



## QFP1301040PDN48

Ciena® 160-9504-900 Compatible 40GBase-PLR4 QSFP+ Transceiver (SMF, 1310nm, 10km, MPO, DOM)

### Product Description

This Ciena® 160-9504-900 compatible QSFP+ transceiver provides 40GBase-PLR4 throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1310nm via an MPO 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-8436 Compliance
- MPO 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:

- 40GBase Ethernet
- Access and Enterprise

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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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## Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ.    | Max.     | Unit | Notes |
|----------------------------|--------|------|---------|----------|------|-------|
| Storage Temperature        | Tstg   | -40  |         | 85       | °C   |       |
| Operating Case Temperature | Tc     | 0    |         | 70       | °C   |       |
| Supply Voltage             | Vcc    | -0.3 |         | 3.6      | V    |       |
| Relative Humidity          | RH     | 0    |         | 85       | %    |       |
| Input Voltage              | VIN    | -0.3 |         | Vcc+0.3V |      |       |
| Data Rate Per Lane         | DR     |      | 10.3125 | 11.1     | Gbps |       |
| Link Distance with G.652   | D      |      |         | 10       | km   |       |

## Electrical Characteristics

| Parameter                             | Symbol | Min.    | Typ. | Max.  | Unit  | Notes |
|---------------------------------------|--------|---------|------|-------|-------|-------|
| Power Supply Voltage                  | Vcc    | 3.135   | 3.3  | 3.465 | V     |       |
| Power Consumption                     | PD     |         |      | 3.5   | W     |       |
| Differential Input Voltage Amplitude  | VIN    | 120     |      | 1200  | mVp-p |       |
| Differential Output Voltage Amplitude | VOUT   | 400     |      | 800   | mVp-p |       |
| Input Logic Level - High              | VIH    | 2.0     |      | Vcc   | V     |       |
| Input Logic Level - Low               | VIL    | 0       |      | 0.8   | V     |       |
| Output Logic Level - High             | VOH    | Vcc-0.5 |      | Vcc   | V     |       |
| Output Logic Level - Low              | VOL    | 0       |      | 0.4   | V     |       |

## Optical Characteristics

| Parameter                                                                   | Symbol      | Min.                               | Typ. | Max. | Unit  | Notes |
|-----------------------------------------------------------------------------|-------------|------------------------------------|------|------|-------|-------|
| Transmitter                                                                 |             |                                    |      |      |       |       |
| Center Wavelength                                                           | $\lambda_C$ | 1260                               | 1310 | 1355 | nm    | 1     |
| Spectral Width (-20dB)                                                      |             |                                    |      | 1    | nm    | 1     |
| Side-Mode Suppression Ratio                                                 | SMSR        | 30                                 |      |      | dB    |       |
| Average Launch Power Per Lane                                               | Pavg        | -5.2                               |      | 1.5  | dBm   |       |
| Optical Modulation Amplitude (OMA)                                          | TOMA        | -4.5                               |      | 2.0  | dBm   | 1     |
| Difference in Launch Power Between Any Two Lanes                            | Ptx, diff   |                                    |      | 5.0  | dB    |       |
| Launch Power in OMA Minus Transmitter and Dispersion Penalty (TDP) Per Lane | OMA-TDP     | -9.7                               |      |      | dBm   | 1     |
| Extinction Ratio                                                            | ER          | 3.5                                |      |      | dB    |       |
| Relative Intensity Noise                                                    | RIN         |                                    |      | -128 | dB/Hz |       |
| Optical Return Loss Tolerance                                               | ORLT        |                                    |      | 12   | dB    |       |
| Transmitter Reflectance                                                     | TR          |                                    |      | -12  | dB    |       |
| Average Launch Power of Off Transmitter Per Lane                            | Toff        |                                    |      | -30  | dBm   |       |
| Transmitter Eye Mask Definition : {X1, X2, X3, Y1, Y2, Y3}                  |             | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |      |      |       |       |
| Receiver                                                                    |             |                                    |      |      |       |       |
| Center Wavelength                                                           | $\lambda_C$ | 1260                               | 1310 | 1355 | nm    |       |
| Damage Threshold Per Lane                                                   | THd         | 3                                  |      |      | dBm   |       |
| Overload Per Lane                                                           |             | 1                                  |      |      | dBm   |       |
| Receiver Sensitivity in OMA Per Lane @ BER 1E-12                            |             |                                    |      | 12.6 | dBm   |       |
| Signal Loss Assert Threshold                                                |             | -30                                |      |      | dBm   |       |
| Signal Loss De-Assert Threshold                                             |             |                                    |      | -15  | dBm   |       |
| LOS Hysteresis                                                              |             | 0.5                                |      | 6    | dB    |       |
| Receiver Reflectance                                                        | RR          |                                    |      | -12  | dBm   |       |

