



## SFP13001GE1DNZ1

Fortinet® FG-TRAN-SX-2K Compatible 1000Base-MX SFP Transceiver (MMF, 1310nm, 2km, LC, DOM)

### Product Description

This Fortinet® FG-TRAN-SX-2K compatible SFP transceiver provides 1000Base-MX throughput up to 2km over multi-mode fiber (MMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Fortinet® 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:

- INF-8074 and SFF-8472 Compliance
- Fabry Perot transmitter and PIN receiver
- Duplex LC 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:

- 1000Base Ethernet
- Access and Enterprise
- Up to 2km over MMF

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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     | V <sub>CC</sub>  | -0.5 | 4.0  | V    |
| Storage Temperature        | T <sub>stg</sub> | -40  | 85   | °C   |
| Operating Case Temperature | T <sub>c</sub>   | 0    | 70   | °C   |
| Operating Humidity         | RH               | 5    | 85   | %    |
| Receiver Power             | R <sub>MAX</sub> |      | 0    | dBm  |
| Maximum Bitrate            | B <sub>max</sub> |      | 1.25 | Gbps |

## Electrical Characteristics (T<sub>c</sub>=25°C, V<sub>CC</sub>=3.3 Volts)

| Parameter                      | Symbol              | Min. | Typ. | Max. | Unit | Notes |
|--------------------------------|---------------------|------|------|------|------|-------|
| Power Supply Voltage           | V <sub>CC</sub>     | 3.15 | 3.30 | 3.43 | V    |       |
| Power Supply Current           | I <sub>CC</sub>     |      |      | 303  | mA   |       |
| Power Consumption              |                     |      |      | 1    | W    |       |
| Transmitter                    |                     |      |      |      |      |       |
| Differential Data Input Swing  | V <sub>IN,pp</sub>  | 120  |      | 850  | mV   |       |
| Input Differential Impedance   | Z <sub>IN</sub>     | 80   | 100  | 120  | Ω    |       |
| Receiver                       |                     |      |      |      |      |       |
| Differential Data Output Swing | V <sub>OUT,pp</sub> | 300  |      | 850  | mV   |       |
| Output Differential Impedance  | Z <sub>IN</sub>     | 80   | 100  | 120  | Ω    |       |

## Optical Characteristics

| Parameter                      | Symbol           | Min. | Typ. | Max. | Unit | Notes |
|--------------------------------|------------------|------|------|------|------|-------|
| Transmitter                    |                  |      |      |      |      |       |
| Optical Power (Average)        | P <sub>AVE</sub> | -9.5 |      | -3   | dBm  | 1     |
| Optical Extinction Ratio       | ER               | 9    |      |      | dB   |       |
| Optical Wavelength             | Tλ               | 1270 | 1310 | 1355 | nm   |       |
| Insertion Loss                 | IL               |      | 0.6  |      |      |       |
| Receiver                       |                  |      |      |      |      |       |
| Receiver Sensitivity (Average) | R <sub>AVE</sub> |      |      | -24  | dBm  | 3     |
| Receiver Overload              | P <sub>max</sub> | 0    |      |      | dBm  | 4     |
| Optical Return Loss            | ORL              | 12   |      |      | dB   |       |
| Receiver Wavelength            | Rλ               | 1260 |      | 1565 | nm   |       |

## Notes:

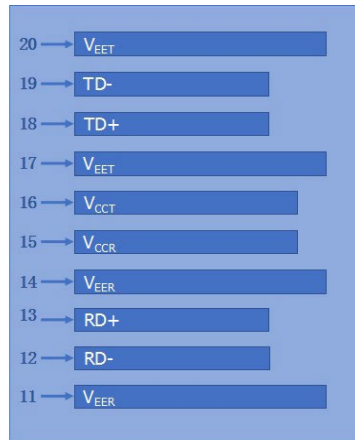
1. Coupled into a single-mode fiber.
2. Per IEEE 802.3ah specification.
3. Average power, back-to-back, @1.25Gbps, BER 1E<sup>-12</sup>, and PRBS 2<sup>31</sup>-1.
4. Exceeding the Receiver Overload can physically damage the module. Please use appropriate attenuation.

