

## S2DTU0152R1FC4E

Juniper Networks® Compatible 10/25GBase-DWDM SFP28 Transceiver Dual-Rate 100GHz (SMF, Tunable, 15km, LC, DOM, -20 to 85C)

### Product Description

This Juniper Networks® Compatible Dual-Rate SFP28 transceiver provides 10/25GBase-DWDM throughput up to 15km over single-mode fiber (SMF) using a tunable wavelength 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:

- SFF-8432 and SFF-8472 Compliant
- 100GHz Channel Spacing
- Duplex LC Connector
- Extended Temperature -20 to 85 Celsius
- Single-mode Fiber
- Supports 24.33024G, 25.78125Gbps (with FEC); 9.8304G, 10.1376G, 10.3125Gbps
- Excellent ESD Protection
- Hot Pluggable
- RoHS Compliant and Lead Free
- Metal with Lower EMI



### Applications:

- 25GBase
- Access, Metro 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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## 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.

## DWDM Wavelength ITU Channels - 100 GHz Spacing

| ITU Channel | Center Wavelength (nm) | Frequency (THz) | ITU Channel | Center Wavelength (nm) | Frequency (THz) |
|-------------|------------------------|-----------------|-------------|------------------------|-----------------|
| 14          | 1566.31                | 191.4           | 38          | 1546.92                | 193.8           |
| 15          | 1565.50                | 191.5           | 39          | 1546.12                | 193.9           |
| 16          | 1564.68                | 191.6           | 40          | 1545.32                | 194.0           |
| 17          | 1563.86                | 191.7           | 41          | 1544.53                | 194.1           |
| 18          | 1563.05                | 191.8           | 42          | 1543.73                | 194.2           |
| 19          | 1562.23                | 191.9           | 43          | 1542.94                | 194.3           |
| 20          | 1561.42                | 192.0           | 44          | 1542.14                | 194.4           |
| 21          | 1560.61                | 192.1           | 45          | 1541.35                | 194.5           |
| 22          | 1559.79                | 192.2           | 46          | 1540.56                | 194.6           |
| 23          | 1558.98                | 192.3           | 47          | 1539.77                | 194.7           |
| 24          | 1558.17                | 192.4           | 48          | 1538.98                | 194.8           |
| 25          | 1557.36                | 192.5           | 49          | 1538.19                | 194.9           |
| 26          | 1556.55                | 192.6           | 50          | 1537.4                 | 195.0           |
| 27          | 1555.75                | 192.7           | 51          | 1536.61                | 195.1           |
| 28          | 1554.94                | 192.8           | 52          | 1535.82                | 195.2           |
| 29          | 1554.13                | 192.9           | 53          | 1535.04                | 195.3           |
| 30          | 1553.33                | 193.0           | 54          | 1534.25                | 195.4           |
| 31          | 1552.52                | 193.1           | 55          | 1533.47                | 195.5           |
| 32          | 1551.72                | 193.2           | 56          | 1532.68                | 195.6           |
| 33          | 1550.92                | 193.3           | 57          | 1531.9                 | 195.7           |
| 34          | 1550.12                | 193.4           | 58          | 1531.12                | 195.8           |
| 35          | 1549.32                | 193.5           | 59          | 1530.33                | 195.9           |
| 36          | 1548.51                | 193.6           | 60          | 1529.55                | 196.0           |
| 37          | 1547.72                | 193.7           | 61          | 1528.77                | 196.1           |

## Absolute Maximum Ratings

| Parameter                  | Symbol           | Min.               | Typ. | Max.                | Unit |
|----------------------------|------------------|--------------------|------|---------------------|------|
| Maximum Supply Voltage     | V <sub>CC</sub>  | 0                  | 3.3  | 3.6                 | V    |
| Storage Temperature        | T <sub>stg</sub> | -40                |      | 85                  | °C   |
| Operating Case Temperature | T <sub>c</sub>   | -20                |      | 85                  | °C   |
| Operating Humidity         | RH               | 0                  |      | 85                  | %    |
| Data Rate                  | DR               | 24.33024<br>9.8304 |      | 25.78125<br>10.3125 | Gbps |
| Data Rate Accuracy         |                  | -100               |      | 100                 | ppm  |
| 9/125μm G.652 SMF          |                  |                    |      | 15                  | km   |

