



### EX-SFP-10GE-ZR-60.61-100-I-OPC

Juniper Networks® Compatible TAA 10GBase-DWDM SFP+ Transceiver C-Band 100GHz (SMF, 1560.61nm, 100km, LC, DOM, -40 to 85C)

#### Features

- SFF-8432 and SFF-8472 Compliance
- Duplex LC Connector
- Temperature-stabilized EML transmitter and APD receiver
- Single-mode Fiber
- Industrial Temperature -40 to 85 Celsius
- Hot Pluggable
- Metal with Lower EMI
- Excellent ESD Protection
- RoHS Compliant and Lead Free



#### Applications:

- 10x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

#### Product Description

This Juniper Networks® SFP+ transceiver provides 10GBase-DWDM throughput up to 100km over single-mode fiber (SMF) using a wavelength of 1560.61nm 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.

OptioConnect's 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."



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

| Channel # | Frequency (THz) | Center Wavelength (nm) |
|-----------|-----------------|------------------------|
| 19        | 191.9           | 1562.23                |
| 20        | 192.0           | 1561.42                |
| 21        | 192.1           | 1560.61                |
| 22        | 192.2           | 1559.79                |
| 23        | 192.3           | 1558.98                |
| 24        | 192.4           | 1558.17                |
| 25        | 192.5           | 1557.36                |
| 26        | 192.6           | 1556.55                |
| 27        | 192.7           | 1555.75                |
| 28        | 192.8           | 1554.94                |
| 29        | 192.9           | 1554.13                |
| 30        | 193.0           | 1553.33                |
| 31        | 193.1           | 1552.52                |
| 33        | 193.3           | 1551.72                |
| 34        | 193.4           | 1550.12                |
| 35        | 193.5           | 1549.32                |
| 36        | 193.6           | 1548.51                |
| 37        | 193.7           | 1547.72                |
| 38        | 193.8           | 1546.92                |
| 39        | 193.9           | 1546.12                |
| 40        | 194.0           | 1545.32                |
| 41        | 194.1           | 1544.53                |
| 42        | 194.2           | 1543.73                |
| 43        | 194.3           | 1542.94                |
| 44        | 194.4           | 1542.14                |
| 45        | 194.5           | 1541.35                |
| 46        | 194.6           | 1540.56                |
| 47        | 194.7           | 1539.77                |
| 48        | 194.8           | 1538.98                |
| 49        | 194.9           | 1538.19                |
| 50        | 195.0           | 1537.40                |
| 51        | 195.1           | 1536.61                |
| 52        | 195.2           | 1535.82                |
| 53        | 195.3           | 1535.04                |
| 54        | 195.4           | 1534.25                |
| 55        | 195.5           | 1533.47                |
| 56        | 195.6           | 1532.68                |
| 57        | 195.7           | 1531.90                |
| 58        | 195.8           | 1531.12                |
| 59        | 195.9           | 1530.33                |

|    |       |         |
|----|-------|---------|
| 60 | 196.0 | 1529.55 |
| 61 | 196.1 | 1528.77 |

### Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ.    | Max. | Unit |
|----------------------------|--------|------|---------|------|------|
| Storage Temperature        | Tstg   | -40  |         | 85   | °C   |
| Operating Case Temperature | Tc     | -40  | 25      | 85   | °C   |
| Supply Voltage             | Vcc    | -0.5 |         | 4.0  | V    |
| Relative Humidity          | RH     | 5    |         | 95   | %    |
| Data Rate                  |        |      | 10.3125 |      | Gbps |

