



## 160-9402-900-SKY

Ciena® 160-9402-900 Compatible 100GBase/OTU4-LR4 QSFP28 Transceiver Dual-Rate (SMF, 1295nm to 1309nm, 10km, LC, DOM)

### Product Description

This Ciena® 160-9402-900 compatible dual-rate QSFP28 transceiver provides 100GBase/OTU4-LR4 throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1295nm to 1309nm via an LC connector. It can operate at temperatures between 0 and 70C. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Ciena®. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows access to real-time operating parameters. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Skylane's transceivers are RoHS compliant and lead-free.

### 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
- OTN OTU4

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*For your product safety, please read the following information carefully before any manipulation of the transceiver:*



#### **ESD**

This transceiver is specified as ESD threshold 1kV for SFI pins and 2kV for all others electrical input pins, tested per MIL-STD-883G, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module.



#### **LASER SAFETY**

This is a Class1 Laser Product according to IEC 60825-1:2007. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

*The optical ports of the module need to be terminated with an optical connector or with a dust plug in order to avoid contamination.*

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## 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 |
|----------------------------|--------|------|-------------|------|------|
| Power Supply Voltage       | VCC    | -0.5 |             | 4.0  | V    |
| Storage Temperature        | Ts     | -40  |             | 85   | °C   |
| Operating Case Temperature | Tc     | -5   | 25          | 70   | °C   |
| Relative Humidity          | RH     | 5    |             | 95   | %    |
| Data Rate PER Channel      |        |      | 25.78/28.05 |      | Gb/s |

## Electrical Characteristics

| Parameter                                  | Symbol     | Min.  | Typ. | Max.  | Unit  | Notes |
|--------------------------------------------|------------|-------|------|-------|-------|-------|
| Supply Voltage                             | VCC        | 3.135 | 3.3  | 3.465 | V     |       |
| Module Supply Current                      | Icc        |       |      | 1100  | mA    |       |
| Power Dissipation                          | PD         |       |      | 3500  | mW    |       |
| Transmitter                                |            |       |      |       |       |       |
| Single-ended Input Voltage Tolerance       |            | -0.3  |      | 4.0   | V     |       |
| Input Differential Impedance               | ZIN        |       | 100  |       | Ω     |       |
| Differential Data Input Swing              | VIN, P-P   | 190   |      | 700   | mVP-P |       |
| AC Common Mode Input Voltage Tolerance     |            | 15    |      |       | mV    |       |
| Differential Input Voltage Swing Threshold |            | 50    |      |       | mVpp  |       |
| Receiver                                   |            |       |      |       |       |       |
| Single-ended Output Voltage                |            | -0.3  |      | 4.0   | V     |       |
| Output Differential Impedance              | ZO         | 90    | 100  | 110   | Ω     |       |
| Differential Data Output Swing             | VOOUT, P-P | 300   |      | 850   | mVP-P |       |
| AC Common Mode Output Voltage              |            |       |      | 7.5   | mV    |       |

## Optical Characteristics

| Parameter                                     | Symbol                             | Min.    | Typ.    | Max.    | Unit | Notes |
|-----------------------------------------------|------------------------------------|---------|---------|---------|------|-------|
| Transmitter                                   |                                    |         |         |         |      |       |
| Launch Optical Power per Lane                 | P <sub>o</sub>                     | -4.3    |         | +4.5    | dBm  | 1     |
| Total Launch Optical Power                    | P <sub>o</sub>                     |         |         | +10.5   | 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                              | EX                                 | 4.0     |         |         | 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                     | P <sub>off</sub>                   |         |         | -30     | dBm  | 1     |
| Eye Mask Coordinates {X1, X2, X3, Y1, Y2, Y3} | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |         |         |         |      |       |
| Receiver                                      |                                    |         |         |         |      |       |
| 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   |       |
| Sensitivity per Channel (OMA)                 | S                                  |         |         | -8.6    | dBm  | 2     |
| Overload (each channel)                       | POL                                | 4.5     |         |         | dBm  | 2     |
| Damage Threshold (each channel)               | P <sub>damage</sub>                | 5.5     |         |         | dBm  |       |
| Optical Return Loss                           | ORL                                | 26      |         |         | dB   |       |
| LOS De-Assert                                 | LOSD                               |         |         | -11.6   | dBm  |       |
| LOS Assert                                    | LOSA                               | -24     |         |         | dBm  |       |
| LOS Hysteresis                                |                                    | 0.5     |         |         | dB   |       |