## Electrical Characteristics

| Parameter                        | Symbol             | Min.               | Typ. | Max.                  | Unit | Notes         |
|----------------------------------|--------------------|--------------------|------|-----------------------|------|---------------|
| Power Supply Voltage             | V <sub>CC</sub>    | 3.135              | 3.30 | 3.465                 | V    |               |
| Power Dissipation                | P <sub>DISS</sub>  |                    |      | 2.5                   | W    | 1             |
| Power Supply Current             | I <sub>CC</sub>    |                    |      | 0.76                  | A    |               |
| <b>Transmitter</b>               |                    |                    |      |                       |      |               |
| Data Rate                        | DR                 | 24.33024<br>9.8304 |      | 25.78125<br>10.3125   | Gbps | CDR<br>Bypass |
| Differential Voltage pk-pk       | V <sub>IN,pp</sub> | 180                |      | 900                   | mV   |               |
| Tx Differential Input Impedence  | Z <sub>IN</sub>    |                    | 100  |                       | Ω    |               |
| Transmitter Disable Voltage      | V <sub>D</sub>     | 2                  |      | V <sub>ee</sub> + 0.3 | V    |               |
| Transmitter Enable Voltage       | V <sub>EN</sub>    | 0                  |      | 0.8                   | V    |               |
| <b>Receiver</b>                  |                    |                    |      |                       |      |               |
| Data Rate                        | DR                 | 24.33024<br>9.8304 |      | 25.78125<br>10.3125   | Gbps | CDR<br>Bypass |
| Differential Voltage pk-pk       | V <sub>IN,pp</sub> | 450                | 600  | 900                   | mV   |               |
| Rx Differential Output Impedence | Z <sub>OUT</sub>   |                    | 100  |                       | Ω    |               |
| LOS Assert Voltage               | V <sub>LOSA</sub>  | 2.4                |      | V <sub>CC</sub>       | V    |               |
| LOS De-Assert Voltage            | V <sub>LOSD</sub>  | V <sub>ee</sub>    |      | V <sub>ee</sub> +0.4  | V    |               |
| Eye Height                       | EH <sub>15</sub>   | 228                |      |                       | mV   |               |
| Eye Width                        | EW <sub>15</sub>   | 0.57               |      |                       | UI   |               |
| Vertical Eye Closure             | VEC                |                    |      | 5.5                   | dB   |               |

