

### JNP-QSFP-100G-ER4-OTU4-AO

Juniper Networks® JNP-QSFP-100G-ER4-OTU4 Compatible TAA OTU-4-ER4 100GbE Dual-Rate QSFP28 Transceiver (SMF, 1295nm to 1309nm, 40km, LC, DOM)

#### Features:

- QSFP28 MSA compliant
- Hot pluggable 38 pin electrical interface
- 4 LAN-WDM lanes MUX/DEMUX design
- 4x25G electrical interface
- Maximum power consumption 5W
- LC duplex connector
- Supports 103.125Gb/s and 111.81Gb/s aggregate bit rate
- Up to 40km transmission on single mode fiber
- Operating temperature: 0°C to 70°C
- Single 3.3V power supply
- RoHS Compliant



#### Applications

- 100GE Ethernet
- OTN OTU4 4L1-9C1F
- Telecom networking
- Data Center Interconnect

#### Product Description

This Juniper Networks® JNP-QSFP-100G-ER4-OTU4 compatible QSFP28 transceiver provides OTU-4-ER4 100GbE Dual-Rate ER4 throughput up to 40km 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 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. 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

### Absolute Maximum Ratings

| Parameter                   | Symbol          | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------------|------|------|------|------|
| Maximum Supply Voltage      | V <sub>cc</sub> | 0    |      | 3.6  | V    |
| Storage Temperature         | T <sub>s</sub>  | -40  |      | 85   | °C   |
| Operating Case Temperature  | T <sub>op</sub> | 0    |      | 70   | °C   |
| Relative Humidity           | RH              | 5    |      | 85   | %    |
| Damage Threshold, each lane | THd             | 5.5  |      |      | dBm  |
| Link Distance with G.652    |                 |      |      | 40   | km   |

## Electrical Characteristics

| Parameter                                    | Symbol      | Min   | Typ      | Max    | Unit | Notes        |
|----------------------------------------------|-------------|-------|----------|--------|------|--------------|
| Supply Voltage                               | Vcc         | 3.135 | 3.3      | 3.465  | V    |              |
| Power dissipation                            |             |       |          | 5      | W    |              |
| Supply Current                               | Icc         |       |          | 1.4430 | A    | Steady state |
| <b>Transmitter</b>                           |             |       |          |        |      |              |
| Data Rate, each lane                         |             |       | 25.78125 |        | Gbps | 1            |
|                                              |             |       | 27.9525  |        | Gbps | 2            |
| Differential Voltage pk-pk                   | Vpp         |       |          | 900    | mV   | At 1 MHz     |
| Common Mode Voltage                          | Vcm         | -350  |          | 2850   | mV   |              |
| Transition time                              | Trise/Tfall | 10    |          |        | ps   | 20%~80%      |
| Differential Termination Resistance Mismatch |             |       |          | 10     | %    |              |
| Eye width                                    | EW15        | 0.46  |          |        | UI   |              |
| Eye height                                   | EH15        | 95    |          |        | mV   |              |
| <b>Receiver</b>                              |             |       |          |        |      |              |
| Data Rate, each lane                         |             |       | 25.78125 |        | Gbps | 1            |
|                                              |             |       | 27.9525  |        | Gbps | 2            |
| Differential Termination Resistance Mismatch |             |       |          | 10     | %    | At 1 MHz     |
| Differential output voltage swing            | Vout, pp    |       |          | 900    | mV   |              |
| Common Mode Noise, RMS                       | Vrms        |       |          | 17.5   | mV   |              |
| Transition time                              | Trise/Tfall | 12    |          |        | ps   | 20%~80%      |
| Eye width                                    | EW15        | 0.57  |          |        | UI   |              |
| Eye height                                   | EH15        | 228   |          |        | mV   |              |