### Notes:

1. Transmitter wavelength, spectral width, and power need to meet the OMA minus TDP specs to guarantee link performance.

## Pin Descriptions

| Pin | Logic   | Symbol  | Name/Description                     | Notes |
|-----|---------|---------|--------------------------------------|-------|
| 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 | ModSelL | Module Select.                       | 3     |
| 9   | LVTTL-I | ResetL  | Module Reset.                        | 4     |
| 10  |         | VccRx   | +3.3V Receiver Power Supply.         | 2     |
| 11  | LVC MOS | SCL     | 2-Wire Serial Interface Clock.       | 5     |
| 12  | LVC MOS | SDA     | 2-Wire Serial Interface Data.        | 5     |
| 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.                      | 6     |
| 28  | LVTTL-O | IntL    | Interrupt                            | 7     |
| 29  |         | VccTx   | +3.3V Transmitter Power Supply.      | 2     |
| 30  |         | Vcc1    | +3.3V Power Supply.                  | 2     |
| 31  | LVTTL-I | LPMODE  | Low-Power Mode.                      | 8     |
| 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 Output.    |   |
| 38 |       | GND  | Module Ground.                       | 1 |

**Notes:**

1. GND is the symbol for signal and supply (power) common for the module. All are common within the 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 shall be applied concurrently. VccRx, Vcc1, and VccTx may be internally connected within the module in any combination. The connector pins are each rated for a maximum current of 1000mA. Recommended host board power supply filtering is shown below.
3. The ModSelL is an input pin. When held "low" by the host, the module responds to 2-wire serial communication commands. The ModSelL allows the use of multiple modules on a single 2-wire interface bus. When the ModSelL is "high," the module shall not respond to or acknowledge any 2-wire interface communication from the host. ModSelL signal input node shall be biased to the "high" state in the module.

In order to avoid conflicts, the host system shall not attempt 2-wire interface communications within the ModSelL de-assert time after any modules are deselected. Similarly, the host shall wait at least for the period of the ModSelL assert time before communicating with the newly selected module. The assertion and de-asserting periods of different modules may overlap as long as the above timing requirements are met.

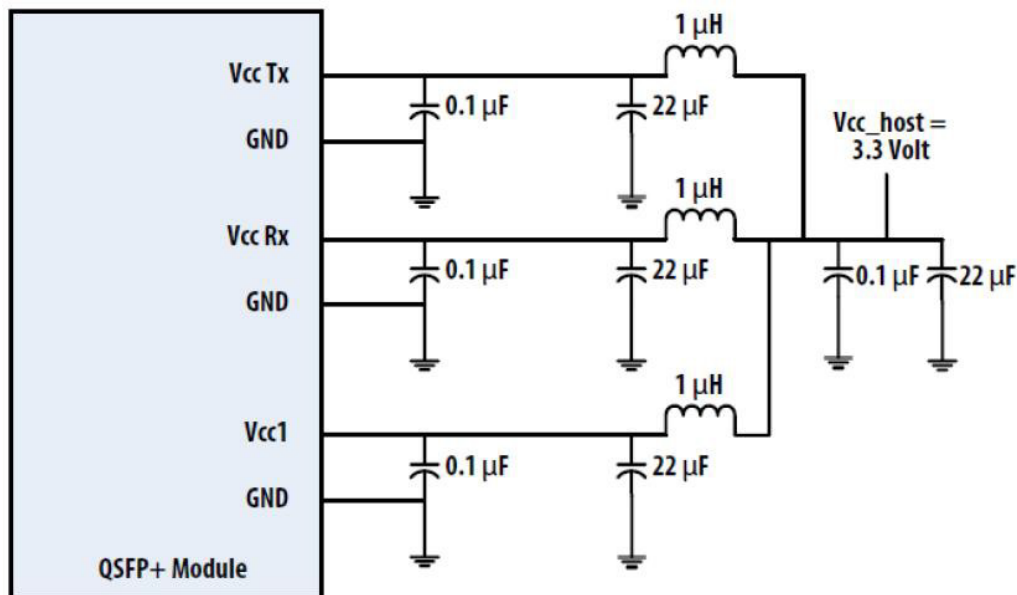
4. The ResetL pin shall be pulled to the Vcc in the module. A "low" level on the ResetL pin for longer than the minimum pulse length ( $t_{\text{Reset\_init}}$ ) initiates a complete module reset, returning all user module settings to their default state. Module Reset Assert Time ( $t_{\text{init}}$ ) starts on the rising edge after the "low" level on the ResetL pin is released. During the execution of a reset ( $t_{\text{init}}$ ) the host shall disregard all status bits until the module indicates a completion of the reset interrupt. The module indicates this by asserting "low" an IntL signal with the Data\_Not\_Ready bit negated. Note that on power up (including hot insertion) the module should post this completion of reset interrupt without requiring a reset.
5. Low-speed signaling other than SCL and SDA is based on Low-Voltage TTL (LVTTTL) operating at the Vcc. Vcc refers to the generic supply voltages of VccTx, VccRx, Host\_Vcc, or Vcc1.  
Hosts shall use a pull-up resistor connected to the Host\_Vcc on each of the 2-wire interface SCL (clock), SDA (data), and all low-speed status outputs. The SCL and SDA is a hot plug interface that may support a bus topology.
6. ModPrsL is pulled up to the Host\_Vcc on the host board and grounded in the module. The ModPrsL is asserted "low" when inserted and de-asserted "high" when the module is physically absent from the host connector.
7. IntL is an output pin. When IntL is "low," it indicates a possible module operational fault or a status critical to the host system. The host identifies the source of the interrupt using the 2-wire serial interface. The IntL pin is an open collector output and shall be pulled to host supply voltage on the host board. The INTL pin is de-asserted "high" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of 0 and the flag field is read (see SFF-8636).