### Electrical Characteristics

| Parameter                      |                      | Symbol            | Min.  | Typ. | Max.     | Unit  | Notes |
|--------------------------------|----------------------|-------------------|-------|------|----------|-------|-------|
| Supply Voltage                 |                      | Vcc               | 3.135 | 3.3  | 3.465    | V     |       |
| Module Supply Current          |                      | Icc               |       |      | 550      | mA    |       |
| Power Dissipation              |                      | P <sub>DISS</sub> |       |      | 1.8      | W     |       |
| Transmitter                    |                      |                   |       |      |          |       |       |
| Input Differential Impedance   |                      | ZIN               |       | 100  |          | Ω     |       |
| Differential Data Input Swing  |                      | VIN,pp            | 180   |      | 700      | mVp-p |       |
| Tx_Fault                       | Transmitter Fault    | VOH               | 2.0   |      | Host_Vcc | V     |       |
|                                | Normal Operation     | VOL               | 0     |      | 0.8      | V     |       |
| Tx_Disable                     | Transmitter Disable  | VIH               | 2.0   |      | Host_Vcc | V     |       |
|                                | Transmitter Enable   | VIL               | 0     |      | 0.8      | V     |       |
| Receiver                       |                      |                   |       |      |          |       |       |
| Output Differential Impedance  |                      | ZOUT              |       | 100  |          | Ω     |       |
| Differential Data Output Swing |                      | VOUT,pp           | 300   |      | 850      | mVp-p | 1     |
| Data Output Rise/Fall Time     |                      | Tr/Tf             | 28    |      |          | ps    | 2     |
| Rx_LOS                         | Loss of Signal (LOS) | VOH               | 2.0   |      | Host_Vcc | V     | 3     |
|                                | Normal Operation     | VOL               | 0     |      | 0.8      | V     | 3     |

### Notes:

1. Internally AC coupled but requires an external 100Ω differential load termination.
2. 20–80%.
3. LOS is an open collector output that should be pulled up with 4.7kΩ on the host board.

## Optical Characteristics

| Parameter                          | Symbol                                                  | Min.    | Typ. | Max.    | Unit  | Notes |
|------------------------------------|---------------------------------------------------------|---------|------|---------|-------|-------|
| Transmitter                        |                                                         |         |      |         |       |       |
| Launch Optical Power               | Po                                                      | +1.0    |      | +4.0    | dBm   | 1     |
| Center Wavelength Range            | λC                                                      | 1528.77 |      | 1562.23 | nm    |       |
| Center Wavelength Spacing          |                                                         |         | 100  |         | GHz   |       |
| Center Wavelength Tolerance        | ΔλC                                                     | -100    |      | 100     | pm    |       |
| Extinction Ratio                   | ER                                                      | 9.0     |      |         | dB    | 2     |
| Side-Mode Suppression Ratio        | SMSR                                                    | 30      |      |         | dB    |       |
| Spectral Width ( -20dB )           |                                                         |         |      | 1       | nm    |       |
| Transmitter and Dispersion Penalty | TDP                                                     |         |      | 4.0     | dB    |       |
| Relative Intensity Noise           | RIN                                                     |         |      | -128    | dB/Hz |       |
| Optical Return Loss Tolerance      | ORLT                                                    |         |      | 21      | dB    |       |
| Pout @Tx_Disable Asserted          | Poff                                                    |         |      | -30     | dBm   | 1     |
| Eye Diagram                        | IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-ZR Compatible |         |      |         |       |       |
| Receiver                           |                                                         |         |      |         |       |       |
| Center Wavelength                  | λC                                                      | 1528    |      | 1565    | nm    |       |
| Receiver Sensitivity (Pavg)        | S                                                       |         |      | -26     | dBm   | 3     |
| Receiver Overload (Pavg)           | PoL                                                     | -7.0    |      |         | dBm   | 3     |
| Optical Return Loss                | ORL                                                     |         |      | -27     | dB    |       |
| OSNR                               |                                                         | 27      |      |         | dB    | 4     |
| Maximum OSNR Path Penalty          |                                                         |         |      | 4       | dB    | 4     |
| Dispersion Limited Distance        |                                                         |         |      | 100     | km    |       |
| LOS De-Assert                      | LOSD                                                    |         |      | -26     | dBm   |       |
| LOS Assert                         | LOSA                                                    | -35     |      |         | dBm   |       |
| LOS Hysteresis                     |                                                         | 0.5     |      |         | dB    |       |

### Notes:

1. The optical power is launched into 9/125 $\mu$ m SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps.
3. Measured with PRBS 2<sup>31</sup>-1 test pattern, @10.3125Gbps, and BER<10<sup>-12</sup>.
4. Receiver power @-7~-18dBm, @10.3125Gbps, and BER<10<sup>-12</sup>.