### Notes:

1. Power dissipation is less than 2.5W when supply voltage is 3.3V.

## Optical Characteristics

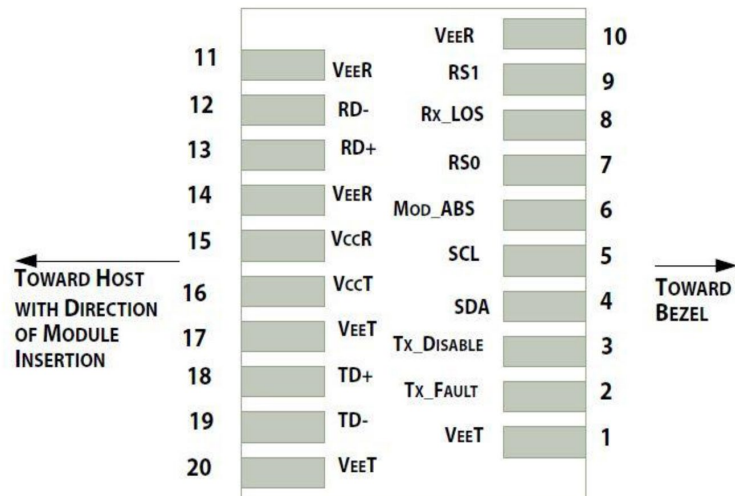
| Parameter                                                   | Symbol                                                                             | Min.    | Typ. | Max.                       | Unit | Notes |
|-------------------------------------------------------------|------------------------------------------------------------------------------------|---------|------|----------------------------|------|-------|
| Transmitter                                                 |                                                                                    |         |      |                            |      |       |
| Output Average Power                                        | PO                                                                                 | 0       |      | 4                          | dBm  |       |
| Wavelength Range                                            | $\lambda_C$                                                                        | 1528.77 |      | 1566.31                    | nm   |       |
| Wavelength Accuracy                                         |                                                                                    | -12.5   |      | 12.5                       | GHz  |       |
| Frequency Range                                             |                                                                                    | 191.3   |      | 196.0                      | THz  |       |
| Channel Spacing                                             |                                                                                    |         | 100  |                            | GHz  |       |
| Extinction Ratio                                            | ER                                                                                 | 3.5     |      |                            | dB   |       |
| Side-Mode Suppression Ratio                                 | SMSR                                                                               | 30      |      |                            | dB   |       |
| Transmitter Eye Mask Definition<br>{X1, X2, X3, Y1, Y2, Y3} | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4}<br>Hit ratio $5 \times 10^{-5}$ hits per sample |         |      |                            |      |       |
| Receiver                                                    |                                                                                    |         |      |                            |      |       |
| Frequency Range                                             |                                                                                    | 191.3   |      | 196.0                      | THz  |       |
| Saturation Power                                            |                                                                                    | -2      |      | -23                        | dBm  |       |
| Receiver Sensitivity                                        | S                                                                                  |         |      | -14 (5e <sup>-5</sup> FEC) | dBm  |       |
| Receiver Sensitivity (After 15km)                           | S                                                                                  |         |      | -14 (5e <sup>-5</sup> FEC) | dBm  |       |
| LOS Assert                                                  | LOSA                                                                               | -30     |      |                            | dBm  |       |
| LOS De-Assert                                               | LOSD                                                                               |         |      | -16                        | dBm  |       |
| LOS Hysteresis                                              |                                                                                    | 0.5     |      |                            | dB   |       |
| SRS Eye Mask Definition<br>{X1, X2, X3, Y1, Y2, Y3}         | {0.31, 0.4, 0.45, 0.34, 0.38, 0.4}                                                 |         |      |                            |      |       |

## Pin Descriptions

| Pin | Symbol     | Name                                                                               | Ref. |
|-----|------------|------------------------------------------------------------------------------------|------|
| 1   | VeeT       | Transmitter Ground.                                                                | 1    |
| 2   | Tx_Fault   | Transmitter Fault Indication.                                                      |      |
| 3   | Tx_Disable | Disables the transmitter or laser output.                                          | 2    |
| 4   | SDA        | 2-Wire Serial Interface Data.                                                      | 2    |
| 5   | SCL        | 2-Wire Serial Interface Clock.                                                     | 2    |
| 6   | Mod_ABS    | Indicates the module online state. This pin is connected to the VeeT or VeeR pin.  |      |
| 7   | RS0        | Selects a rate for the module. This pin is connected to the 33k $\Omega$ resistor. |      |
| 8   | LOS        | Indicates a loss of received signals.                                              | 2    |
| 9   | RS1        | Selects a rate for the module. This pin is connected to the 33k $\Omega$ resistor. |      |
| 10  | VeeR       | Receiver Ground.                                                                   | 1    |
| 11  | VeeR       | Receiver Ground 1.                                                                 | 1    |
| 12  | RD-        | Inverse Received Data Output.                                                      |      |
| 13  | RD+        | Received Data Output.                                                              |      |
| 14  | VeeR       | Receiver Ground.                                                                   | 1    |
| 15  | VccR       | +3.3V Receiver Power.                                                              | 1    |
| 16  | VccT       | +3.3V Transmitter Power.                                                           | 1    |
| 17  | VeeT       | Transmitter Ground.                                                                | 1    |
| 18  | TD+        | Transmit Data Input.                                                               |      |
| 19  | TD-        | Inverse Transmit Data Input.                                                       |      |
| 20  | VeeT       | Transmitter Ground.                                                                | 1    |