### Notes:

1. For use of 100GBASE-ER4.
2. For use of OTU4.

## Optical Characteristics

100GBASE-ER4 Operation (EOL, TOP = 0 to +70 °C , VCC = 3.135 to 3.465 Volts)

| Parameter                                                          | Symbol              | Min                                | Typical | Max     | Unit  | Notes |
|--------------------------------------------------------------------|---------------------|------------------------------------|---------|---------|-------|-------|
| <b>Transmitter</b>                                                 |                     |                                    |         |         |       |       |
| Signaling Speed per Lane                                           |                     | 25.78125 ± 100 ppm                 |         |         | Gb/s  |       |
| Transmit wavelengths                                               | L1                  | 1294.53                            |         | 1296.59 | nm    |       |
|                                                                    | L2                  | 1299.02                            |         | 1301.09 | nm    |       |
|                                                                    | L3                  | 1303.54                            |         | 1305.63 | nm    |       |
|                                                                    | L4                  | 1308.09                            |         | 1310.19 | nm    |       |
| Total Average Launch Power                                         | P <sub>o</sub>      |                                    |         | 8.9     | dBm   |       |
| Average launch power, each lane                                    | P <sub>o</sub>      | -2.9                               |         | 2.9     | dBm   |       |
| Optical Modulation Amplitude (OMA), each lane                      | OMA                 | 0.1                                |         | 4.5     | dBm   |       |
| Difference in launch power between any two lanes (Average and OMA) |                     |                                    |         | 3.6     | dB    |       |
| Transmitter and Dispersion Penalty (TDP), each lane                | TDP                 |                                    |         | 2.5     | dB    |       |
| Extinction Ratio                                                   | ER                  | 8                                  |         |         | dB    |       |
| RIN <sub>20OMA</sub>                                               |                     |                                    |         | -130    | dB/Hz |       |
| Side Mode Suppression Ratio                                        | SMSR                | 30                                 |         |         | dB    |       |
| Optical Return Loss Tolerance                                      | ORLT                |                                    |         | 20      | dB    |       |
| Transmitter reflectance                                            |                     |                                    |         | -12     | dB    |       |
| Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}           |                     | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |         |         |       | 1     |
| Mask margin                                                        |                     | 5                                  |         |         | %     | 1     |
| <b>Receiver</b>                                                    |                     |                                    |         |         |       |       |
| Signaling Speed per Lane                                           |                     | 25.78125 ± 100 ppm                 |         |         | Gb/s  |       |
| Receive wavelengths                                                | L1                  | 1294.53                            |         | 1296.59 | nm    |       |
|                                                                    | L2                  | 1299.02                            |         | 1301.09 | nm    |       |
|                                                                    | L3                  | 1303.54                            |         | 1305.63 | nm    |       |
|                                                                    | L4                  | 1308.09                            |         | 1310.19 | nm    |       |
| Damage threshold, each lane                                        | P <sub>damage</sub> | 5.5                                |         |         | dBm   |       |
| Average receiver power, each lane                                  |                     | -20.9                              |         | -3.5    | dBm   |       |
| Receiver power, each lane (OMA)                                    |                     |                                    |         | -3.5    | dBm   |       |
| Receiver Reflectance                                               | R <sub>f</sub>      |                                    |         | -26     | dB    |       |
| Receiver sensitivity (AOP), each lane                              | S                   |                                    |         | -20.9   | dBm   | 2     |
| Receiver 3 dB electrical upper cutoff frequency, each lane         |                     |                                    |         | 31      | GHz   |       |
| LOS Assert                                                         | LOSA                | -33                                |         |         | dBm   |       |

|                |      |     |  |     |     |  |
|----------------|------|-----|--|-----|-----|--|
| LOS Deassert   | LOSD |     |  | -22 | dBm |  |
| LOS Hysteresis | LOSH | 0.5 |  |     | dB  |  |

