



## Q2L21020C00FC72

Juniper Networks® Compatible 100GBase-OWDM QSFP28 Transceiver O-Band Channel OW309 50GHz (SMF, 1309.14nm, 20km, LC, DOM, -5 to +80C)

### Product Description

This Juniper Networks® QSFP28 transceiver provides 100GBase-OWDM throughput up to 20km over single-mode fiber (SMF) using a wavelength of 1309.14nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Juniper 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. 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:

- Hot-pluggable QSFP28 form factor
- Supports 106.25Gb/s (PAM4)
- Compliant with QSFP28 MSA
- High Sensitivity APD Receiver
- OWDM 8 Wavelengths
- Duplex LC receptacles
- Aligned with IEEE 802.3bs and 100G Lambda MSA
- Single +3.3V power supply
- Operating temperature: -5 to +80 Celsius
- I2C management interface
- RoHS Compliant and Lead-Free



### Applications:

- 100GBase 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. | Max. | Unit |
|-------------------------------------|--------|------|------|------|
| Maximum Supply Voltage              | Vcc    | 0    | 3.6  | V    |
| Storage Temperature                 | Tstg   | -40  | 85   | °C   |
| Operating Case Temperature          | Tc     | -5   | 80   | °C   |
| Relative Humidity (No Condensation) | RH     | 0    | 85   | %    |
| Damage Threshold                    | THd    | 0    |      | dBm  |
| Link Distance Through Mux           | D      |      | 20   | km   |
| Link Distance Back-to-Back          | D      |      | 40   | km   |

## Electrical Characteristics

| Parameter                                                                                        | Symbol | Min.              | Typ.                                      | Max.                                      | Unit | Notes  |
|--------------------------------------------------------------------------------------------------|--------|-------------------|-------------------------------------------|-------------------------------------------|------|--------|
| Supply Voltage                                                                                   | Vcc    | 3.135             | 3.3                                       | 3.465                                     | V    |        |
| Supply Current                                                                                   | Icc    |                   |                                           | 1.8                                       | A    |        |
| Power Consumption                                                                                |        |                   | 4.7 at -5°C<br>4.4 at 25°C<br>5.2 at 80°C | 5.0 at -5°C<br>4.8 at 25°C<br>5.5 at 80°C | W    |        |
| Transmitter High-Speed Electrical Characteristics                                                |        |                   |                                           |                                           |      |        |
| Signaling Rate                                                                                   | Rate   | 25.78125 ± 100ppm |                                           |                                           | Gbps |        |
| Input Differential Impedance                                                                     | ZIN    |                   | 100                                       |                                           | Ω    |        |
| Differential Input Voltage Per Lane                                                              |        |                   |                                           | 900                                       | mV   |        |
| Input Impedance Mismatch                                                                         |        |                   |                                           | 10                                        | %    |        |
| Input High Voltage                                                                               | VIH    | 2                 |                                           | Vcc+0.3                                   | V    |        |
| Input Low Voltage                                                                                | VIL    | -0.3              |                                           | 0.8                                       | V    |        |
| Receiver High-Speed Electrical Characteristics                                                   |        |                   |                                           |                                           |      |        |
| Signaling Rate                                                                                   | Rate   | 25.78125 ± 100ppm |                                           |                                           | Gbps |        |
| Common-Mode Voltage                                                                              | Vcm    | -350              |                                           | 2850                                      | mV   |        |
| Common-Mode Noise (RMS)                                                                          |        |                   |                                           | 17.5                                      | mV   | 20-80% |
| Differential Termination Resistance Mismatch (At 1MHz)                                           |        |                   |                                           | 10                                        | %    |        |
| Differential Return Loss (SDD22)                                                                 |        |                   |                                           | Per CEI-28G-VSR                           | dB   |        |
| Common-Mode to Differential Conversion and Differential to Common-Mode Conversion (SDC22, SCD22) |        |                   |                                           | Per CEI-28G-VSR                           | dB   |        |
| Common-Mode Return Loss (SCC22): From 250MHz to 30GHz                                            |        |                   |                                           | -2                                        |      |        |

|                                             |      |      |  |     |    |  |
|---------------------------------------------|------|------|--|-----|----|--|
| Transition Time (20-80%)                    |      | 9.5  |  |     | ps |  |
| Vertical Eye Closure                        | VEC  |      |  | 6.5 | dB |  |
| Eye Width at 10 <sup>-15</sup> Probability  | EW15 | 0.57 |  |     | UI |  |
| Eye Height at 10 <sup>-15</sup> Probability | EH15 | 228  |  |     | mV |  |

