

### QSFP28-100GB-ZR4P-CN2-C

Ciena® Compatible TAA 100GBase-ZR4+ QSFP28 Transceiver (SMF, 1295nm to 1309nm, 80/95km, LC, DOM)

#### Features:

- Supports up to 103Gbps
- Single 3.3V Power Supply
- Power Dissipation 5.5W
- Four 25Gbps EML LAN-WDM lasers on the transmitter side
- Receiver: 4x25Gbps SOA+PIN ROSA
- 4x25Gbps Electrical Interface
- Hot-pluggable QSFP28 MSA form factor
- Duplex LC Connector
- I2C interface with integrated Digital Diagnostic Monitoring
- Commercial Temperature 0 to 70 Celsius
- RoHS Compliant and Lead Free



#### Applications:

- 100GBase Ethernet

#### Product Description

This Ciena® QSFP28 transceiver provides 100GBase-ZR4+ throughput up to 80/95km 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 Ciena® 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."



## Absolute Maximum Ratings

| Parameter                   | Symbol           | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------|------|------|------|------|
| Maximum Supply Voltage      | V <sub>CC</sub>  | -0.5 |      | 3.6  | V    |
| Storage Temperature         | T <sub>stg</sub> | -40  |      | 85   | °C   |
| Operating Case Temperature  | T <sub>c</sub>   | 0    |      | 70   | °C   |
| Operating Relative Humidity | RH               | 5    |      | 85   | %    |

### Notes:

- Exceeding any one of these values may destroy the device immediately.

## Electrical Characteristics

| Parameter                              | Symbol            | Min.                     | Typ. | Max.  | Unit  | Notes |
|--|-------------------|--------------------------|------|-------|-------|-------|
| Power Supply Voltage                   | V <sub>CC</sub>   | 3.135                    | 3.3  | 3.465 | V     |       |
| Power Dissipation                      | P <sub>DISS</sub> |                          |      | 5.5   | W     |       |
| Transmitter                            |                   |                          |      |       |       |       |
| Differential Data Input Swing Per Lane |                   |                          |      | 900   | mVp-p |       |
| Input Differential Impedance           | Z <sub>IN</sub>   | 85                       | 100  | 115   | Ω     |       |
| Stressed Input Parameters              |                   |                          |      |       |       |       |
| Eye Width                              |                   | 0.46                     |      |       | UI    |       |
| Applied Pk-Pk Sinusoidal Jitter        |                   | IEEE 802.3bm Table 88-13 |      |       |       |       |
| Eye Height                             |                   | 95                       |      |       | mV    |       |
| DC Common-Mode Voltage                 |                   | -350                     |      | 2850  | mV    |       |
| Receiver                               |                   |                          |      |       |       |       |
| Differential Output Amplitude          |                   | 200                      |      | 900   | mVp-p |       |
| Output Differential Impedance          | Z <sub>OUT</sub>  | 85                       | 100  | 115   | Ω     |       |
| Eye Width                              |                   | 0.57                     |      |       | UI    |       |
| Eye Height Differential                |                   | 228                      |      |       | mV    |       |
| Vertical Eye Closure                   |                   |                          |      | 5.5   | dB    |       |