**Notes:**

1. Hit ratio  $5 \times 10^{-5}$ .
2. Sensitivity is specified at BER@1E-12 without FEC.

**Optical Characteristics**

**OTU4 Operation** (EOL, TOP = 0 to +70 °C , VCC = 3.135 to 3.465 Volts)

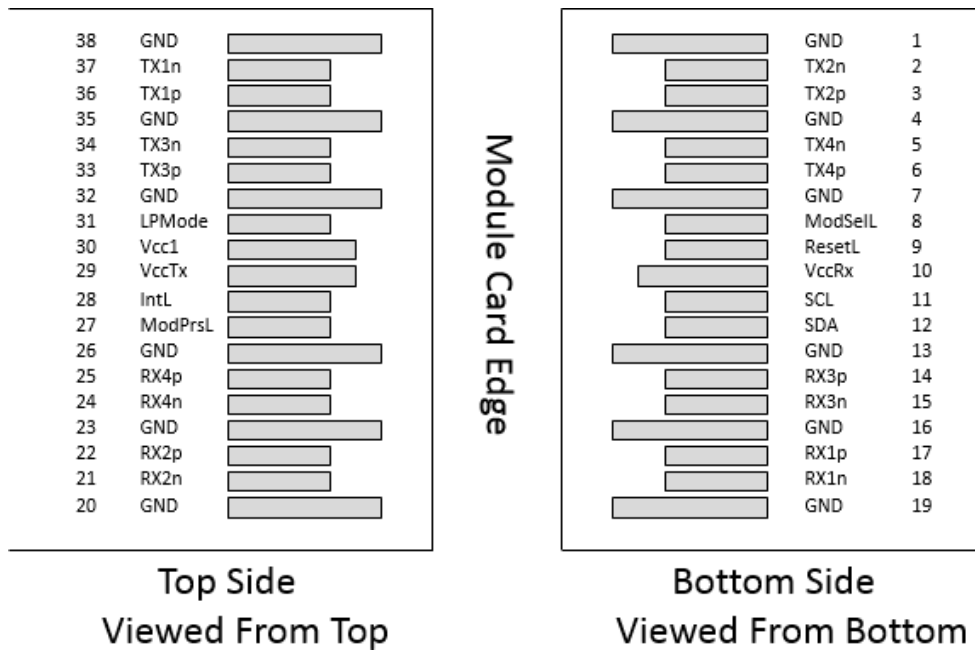
| Parameter                                                           | Symbol | Min                                | Typical | Max     | Unit | Notes |
|---------------------------------------------------------------------|--------|------------------------------------|---------|---------|------|-------|
| <b>Transmitter</b>                                                  |        |                                    |         |         |      |       |
| Signaling Speed per Lane                                            |        | 27.9525 ± 20 ppm                   |         |         | Gb/s |       |
| Transmit wavelengths                                                | L1     | 1294.53                            |         | 1296.59 | nm   |       |
|                                                                     | L2     | 1299.02                            |         | 1301.09 | nm   |       |
|                                                                     | L3     | 1303.54                            |         | 1305.63 | nm   |       |
|                                                                     | L4     | 1308.09                            |         | 1310.19 | nm   |       |
| Total Average Launch Power                                          | Po     |                                    |         | 8.9     | dBm  |       |
| Average launch power, each lane                                     | Po     | -2.7                               |         | 2.9     | dBm  |       |
| Difference in launch power between any two lanes (Average and OMA)  |        |                                    |         | 3.6     | dB   |       |
| Extinction Ratio                                                    | ER     | 8                                  |         |         | dB   |       |
| Optical Return Loss Tolerance                                       | ORLT   |                                    |         | 20      | dB   |       |
| Transmitter reflectance                                             |        |                                    |         | -26     | dB   |       |
| Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}            |        | {0.25, 0.4, 0.45, 0.25, 0.28, 0.4} |         |         |      | 1     |
| Mask margin                                                         |        | 5                                  |         |         | %    | 1     |
| <b>Receiver</b>                                                     |        |                                    |         |         |      |       |
| Signaling Speed per Lane                                            |        | 27.9525 ± 20 ppm                   |         |         | Gb/s |       |
| Receive wavelengths                                                 | L1     | 1294.53                            |         | 1296.59 | nm   |       |
|                                                                     | L2     | 1299.02                            |         | 1301.09 | nm   |       |
|                                                                     | L3     | 1303.54                            |         | 1305.63 | nm   |       |
|                                                                     | L4     | 1308.09                            |         | 1310.19 | nm   |       |
| Average receiver power, each lane                                   |        | -20.7                              |         | -3.5    | dBm  |       |
| Receiver power, each lane (OMA)                                     |        |                                    |         | -3.5    | dBm  |       |
| Difference in receive power between any two lanes (Average and OMA) |        |                                    |         | 4.5     |      |       |
| Receiver Reflectance                                                | Rf     |                                    |         | -26     | dB   |       |

