

### 160-9401-900-2DW27-C

Ciena® 160-9401-900-2DW27 Compatible TAA 100GBase-DWDM 100GHz PAM4 QSFP28 Transceiver (SMF, 1555.75nm, 80km w/EDFA/DCM, LC, DOM)

#### Features:

- SFF-8665 Compliance
- Duplex LC Connector
- 100GHz DWDM ITU Grid
- Single-mode Fiber
- Commercial Temperature 20 to 70 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### Applications:

- 100GBase Ethernet
- Access, Metro and Enterprise

#### Product Description

This Ciena® 160-9401-900-2DW27 compatible QSFP28 transceiver provides 100GBase-DWDM throughput up to 80km over single-mode fiber (SMF) using a wavelength of 1555.75nm 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."



## 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

## Wavelength Guide (100GHz ITU-T Channel)

| Channel # | Frequency (GHz) | Wavelength (nm) | Frequency (GHz) | Wavelength (nm) |
|-----------|-----------------|-----------------|-----------------|-----------------|
|           | L0              |                 | L1              |                 |
| 16        | 191600          | 1564.68         | 191650          | 1564.27         |
| 17        | 191700          | 1563.86         | 191750          | 1563.45         |
| 18        | 191800          | 1563.05         | 191850          | 1562.64         |
| 19        | 191900          | 1562.23         | 191950          | 1561.83         |
| 20        | 192000          | 1561.42         | 192050          | 1561.01         |
| 21        | 192100          | 1560.61         | 192150          | 1560.2          |
| 22        | 192200          | 1559.79         | 192250          | 1559.39         |
| 23        | 192300          | 1558.98         | 192350          | 1558.58         |
| 24        | 192400          | 1558.17         | 192450          | 1557.77         |
| 25        | 192500          | 1557.36         | 192550          | 1556.96         |
| 26        | 192600          | 1556.56         | 192650          | 1556.15         |
| 27        | 192700          | 1555.75         | 192750          | 1555.34         |
| 28        | 192800          | 1554.94         | 192850          | 1554.54         |
| 29        | 192900          | 1554.13         | 192950          | 1553.73         |
| 30        | 193000          | 1553.33         | 193050          | 1552.93         |
| 31        | 193100          | 1552.52         | 193150          | 1552.12         |
| 32        | 193200          | 1551.72         | 193250          | 1551.32         |
| 33        | 193300          | 1550.92         | 193350          | 1550.52         |
| 34        | 193400          | 1550.12         | 193450          | 1549.72         |
| 35        | 193500          | 1549.32         | 193550          | 1548.91         |
| 36        | 193600          | 1548.52         | 193650          | 1548.11         |
| 37        | 193700          | 1547.72         | 193750          | 1547.32         |
| 38        | 193800          | 1546.92         | 193850          | 1546.52         |
| 39        | 193900          | 1546.12         | 193950          | 1545.72         |
| 40        | 194000          | 1545.32         | 194050          | 1544.92         |
| 41        | 194100          | 1544.53         | 194150          | 1544.13         |
| 42        | 194200          | 1543.73         | 194250          | 1543.33         |
| 43        | 194300          | 1542.94         | 194350          | 1542.54         |
| 44        | 194400          | 1542.14         | 194450          | 1541.75         |
| 45        | 194500          | 1541.35         | 194550          | 1540.95         |
| 46        | 194600          | 1540.56         | 194650          | 1540.16         |
| 47        | 194700          | 1539.77         | 194750          | 1539.37         |
| 48        | 194800          | 1538.98         | 194850          | 1538.58         |

|    |        |         |        |         |
|----|--------|---------|--------|---------|
| 49 | 194900 | 1538.19 | 194950 | 1537.79 |
| 50 | 195000 | 1537.4  | 195050 | 1537    |
| 51 | 195100 | 1536.61 | 195150 | 1536.22 |
| 52 | 195200 | 1535.82 | 195250 | 1535.43 |
| 53 | 195300 | 1535.04 | 195350 | 1534.64 |
| 54 | 195400 | 1534.25 | 195450 | 1533.86 |
| 55 | 195500 | 1533.47 | 195550 | 1533.07 |
| 56 | 195600 | 1532.68 | 195650 | 1532.29 |
| 57 | 195700 | 1531.9  | 195750 | 1531.51 |
| 58 | 195800 | 1531.12 | 195850 | 1530.72 |
| 59 | 195900 | 1530.33 | 195950 | 1529.94 |
| 60 | 196000 | 1529.55 | 196050 | 1529.16 |
| 61 | 196100 | 1528.77 | 196150 | 1528.38 |