## Optical Characteristics

| Parameter   | Symbol                             | Min.    | Typ.    | Max.    | Unit | Notes |
|---|------------------------------------|---------|---------|---------|------|-------|
| Transmitter   |                                    |         |         |         |      |       |
| Signaling Speed Per Lane                                | BRAVE                              |         | 25.78   |         | Gbps |       |
| Data Rate Variation                                     |                                    | -100    |         | 100     | ppm  |       |
| Lane 0 Center Wavelength                                | $\lambda_{C0}$                     | 1294.53 | 1295.56 | 1296.59 | nm   |       |
| Lane 1 Center Wavelength                                | $\lambda_{C1}$                     | 1299.02 | 1300.05 | 1301.09 | nm   |       |
| Lane 2 Center Wavelength                                | $\lambda_{C2}$                     | 1303.54 | 1304.58 | 1305.63 | nm   |       |
| Lane 3 Center Wavelength                                | $\lambda_{C3}$                     | 1308.09 | 1309.14 | 1310.19 | nm   |       |
| Spectral Width (-20dB)                                  | $\Delta\lambda$                    |         |         | 1       | nm   |       |
| Total Average Output Power                              | POUT                               |         |         | 13      | dBm  |       |
| Average Launch Power Per Lane                           | P <sub>each</sub>                  | 3       |         | 7       | dBm  | 1     |
| Optical Modulation Amplitude Per Lane                   | POMA                               | 3.7     |         | 7.8     | dBm  |       |
| Average Launch Power of Off Transmitter Per Lane        | P <sub>off</sub>                   |         |         | -30     | dBm  |       |
| Side-Mode Suppression Ratio                             | SMSR                               | 30      |         |         | dB   |       |
| Transmitter Dispersion Penalty Per Lane                 | TDP                                |         |         | 3       | dB   | 4     |
| Difference in Launch Power Between Any Two Lanes        |                                    |         |         | 3.6     | dB   |       |
| Optical Return Loss Tolerance                           |                                    |         |         | 20      | dB   |       |
| Transmitter Reflectance                                 |                                    |         |         | -26     |      |       |
| Extinction Ratio  | ER                                 | 6       | 8       |         | dB   |       |
| Transmitter Eye Mask Definition: X1, X2, X3, Y1, Y2, Y3 | (0.25, 0.4, 0.45, 0.25, 0.28, 0.4) |         |         |         |      |       |
| Receiver  |                                    |         |         |         |      |       |
| Signaling Speed Per Lane                                | BRAVE                              |         | 25.78   |         | Gbps |       |
| Data Rate Variation                                     |                                    | -100    |         | 100     | ppm  |       |
| Damage Threshold Per Lane (Minimum)                     | THd                                |         |         | 5.5     | dBm  | 3     |
| Lane 0 Center Wavelength                                | $\lambda_{C0}$                     | 1294.53 | 1295.56 | 1296.59 | nm   |       |
| Lane 1 Center Wavelength                                | $\lambda_{C1}$                     | 1299.02 | 1300.05 | 1301.09 | nm   |       |
| Lane 2 Center Wavelength                                | $\lambda_{C2}$                     | 1303.54 | 1304.58 | 1305.63 | nm   |       |
| Lane 3 Center Wavelength                                | $\lambda_{C3}$                     | 1308.09 | 1309.14 | 1310.19 | nm   |       |
| Average Receive Power Per Lane                          | Rx_pow                             | -31     |         | 4.5     | dBm  | 2     |
| Receiver Overload Per Lane                              | Psat                               | 4.5     |         |         | dBm  |       |
| Receive Sensitivity Average Per Lane                    | Rx_sens                            |         |         | -29     | dBm  | 4     |
| Stressed Sensitivity Per Lane                           | SRS                                |         |         | -25.1   | GHz  | 4     |
| Receiver Reflectance                                    |                                    |         |         | -26     | dBm  |       |
| LOS Assert  | LOSA                               | -40     |         |         | dBm  |       |
| LOS De-Assert   | LOSD                               |         |         | -31.5   | dBm  |       |
| LOS Hysteresis  |                                    | 0.5     |         |         | dB   |       |

**Notes:**

1. Average launch power, per lane (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. Average receive power, per lane (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.
3. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level.
4. Measured with conformance test signal for BER=5E<sup>-5</sup> @25.78Gbps and PRBS<sup>31</sup>-1.