|                                                            |      |     |  |       |     |   |
|------------------------------------------------------------|------|-----|--|-------|-----|---|
| Receiver sensitivity (AOP), each lane                      | S    |     |  | -23.2 | dBm | 2 |
| Receiver 3 dB electrical upper cutoff frequency, each lane |      |     |  | 31    | GHz |   |
| LOS Assert                                                 | LOSA | -33 |  |       | dBm |   |
| LOS Deassert                                               | LOSD |     |  | -24   | dBm |   |
| LOS Hysteresis                                             | LOSH | 0.5 |  |       | dB  |   |

**Notes:**

1. Hit ratio  $5 \times 10^{-5}$ .
2. Sensitivity is specified at BER@5E-5 with FEC.

**Electrical Pin-out Details**



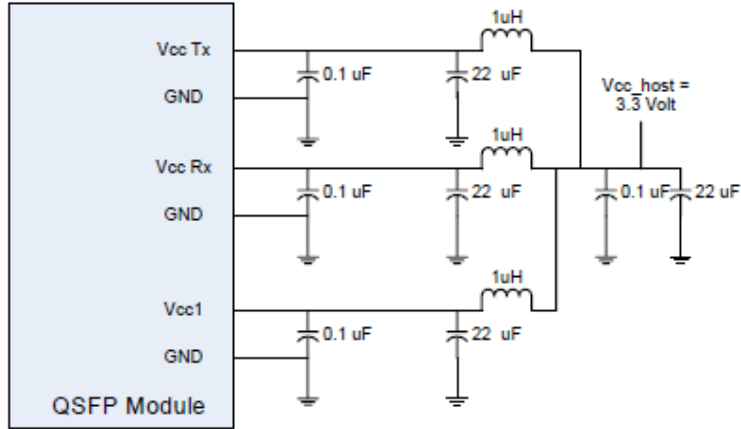
## Pin Descriptions

| Pin | Symbol  | Name/Descriptions                   | Ref. |
|-----|---------|-------------------------------------|------|
| 1   | GND     | Ground                              | 1    |
| 2   | Tx2n    | Transmitter Inverted Data Input     |      |
| 3   | Tx2p    | Transmitter Non-Inverted Data Input |      |
| 4   | GND     | Ground                              | 1    |
| 5   | Tx4n    | Transmitter Inverted Data Input     |      |
| 6   | Tx4p    | Transmitter Non-Inverted Data Input |      |
| 7   | GND     | Ground                              | 1    |
| 8   | ModSelL | Module Select                       |      |
| 9   | ResetL  | Module Reset                        |      |
| 10  | Vcc Rx  | +3.3V Power Supply Receiver         |      |
| 11  | SCL     | 2-wire serial interface clock       |      |
| 12  | SDA     | 2-wire serial interface data        |      |
