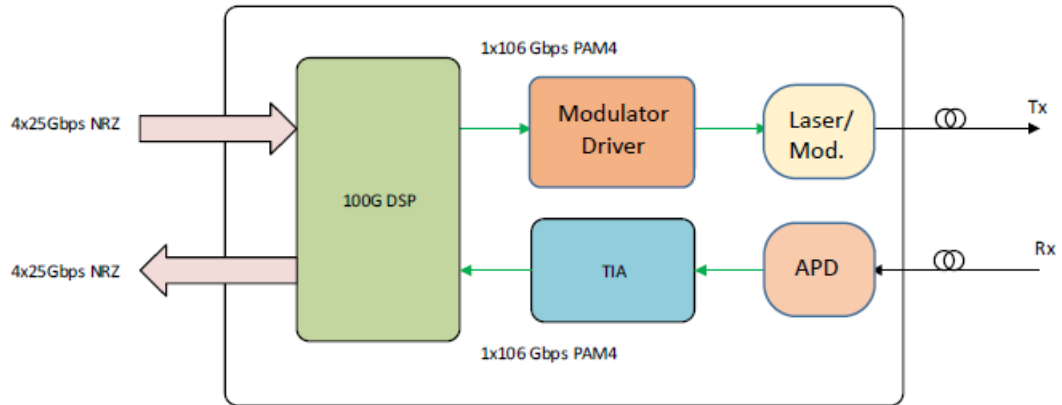
**Electrical Pin-Out Details**



### Recommended Power Supply Filter Network

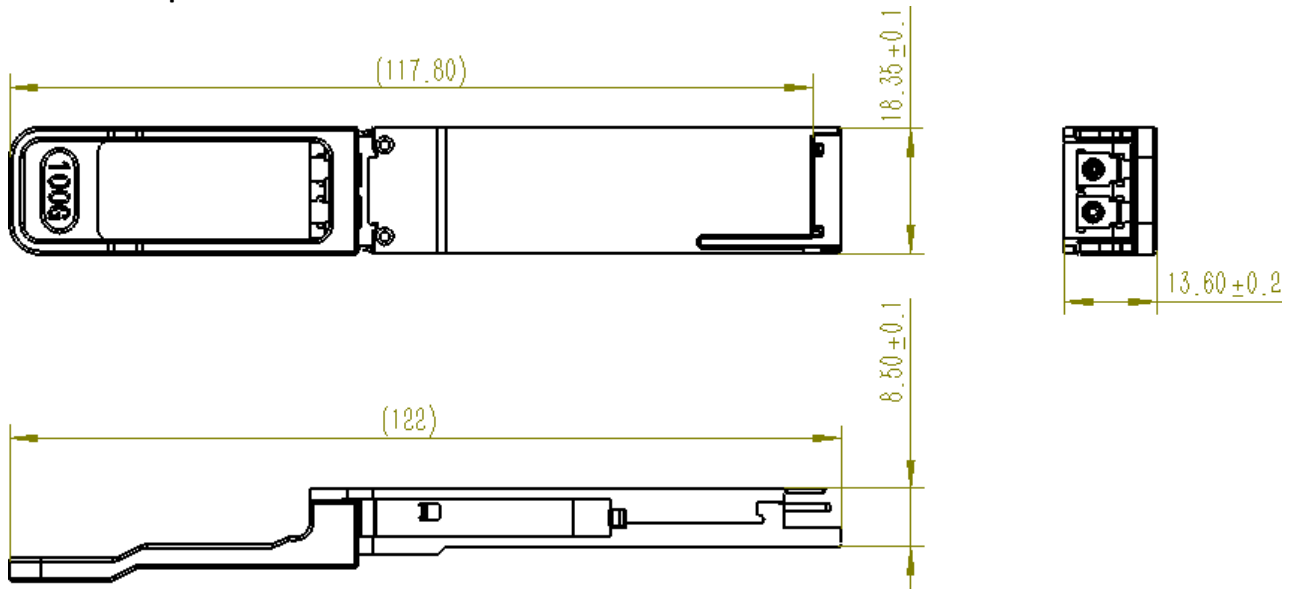


### Block Diagram





## Mechanical Specifications



## Digital Diagnostics

| Parameter                               | Symbol       | Min. | Max. | Unit | Notes                            |
|---|--------------|------|------|------|----------------------------------|
| Temperature Monitor Absolute Error      | DMI_Temp     | -3   | 3    | °C   | Over operating temperature range |
| Supply Voltage Monitor Absolute Error   | DMI_Vcc      | -0.1 | 0.1  | V    | Over full operating range        |
| Channel Rx Power Monitor Absolute Error | DMI_Rx_Ch    | -3   | 3    | dB   | 1                                |
| Channel Bias Current Monitor            | DMI_Ibias_Ch | -10% | 10%  | mA   |                                  |
| Channel Tx Power Monitor Absolute Error | DMI_Tx_Ch    | -3   | 3    | dB   | 1                                |

### Notes:

1. Due to the measurement accuracy of different single-mode fibers, there could be an additional ±1dB fluctuation or a ±3dB total accuracy.

**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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