**Pin Descriptions**

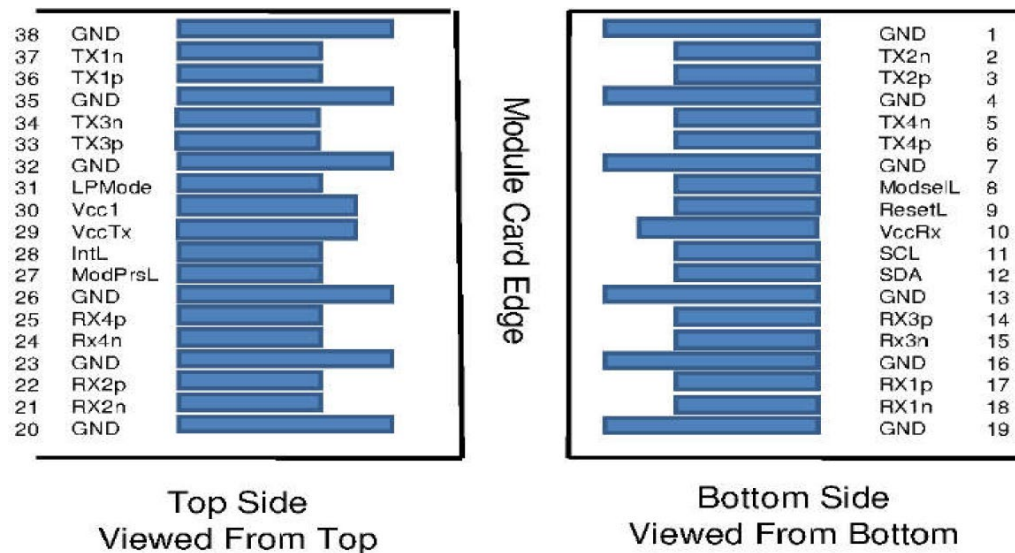
| Pin | Logic       | Symbol  | Name/Description                     | Plug Sequence | Notes |
|-----|-------------|---------|--------------------------------------|---------------|-------|
| 1   |             | GND     | Module Ground.                       | 1             | 1     |
| 2   | CML-I       | Tx2-    | Transmitter Inverted Data Input.     | 3             |       |
| 3   | CML-I       | Tx2+    | Transmitter Non-Inverted Data Input. | 3             |       |
| 4   |             | GND     | Module Ground.                       | 1             | 1     |
| 5   | CML-I       | Tx4-    | Transmitter Inverted Data Input.     | 3             |       |
| 6   | CML-I       | Tx4+    | Transmitter Non-Inverted Data Input. | 3             |       |
| 7   |             | GND     | Module Ground.                       | 1             | 1     |
| 8   | LVTTL-I     | ModSelL | Module Select.                       | 3             |       |
| 9   | LVTTL-I     | ResetL  | Module Reset.                        | 3             |       |
| 10  |             | VccRx   | +3.3V Receiver Power Supply.         | 2             | 2     |
| 11  | LVC MOS-I/O | SCL     | 2-Wire Serial Interface Clock.       | 3             |       |
| 12  | LVC MOS-I/O | SDA     | 2-Wire Serial Interface Data.        | 3             |       |
| 13  |             | GND     | Module Ground.                       | 1             | 1     |
| 14  | CML-O       | Rx3+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 15  | CML-O       | Rx3-    | Receiver Inverted Data Output.       | 3             |       |
| 16  |             | GND     | Module Ground.                       | 1             | 1     |
| 17  | CML-O       | Rx1+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 18  | CML-O       | Rx1-    | Receiver Inverted Data Output.       | 3             |       |
| 19  |             | GND     | Module Ground.                       | 1             | 1     |
| 20  |             | GND     | Module Ground.                       | 1             | 1     |
| 21  | CML-O       | Rx2-    | Receiver Inverted Data Output.       | 3             |       |
| 22  | CML-O       | Rx2+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 23  |             | GND     | Module Ground.                       | 1             | 1     |
| 24  | CML-O       | Rx4-    | Receiver Inverted Data Output.       | 3             |       |
| 25  | CML-O       | Rx4+    | Receiver Non-Inverted Data Output.   | 3             |       |
| 26  |             | GND     | Module Ground.                       | 1             | 1     |

|    |         |         |                                      |   |   |
|----|---------|---------|--------------------------------------|---|---|
| 27 | LVTTL-O | ModPrsL | Module Present.                      | 3 |   |
| 28 | LVTTL-O | IntL    | Interrupt.                           | 3 |   |
| 29 |         | VccTx   | +3.3V Transmitter Power Supply.      | 2 | 2 |
| 30 |         | Vcc1    | +3.3V Power Supply.                  | 2 | 2 |
| 31 | LVTTL-I | LPMode  | Low-Power Mode.                      | 3 |   |
| 32 |         | GND     | Module Ground.                       | 1 | 1 |
| 33 | CML-I   | Tx3+    | Transmitter Non-Inverted Data Input. | 3 |   |
| 34 | CML-I   | Tx3-    | Transmitter Inverted Data Input.     | 3 |   |
| 35 |         | GND     | Module Ground.                       | 1 | 1 |
| 36 | CML-I   | Tx1+    | Transmitter Non-Inverted Data Input. | 3 |   |
| 37 | CML-I   | Tx1-    | Transmitter Inverted Data Input.     | 3 |   |
| 38 |         | GND     | Module Ground.                       | 1 | 1 |

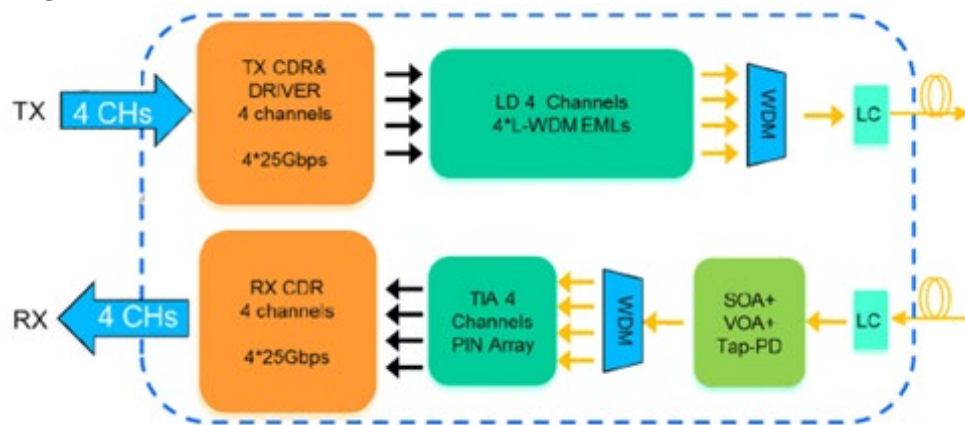
#### Notes:

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.
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.