## Optical Characteristics (EOL)

| Parameter                                                                |           | Symbol | Min.            | Typ.    | Max.    | Unit  | Notes |
|--------------------------------------------------------------------------|-----------|--------|-----------------|---------|---------|-------|-------|
| Transmitter                                                              |           |        |                 |         |         |       |       |
| Data Rate Per Lane                                                       |           |        | 53.125 ± 100ppm |         |         | Gbps  |       |
| Modulation Format                                                        |           |        | PAM4            |         |         |       |       |
| Wavelength                                                               |           | λ      | 1308.74         | 1309.14 | 1309.54 | nm    |       |
| Side-Mode Suppression Ratio                                              |           | SMSR   | 30              |         |         | dB    |       |
| Average Launch Power                                                     |           | Pavg   | 0               |         | 3.4     | dBm   | 1     |
| Outer Optical Modulation Amplitude (OMA <sub>outer</sub> )               | TDP<1.4dB | POMA   | 3.0             |         | 6.4     | dBm   |       |
|                                                                          | TDP>1.4dB |        | 1.6+TDP         |         | 6.4     | dBm   |       |
| Transmitter and Dispersion Penalty                                       |           | TDP    |                 |         | 3.4     | dB    |       |
| TECQ                                                                     |           | TECQ   |                 |         | 3.9     | dB    |       |
| TDP-TECQ  (Maximum)                                                      |           |        |                 |         | 2.5     | dB    |       |
| Extinction Ratio                                                         |           | ER     | 5.0             |         |         | dB    |       |
| Optical Return Loss Tolerance                                            |           | ORLT   |                 |         | 15.6    | dB    |       |
| Transmitter Reflectance                                                  |           | RL     |                 |         | -26     | dB    | 2     |
| Average Launch Power Off Transmitter                                     |           | Poff   |                 |         | -15     | dBm   |       |
| RIN <sub>15.6OMA</sub>                                                   |           | RIN    |                 |         | -136    | dB/Hz |       |
| Receiver                                                                 |           |        |                 |         |         |       |       |
| Data Rate Per Lane                                                       |           |        | 53.125 ± 100ppm |         |         | Gbps  |       |
| Modulation Format                                                        |           |        | PAM             |         |         |       |       |
| Lane Wavelength                                                          |           | λ      | 1295.04~1311.96 |         |         | nm    |       |
| Damage Threshold                                                         |           | THd    | 0               |         |         | dBm   | 3     |
| Average Receive Power                                                    |           |        | -15.7           |         | -3      | dBm   | 4     |
| Receive Power (OMA <sub>outer</sub> )                                    |           |        |                 |         | -2.6    | dBm   |       |
| Receiver Reflectance                                                     |           | RL     |                 |         | -26     | dB    |       |
| Receiver Sensitivity (OMA <sub>outer</sub> )                             |           |        |                 |         |         | dBm   | 5, 6  |
| Stressed Receiver Sensitivity (OMA <sub>outer</sub> ) Per Lane (Maximum) |           | SRS    |                 |         | -11.6   | dBm   |       |
| Transmitter Reflectance                                                  |           | RL     |                 |         | -26     | dB    |       |
| LOS Assert                                                               |           | LOSA   | -30             |         | -19.5   | dBm   |       |