### Absolute Maximum Ratings

| Parameter             | Symbol            | Min. | Typical | Max.                 | Unit |
|-----------------------|-------------------|------|---------|----------------------|------|
| Signal Input Voltage  | V <sub>in</sub>   | -0.5 |         | V <sub>cc</sub> +0.5 | V    |
| Power Supply Voltage  | V <sub>cc</sub>   | -0.5 |         | 3.6                  | °C   |
| Storage Temperature   | T <sub>S</sub>    | 5    |         | 85                   | °C   |
| Operating Temperature | T <sub>case</sub> | 20   |         | 70                   | °C   |

### 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>D</sub>  |       | 4    | 5     | W    |       |

## Optical Characteristics

| Parameter                   | Symbol          | Min. | Typ.      | Max. | Unit | Notes |
|-----------------------------|-----------------|------|-----------|------|------|-------|
| <b>Transmitter</b>          |                 |      |           |      |      |       |
| Optical Wavelength          | $\lambda_C$     | 1480 | $\lambda$ | 1580 | nm   |       |
| Channel Spacing             | $\Delta f$      |      | 100       |      | GHz  |       |
| Optical Extinction Ratio    | ER              |      | 6         |      | dB   |       |
| Side-Mode Suppression Ratio | SMSR            | 30   |           |      | dB   |       |
| Spectral Width              | $\Delta\lambda$ |      | +/-25     | 1    | GHz  |       |
| Optical Transmit Power      | Pout/lane       | -11  | -10       | -8   | dBm  |       |
| <b>Receiver</b>             |                 |      |           |      |      |       |
| Optical Wavelength          | $\lambda_C$     | 1480 |           | 1580 | nm   |       |
| Receiver Max. Sensitivity   | Pmin            | -3   | -2.5      | -2   | dBm  |       |
| Damage Threshold            | Pmax            | 10   |           |      | dBm  |       |
| Optical Return Loss         | ORL             |      |           | 20   | dBm  |       |
| LOS Hysteresis              | LOSH            |      | 1.0       |      | dB   |       |
| LOS Assert                  | LOSA            | -10  |           |      | dBm  |       |
| LOS De-Assert               | LOSD            |      |           | -3   | dBm  |       |