8. The LPMODE pin shall be pulled up to the Vcc in the module. The pin is a hardware control used to put modules into a low-power mode when “high.” By using the LPMODE pin and a combination of the Power\_override, Power\_set, and High\_Power\_Class\_Enable software control bits (Address A0h, byte 93 bits 0, 1, 2), the host controls how much power a module can dissipate.

## Electrical Pin-Out Details



## Power Supply Filter



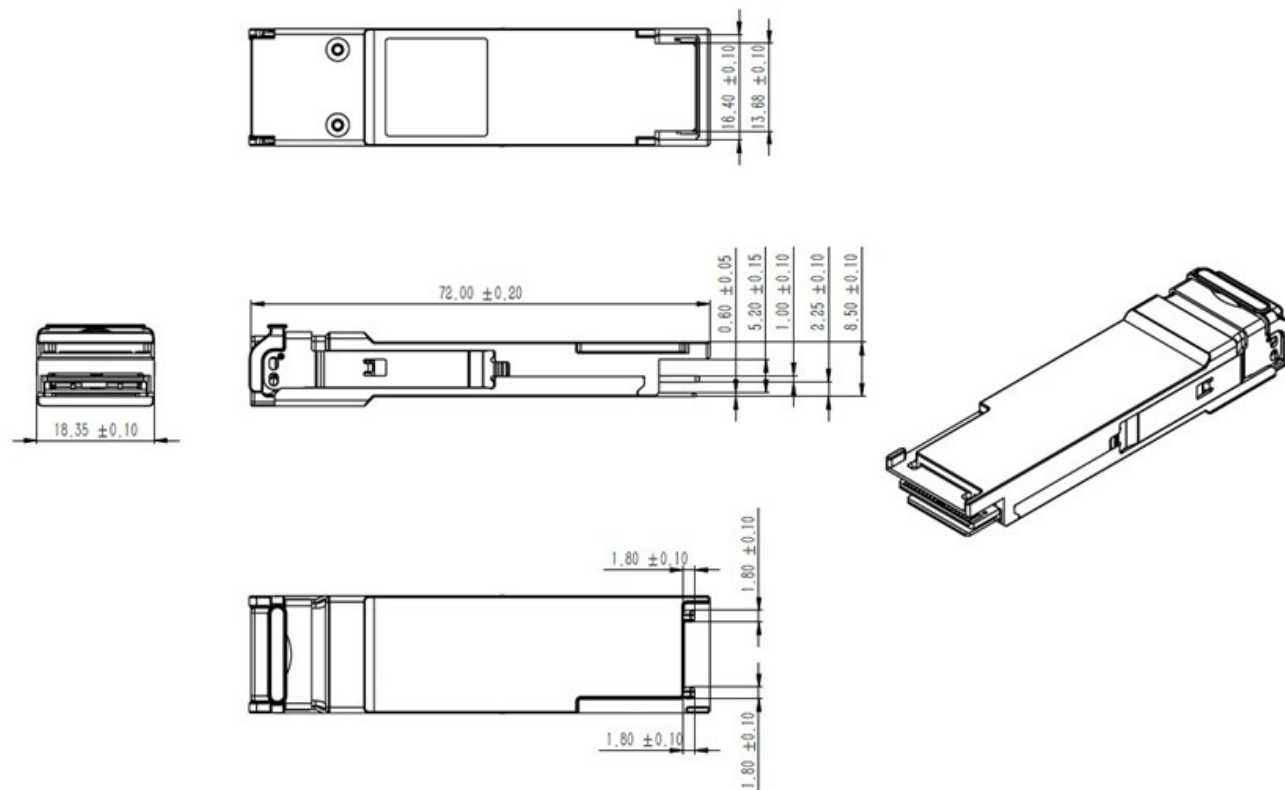
## Optical Interface Lanes and Assignment

The optical interface port is a male MPO connector. The four fiber positions on the left as shown below, with the key up, are used for the optical transmit signals (Channel 1 through 4). The fiber positions on the right are used for the optical receive signals (Channel 4 through 1). The central four fibers are physically present.



Transmit Channels: 1 2 3 4  
Unused positions: x x x x  
Receive Channels: 4 3 2 1

## 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.