## Pin Descriptions

| Pin | Symbol     | Name/Description                                                           | Notes |
|-----|------------|----------------------------------------------------------------------------|-------|
| 1   | VeeT       | Transmitter Ground (Common with Receiver Ground).                          | 1     |
| 2   | Tx_Fault   | Transmitter Fault. LVTTTL-O.                                               | 2     |
| 3   | Tx_Disable | Transmitter Disable. Laser output disabled on “high” or “open.” LVTTTL-I.  | 3     |
| 4   | SDA        | 2-Wire Serial Interface Data (Same as MOD-DEF2 in INF-8074i). LVTTTL-I/O.  |       |
| 5   | SCL        | 2-Wire Serial Interface Clock (Same as MOD-DEF2 in INF-8074i). LVTTTL-I.   |       |
| 6   | MOD_ABS    | Module Absent. Connect to the VeeT or VeeR in the module.                  | 4     |
| 7   | RS0        | Rate Select 0. Not Used.                                                   | 5     |
| 8   | LOS        | Loss of Signal Indication. “Logic 0” indicates normal operation. LVTTTL-O. | 2     |
| 9   | RS1        | Rate Select 1. Not Used.                                                   | 5     |
| 10  | VeeR       | Receiver Ground (Common with Transmitter Ground).                          | 1     |
| 11  | VeeR       | Receiver Ground (Common with Transmitter Ground).                          | 1     |
| 12  | RD-        | Receiver Inverted Data Out. AC Coupled. CML-O.                             |       |
| 13  | RD+        | Receiver Non-Inverted Data Out. AC Coupled. CML-O.                         |       |
| 14  | VeeR       | Receiver Ground (Common with Transmitter Ground).                          | 1     |
| 15  | VccR       | Receiver Power Supply.                                                     |       |
| 16  | VccT       | Transmitter Power Supply.                                                  |       |
| 17  | VeeT       | Transmitter Ground (Common with Receiver Ground).                          | 1     |
| 18  | TD+        | Transmitter Non-Inverted Data In. AC Coupled. CML-I.                       |       |
| 19  | TD-        | Transmitter Inverted Data In. AC Coupled. CML-O.                           |       |
| 20  | VeeT       | Transmitter Ground (Common with Receiver Ground).                          | 1     |

### Notes:

1. The module signal ground contacts, VeeR and VeeT, should be isolated from the module case.
2. This contact is an open collector/drain output and should be pulled up to the Host\_Vcc with resistor in the range 4.7kΩ to 10kΩ. Pull-ups can be connected to one or several power supplies; however, the hostboard design shall ensure that no module contract has voltage exceeding module VccT/R+0.5V.
3. Tx\_Disable is an input contact with a 4.7kΩ to 10kΩ pull-up resistor to VccT inside the module.
4. MOD\_ABS is connected to VeeT or VeeR in the SFP+ module. The host may pull the contract up to Host\_Vcc with a resistor in the range from 4.7kΩ to 10kΩ. MOD\_ABS is asserted “high” when the SFP+ module is physically absent from a host slot.
5. Internally pulled down per SFF-8431.