### Notes:

1. The optical power is launched into SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @28.05Gbps.

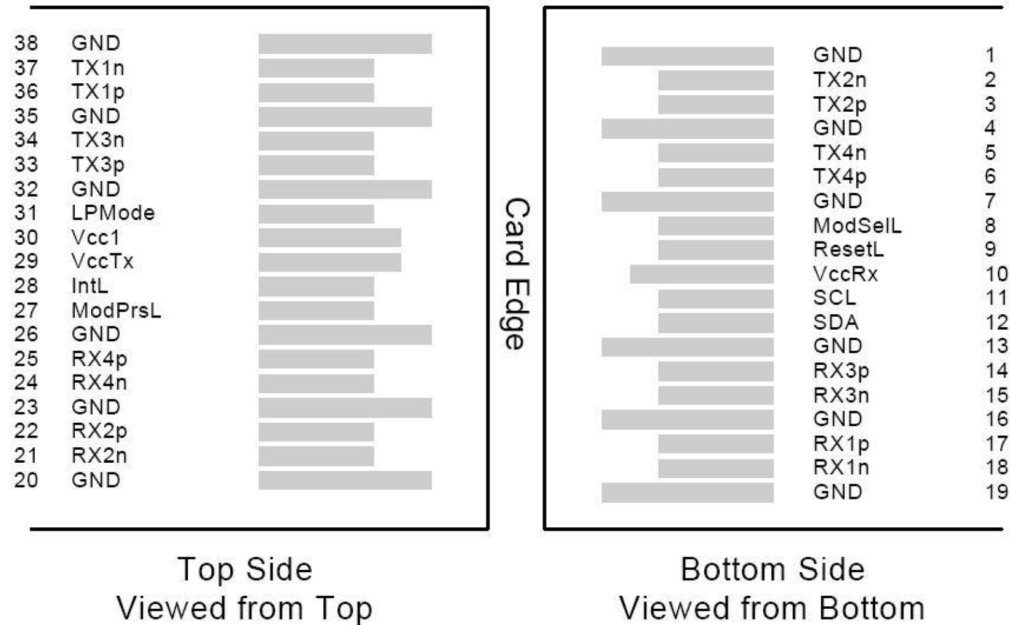
## Pin Descriptions

| 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   | LVTTTL-I    | MODSEIL | Module Select                                       | 2    |
| 9   | LVTTTL-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  | LVTTTL-O    | ModPrsL | Module Present, internal pulled down to GND         |      |
| 28  | LVTTTL-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  | LVTTTL-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    |

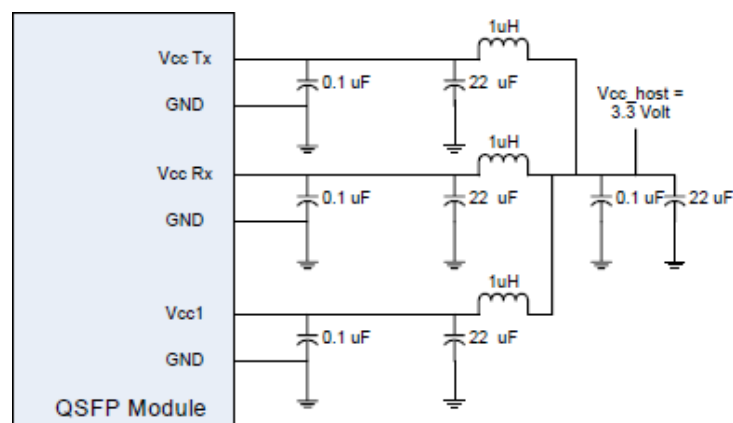
### Notes:

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.