| 13  | GND     | Ground                              | 1    |
| 14  | Rx3p    | Receiver Non-Inverted Data Output   |      |
| 15  | Rx3n    | Receiver Inverted Data Output       |      |
| 16  | GND     | Ground                              | 1    |
| 17  | Rx1p    | Receiver Non-Inverted Data Output   |      |
| 18  | Rx1n    | Receiver Inverted Data Output       |      |
| 19  | GND     | Ground                              | 1    |
| 20  | GND     | Ground                              | 1    |
| 21  | Rx2n    | Receiver Inverted Data Output       |      |
| 22  | Rx2p    | Receiver Non-Inverted Data Output   |      |
| 23  | GND     | Ground                              | 1    |
| 24  | Rx4n    | Receiver Non-Inverted Data Output   |      |
| 25  | Rx4p    | Receiver Inverted Data Output       |      |
| 26  | GND     | Ground                              | 1    |
| 27  | ModPrsL | Module Present                      |      |
| 28  | IntL    | Interrupt                           |      |
| 29  | Vcc Tx  | +3.3V Power supply transmitter      |      |
| 30  | Vcc1    | +3.3V Power supply                  |      |
| 31  | LPMode  | Low Power Mode                      |      |
| 32  | GND     | Ground                              | 1    |
| 33  | Tx3p    | Transmitter Non-Inverted Data Input |      |
| 34  | Tx3n    | Transmitter Inverted Data Input     |      |
| 35  | GND     | Ground                              | 1    |
| 36  | Tx1p    | Transmitter Non-Inverted Data Input |      |
| 37  | Tx1n    | Transmitter Inverted Data Input     |      |
| 38  | GND     | Ground                              | 1    |

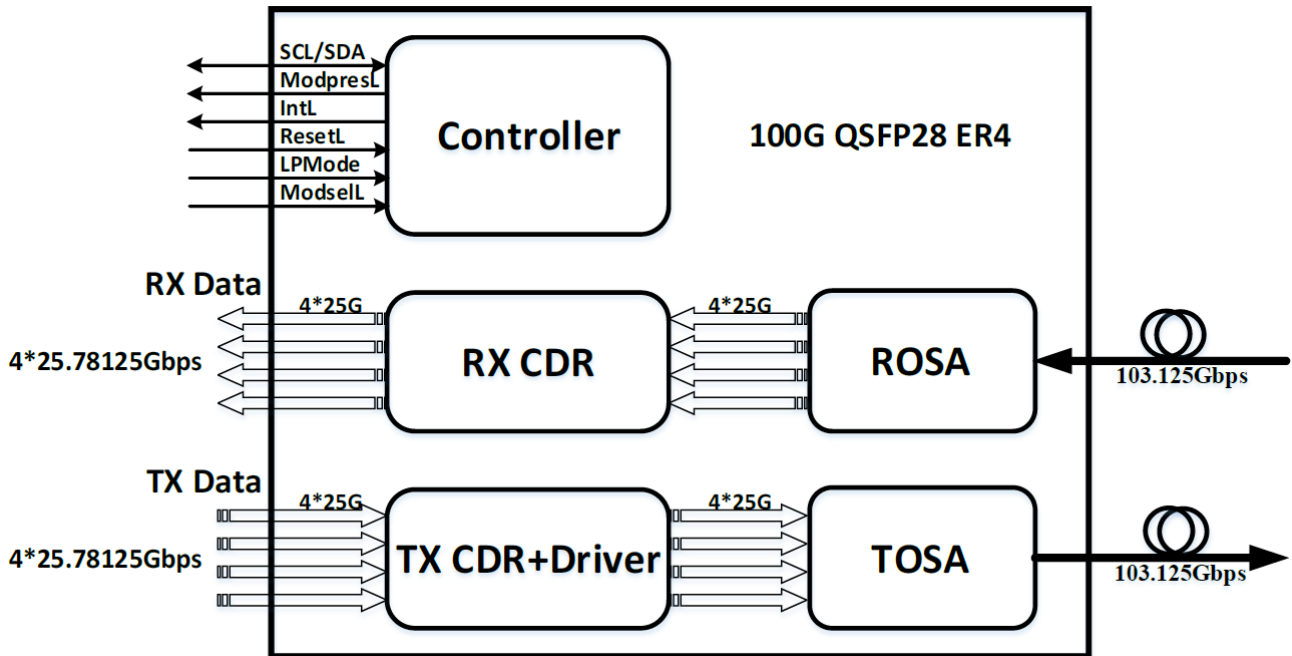
**Notes:**

- 1. Circuit ground is internally isolated from chassis ground.