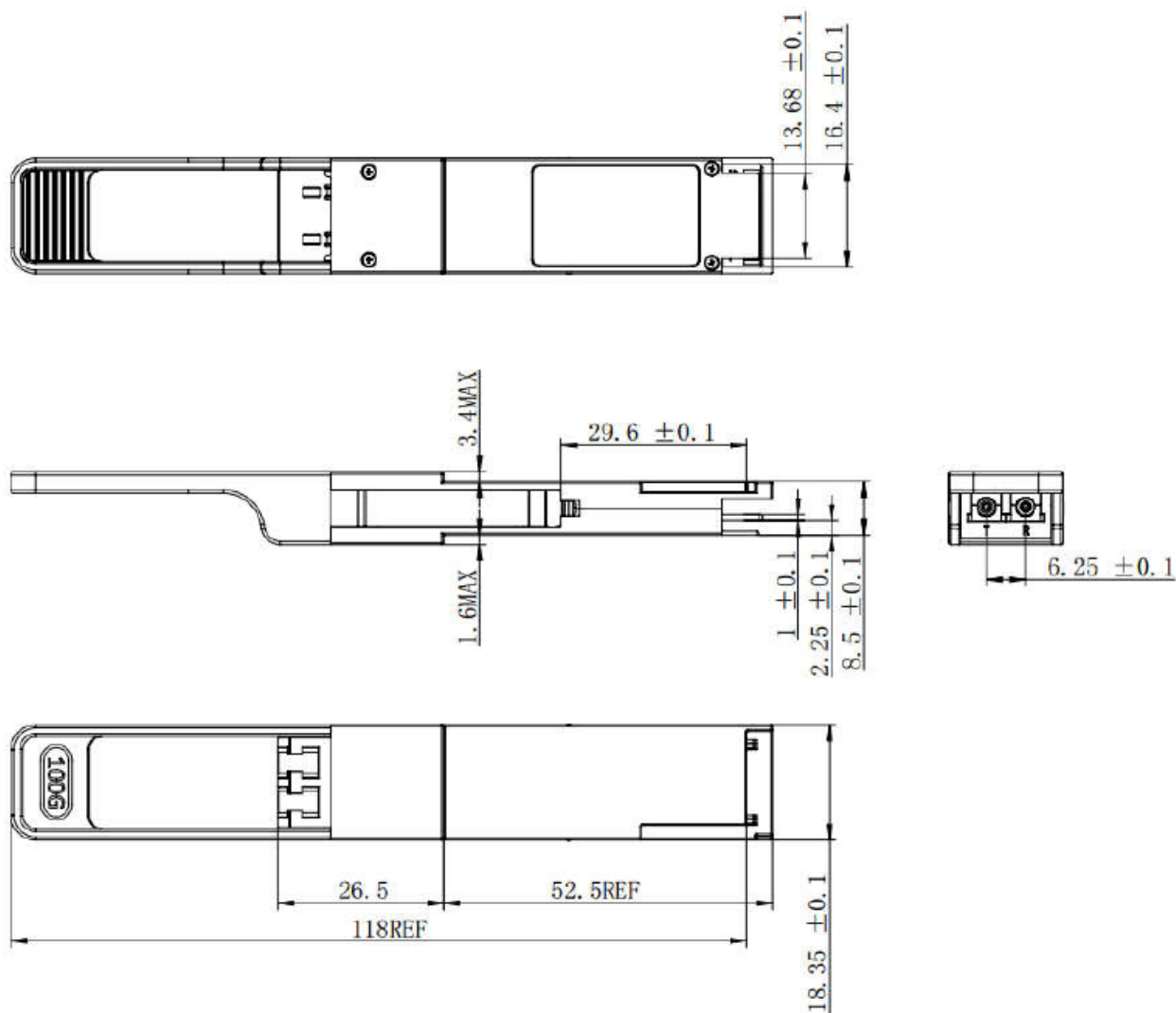
#### Electrical Pin-Out Details



Function Block Diagram



Mechanical Specifications



## 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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