## Electrical Pin-out Details



## Pin Descriptions

| Pin | Logic       | Symbol  | Name/Descriptions                    | Plug Sequence | Ref. |
|-----|-------------|---------|--------------------------------------|---------------|------|
| 1   |             | GND     | Ground                               | 1             | 1    |
| 2   | CML-I       | Tx2n    | Transmitter Inverted Data Input      | 3             |      |
| 3   | CML-I       | Tx2p    | Transmitter Non-Inverted Data output | 3             |      |
| 4   |             | GND     | Ground                               | 1             | 1    |
| 5   | CML-I       | Tx4n    | Transmitter Inverted Data Input      | 3             |      |
| 6   | CML-I       | Tx4p    | Transmitter Non-Inverted Data output | 3             |      |
| 7   |             | GND     | Ground                               | 1             | 1    |
| 8   | LVTTTL-I    | ModSelL | Module Select                        | 3             |      |
| 9   | LVTTTL-I    | ResetL  | Module Reset                         | 3             |      |
| 10  |             | VccRx   | +3.3V Power Supply Receiver          | 2             | 2    |
| 11  | LVCNOS- I/O | SCL     | 2-Wire Serial Interface Clock        | 3             |      |
| 12  | LVCNOS- I/O | SDA     | 2-Wire Serial Interface Data         | 3             |      |
| 13  |             | GND     | Ground                               | 1             | 1    |
| 14  | CML-O       | Rx3p    | Receiver Non-Inverted Data output    | 3             |      |
| 15  | CML-O       | Rx3n    | Receiver Inverted Data output        | 3             |      |
| 16  |             | GND     | Ground                               | 1             | 1    |
| 17  | CML-O       | Rx1p    | Receiver Non-Inverted Data output    | 3             |      |
| 18  | CML-O       | Rx1n    | Receiver Inverted Data output        | 3             |      |
| 19  |             | GND     | Ground                               | 1             | 1    |
| 20  |             | GND     | Ground                               | 1             | 1    |
| 21  | CML-O       | Rx2n    | Receiver Inverted Data output        | 3             |      |
| 22  | CML-O       | Rx2p    | Receiver Non-Inverted Data output    | 3             |      |
| 23  |             | GND     | Ground                               | 1             | 1    |
| 24  | CML-O       | Rx4n    | Receiver Inverted Data output        | 3             |      |
| 25  | CML-O       | Rx4p    | Receiver Non-Inverted Data output    | 3             |      |
| 26  |             | GND     | Ground                               | 1             | 1    |
| 27  | LVTTTL-O    | ModPrsL | Module Present                       | 3             |      |
| 28  | LVTTTL-O    | IntL    | Interrupt                            | 3             |      |
| 29  |             | VccTx   | +3.3V Power Supply Transmitter       | 2             | 2    |
| 30  |             | Vccl    | +3.3V Power Supply                   | 2             | 2    |
| 31  | LVTTTL-I    | LPMODE  | Low Power Mode                       | 3             |      |
| 32  |             | GND     | Ground                               | 1             | 1    |
| 33  | CML-I       | Tx3p    | Transmitter Non-Inverted Data input  | 3             |      |
| 34  | CML-I       | Tx3n    | Transmitter Inverted Data Input      | 3             |      |
| 35  |             | GND     | Ground                               | 1             | 1    |
| 36  | CML-I       | Tx1p    | Transmitter Non-Inverted Data input  | 3             |      |
| 37  | CML-I       | Tx1n    | Transmitter Inverted Data Input      | 3             |      |
| 38  |             | GND     | Ground                               | 1             | 1    |

**Notes:**

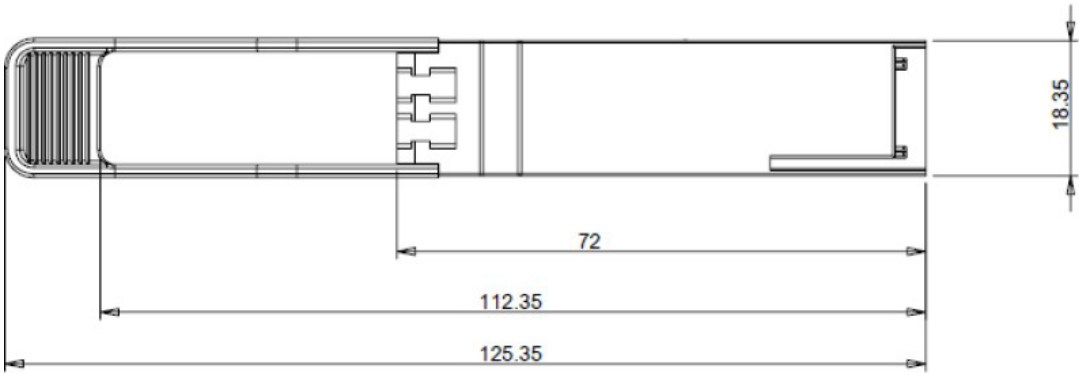
1. GND is the symbol for signal and supply (power) common for the QSFP28 module. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, Vcc1 and VccTx are the receiver and transmitter power supplies and shall be applied concurrently. Requirements defined for the host side of the Host Edge Card Connector are listed in Table 6. Recommended host board power supply filtering is shown in Figures 3 and 4. Vcc Rx Vcc1 and Vcc Tx may be internally connected within the QSFP28 Module in any combination. The connector pins are each rated for a maximum current of 500Ma.

**DOM Specifications**

| Parameter                                      | Min. | Typ. | Max. | Unit |
|--|------|------|------|------|
| Receive Power Monitor Accuracy                 | -2   |      | 2    | dB   |
| Transmit Power Monitor                         | -2   |      | 2    | dB   |
| Laser Bias Current Monito Accuracy             | -10  |      | 10   | %    |
| Transceiver Temperature Monitor Accuracy       | -5   |      | 5    | °C   |
| Internally Measured Transceiver Supply Voltage |      |      | 3    | %    |

**Mechanical Specifications**

Measurement unit: mm



## **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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