**Recommended Host Board Power Supply Filter Network**

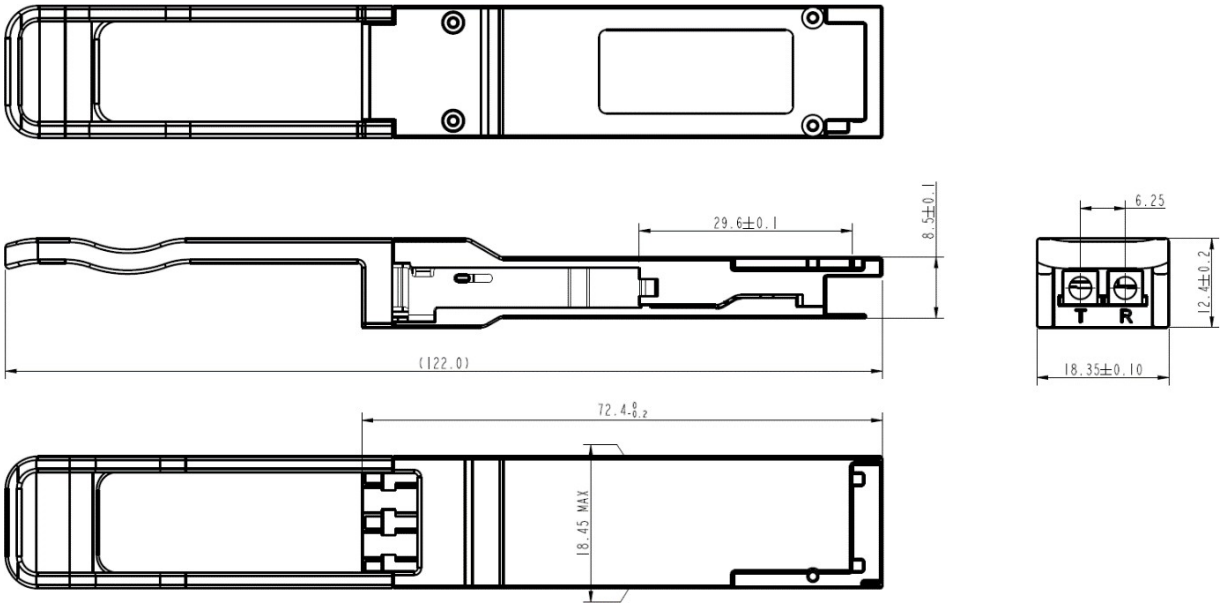


**Transceiver Block Diagram**





# Mechanical Specifications



## **About AddOn Networks**

In 1999, AddOn Networks entered the market with a single product. Our founders fulfilled a severe shortage for compatible, cost-effective optical transceivers that compete at the same performance levels as leading OEM manufacturers. Adhering to the idea of redefining service and product quality not previously had in the fiber optic networking industry, AddOn invested resources in solution design, production, fulfillment, and global support.

Combining one of the most extensive and stringent testing processes in the industry, an exceptional free tech support center, and a consistent roll-out of innovative technologies, AddOn has continually set industry standards of quality and reliability throughout its history.

Reliability is the cornerstone of any optical fiber network and is engrained in AddOn's DNA. It has played a key role in nurturing the long-term relationships developed over the years with customers. AddOn remains committed to exceeding industry standards with certifications from ranging from NEBS Level 3 to ISO 9001:2005 with every new development while maintaining the signature reliability of its products.

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