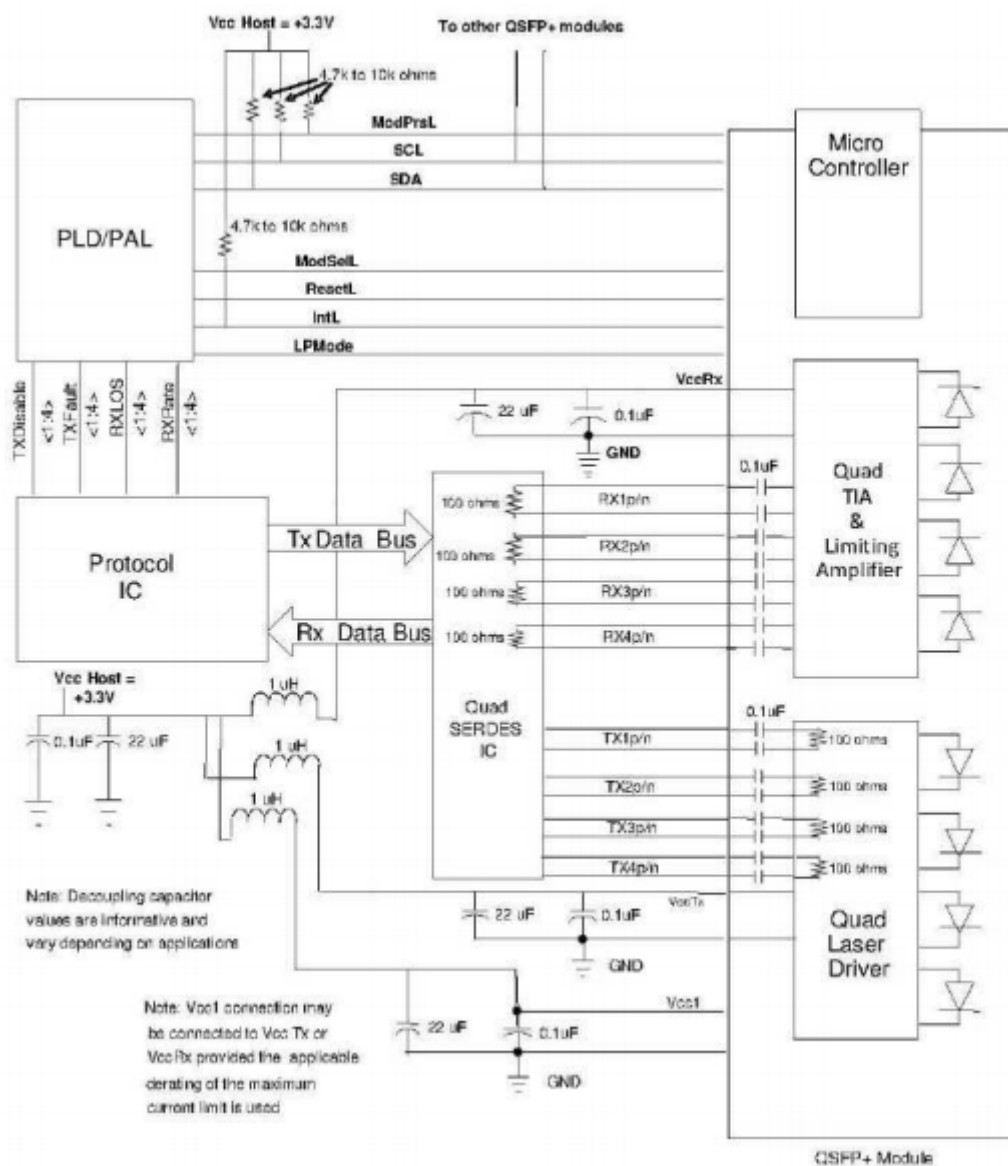
### Electrical Pin-out Details



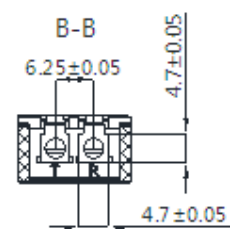
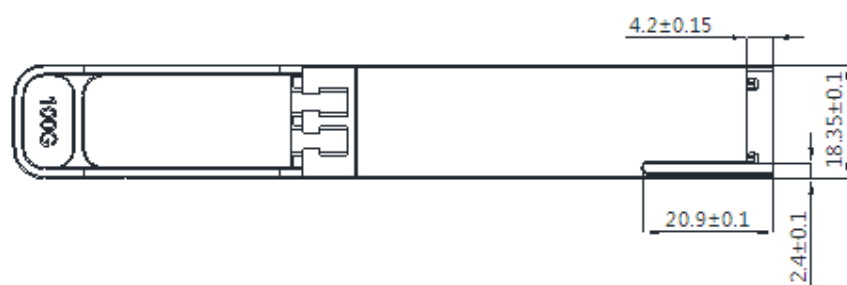
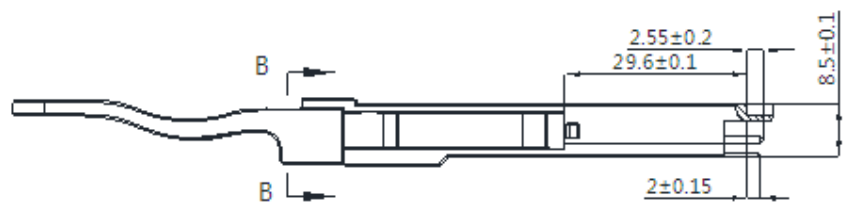
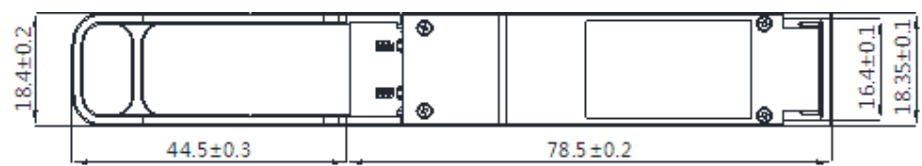
### Recommended Host Board Power Supply Filter Network



## Recommended Application Interface Block Diagram



Mechanical Specifications



# About Skylane Optics

Skylane is a leading provider of transceivers for optical communication.

We offer an extensive portfolio for the enterprise, access, datacenter and metropolitan fiber optical market as well as for smart home applications and home networks.

We cover the European, South American and North American market with a strong partner network and have offices in Belgium, Brazil, Sweden and USA.

Our offerings are characterized by high quality and performance. In combination with our strong technical support, we enable our customers to build cost optimized network solutions.

We offer an extensive range of high-quality products including transceivers (Optical and copper), Active Optical Cable (AOC), Direct Attach Cable (DAC), Mux/Demux, Coding Box.