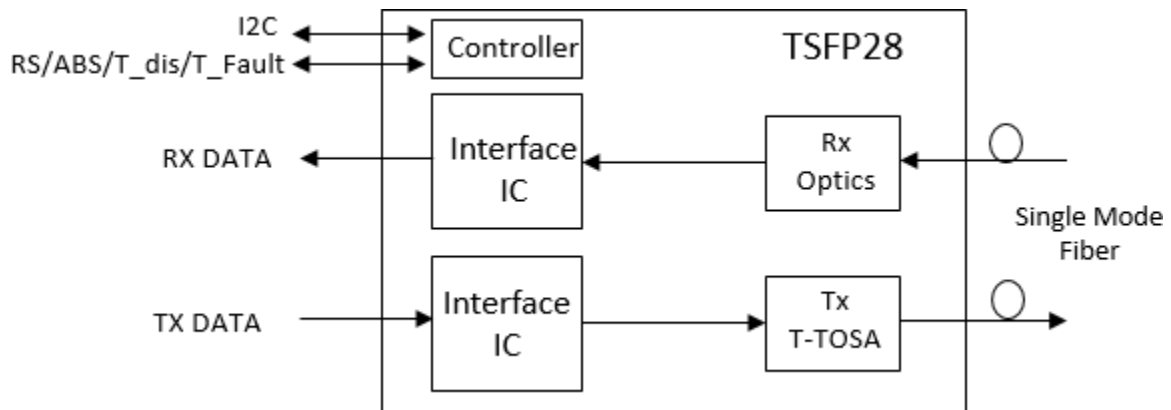
### Notes:

1. The ground of the module (operating module ground) and that of the module shell are separate from each other.
2. 4.7k $\Omega$ –10k $\Omega$  resistor is used on the module to pull the output up to 3.15–3.45V.



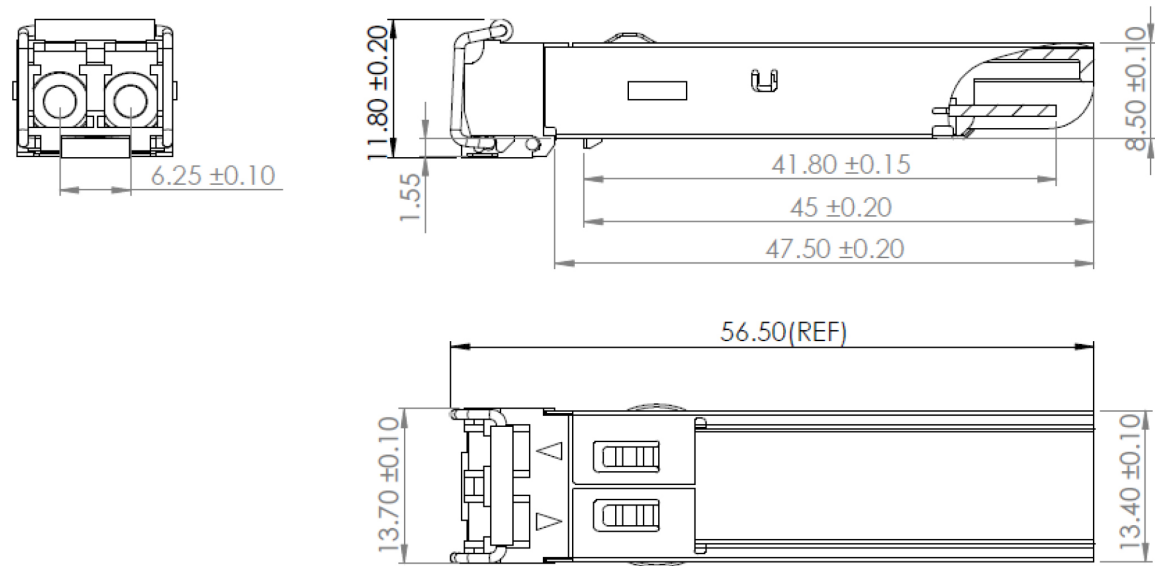
Pin-Out of Connector Block on Host Board

### Transceiver 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                                       |
|                                         | Vendor Specific (8 bytes)                 |
|                                         | 127                                       |
|                                         | User Writable EEPROM (120 bytes)          |
|                                         | 247                                       |
| 255                                     | Vendor Specific (8 bytes)                 |
|                                         | 255                                       |

# 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.