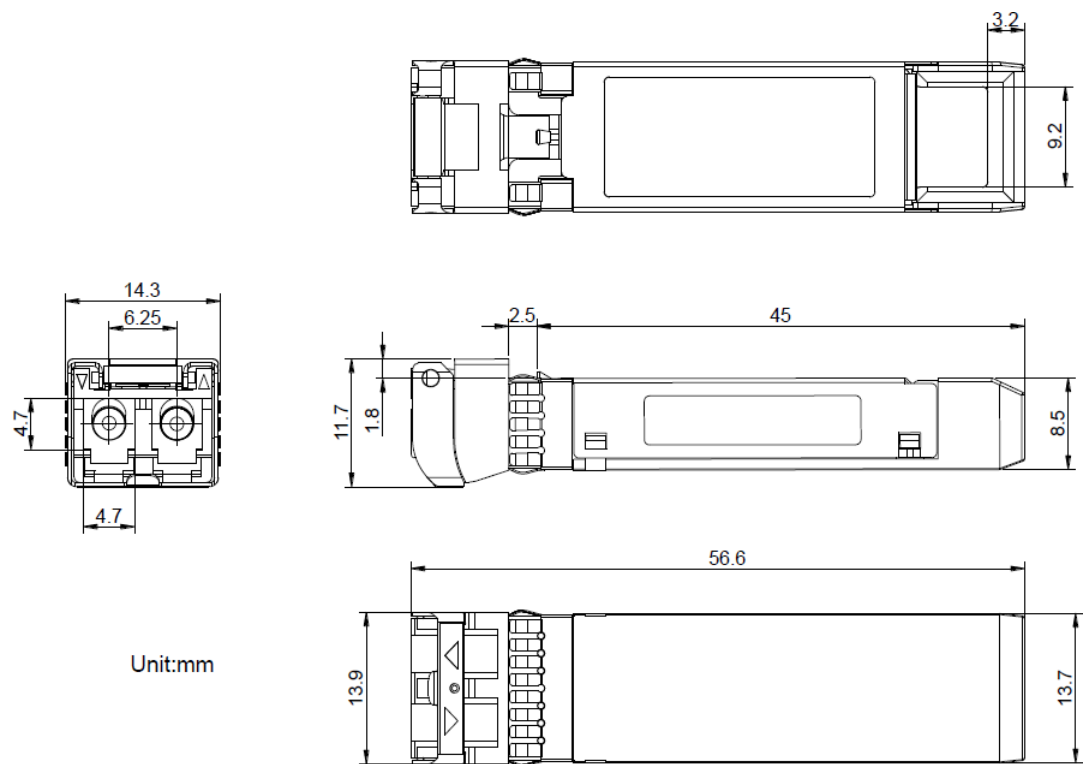
Pin-Out of Connector Block on the Host Board

### Recommended Application Interface Block Diagram



Mechanical Specifications

Small Form Factor Pluggable (SFP) transceivers are compatible with the dimensions defined by the SFP Multi-Sourcing Agreement (MSA).



EEPROM Information

EEPROM memory map-specific data field description is as below:

| 2 wire address 1010000X (A0h)           | 2 wire address 1010001X (A2h)             |
|-----------------------------------------|-------------------------------------------|
| 0                                       | 0                                         |
| Serial ID Defined by SFP MSA (96 bytes) | Alarm and Warning Thresholds (56 bytes)   |
| 95                                      | 55                                        |
| Vendor Specific (32 bytes)              | Cal Constants (40 bytes)                  |
| 127                                     | 95                                        |
| Reserved, SFF8079 (128 bytes)           | Real Time Diagnostic Interface (24 bytes) |
|                                         | 119                                       |
|                                         | 127                                       |
|                                         | Vendor Specific (8 bytes)                 |
|                                         | User Writable EEPROM (120 bytes)          |
|                                         | 247                                       |
| 255                                     | 255                                       |
|                                         | Vendor Specific (8 bytes)                 |

## **OptioConnect**

### **Innovation for the Future of High-Speed Networking**

#### **Who We Are**

OptioConnect is reshaping the landscape of communication and high-speed networking through intelligent technology. With a core focus on cutting edge technology, we deliver smarter fiber optic solutions for enterprise networks, data centers, and next-gen telecom infrastructures.

#### **What We Do**

At OptioConnect, we fuse advanced engineering with intelligent automation to drive the future of networking. Our AI-integrated solutions are designed to optimize performance and streamline operations with:

- Superior Performance
- Network and traffic optimization
- Intelligent energy management
- Seamless OEM compatibility
- Scalable cost-efficiency

#### **Smarter Networks by Design**

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