|                                                         |      |     |  |       |     |  |
|---------------------------------------------------------|------|-----|--|-------|-----|--|
| LOS De-Assert                                           | LOSD |     |  | -16.5 | dBm |  |
| LOS Hysteresis                                          | LOSH | 0.5 |  |       | dB  |  |
| Conditions of Stress Receiver Sensitivity Test          |      |     |  |       |     |  |
| Stressed Eye Closure for PAM4 (SECQ)<br>Lane Under Test |      |     |  | 3.4   | dB  |  |
| SECQ – $10 \cdot \log_{10} (C_{eq})$ Lane Under Test    |      |     |  | 3.4   | 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. Receiver Sensitivity (OMA<sub>outer</sub>) (maximum) is informative and is defined for a transmitter with a value of SECQ up to 3.4dB for 100G ER1 O-Band WDM.
6. Measured with a conformance test signal at TP3 (see 3.11) for the BER specified in IEEE Std 802.3.

## Pin Descriptions

| Pin | Symbol  | Name/Descriptions                                 | Notes |
|-----|---------|---------------------------------------------------|-------|
| 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.                 |       |

|           |      |                                                   |   |
|-----------|------|---------------------------------------------------|---|
| <b>35</b> | GND  | Transmitter Ground (Common with Receiver Ground). | 1 |
| <b>36</b> | Tx1+ | Transmitter Non-Inverted Data Input.              |   |
| <b>37</b> | Tx1- | Transmitter Inverted Data Output.                 |   |
| <b>38</b> | 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 4.7k $\Omega$  to 10k $\Omega$  pull-up resistor to Host\_Vcc.

#### Electrical Pin-Out Details



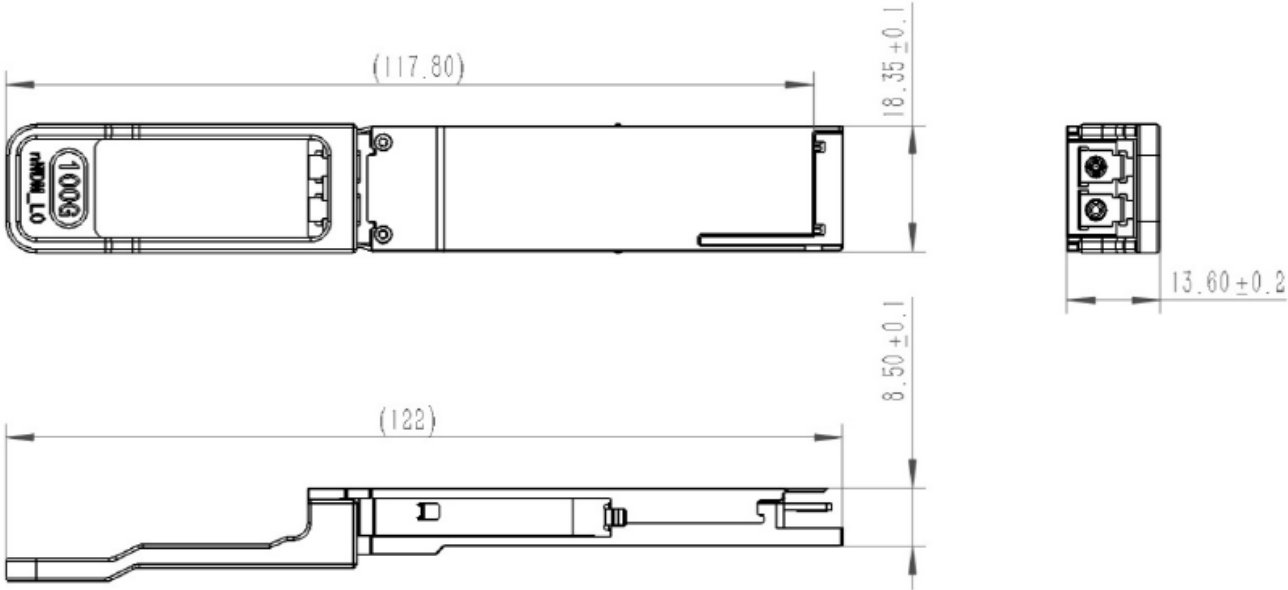
Recommended Host Board Power Supply Filter Network



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.