## Pin Descriptions

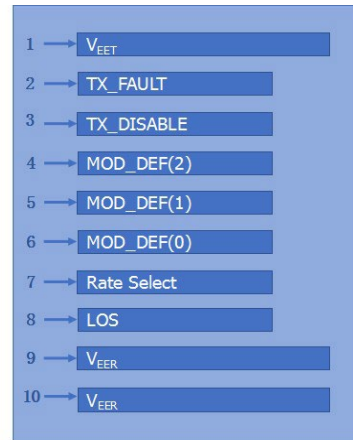
| Pin | Symbol      | Name/Description                                                 | Notes |
|-----|-------------|------------------------------------------------------------------|-------|
| 1   | VeeT        | Transmitter Ground (Common with Receiver Ground).                | 1     |
| 2   | Tx_Fault    | Transmitter Fault. Not Supported.                                |       |
| 3   | Tx_Disable  | Transmitter Disable. Laser output disabled on “high” or “open.”  | 2     |
| 4   | MOD_DEF (2) | Module Definition 2. Data Line for Serial ID.                    | 3     |
| 5   | MOD_DEF (1) | Module Definition 1. Clock Line for Serial ID.                   | 3     |
| 6   | MOD_DEF (0) | Module Definition 0. Grounded within the module.                 | 3     |
| 7   | Rate Select | No Connection Required.                                          |       |
| 8   | LOS         | Loss of Signal Indication. “Logic 0” indicates normal operation. | 4     |
| 9   | VeeR        | Receiver Ground (Common with Transmitter Ground).                | 1     |
| 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.                          |       |
| 13  | RD+         | Receiver Non-Inverted Data Out. AC Coupled.                      |       |
| 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.                    |       |
| 19  | TD-         | Transmitter Inverted Data In. AC Coupled.                        |       |
| 20  | VeeT        | Transmitter Ground (Common with Receiver Ground).                | 1     |

### Notes:

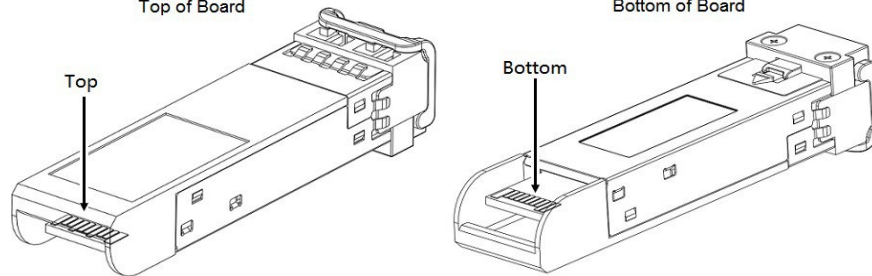
1. The circuit ground is isolated from the chassis ground.
2. Disabled:  $T_{DIS} > 2V$  or Open, Enabled:  $T_{DIS} < 0.8V$ .
3. Should be pulled up with  $4.7k\Omega$  to  $10k\Omega$  on the host board to a voltage between 2V and 3.6V.
4. LOS is an open collector output.



Top of Board

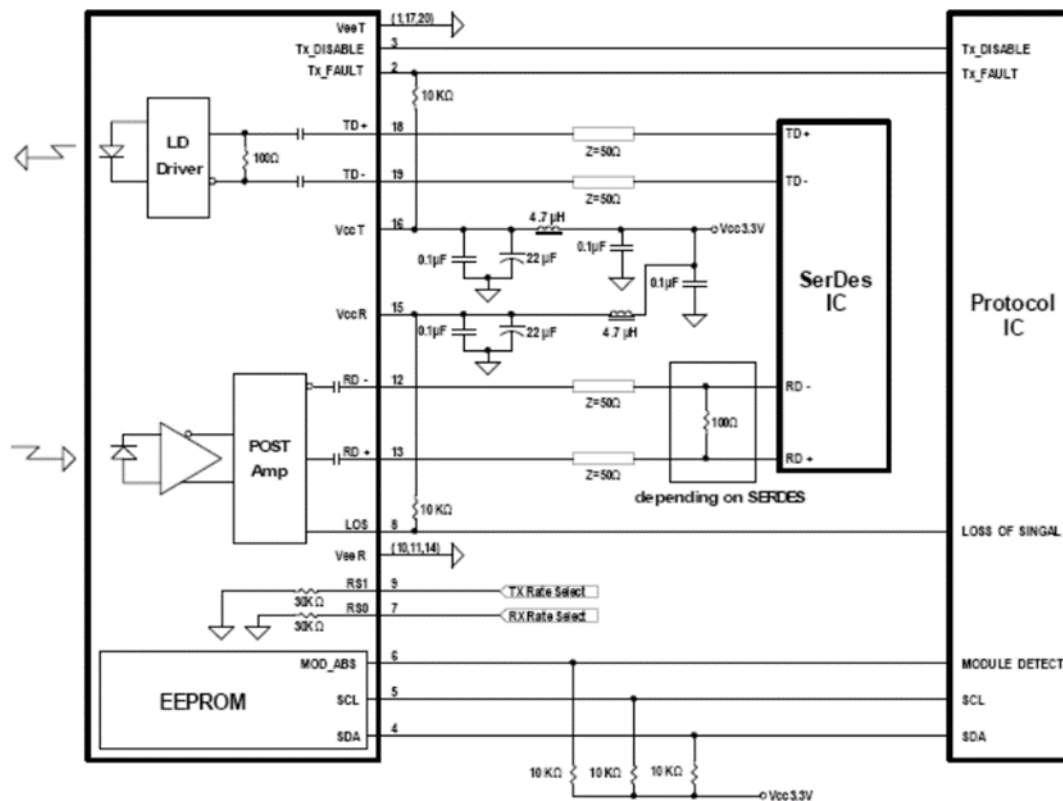


Bottom of Board



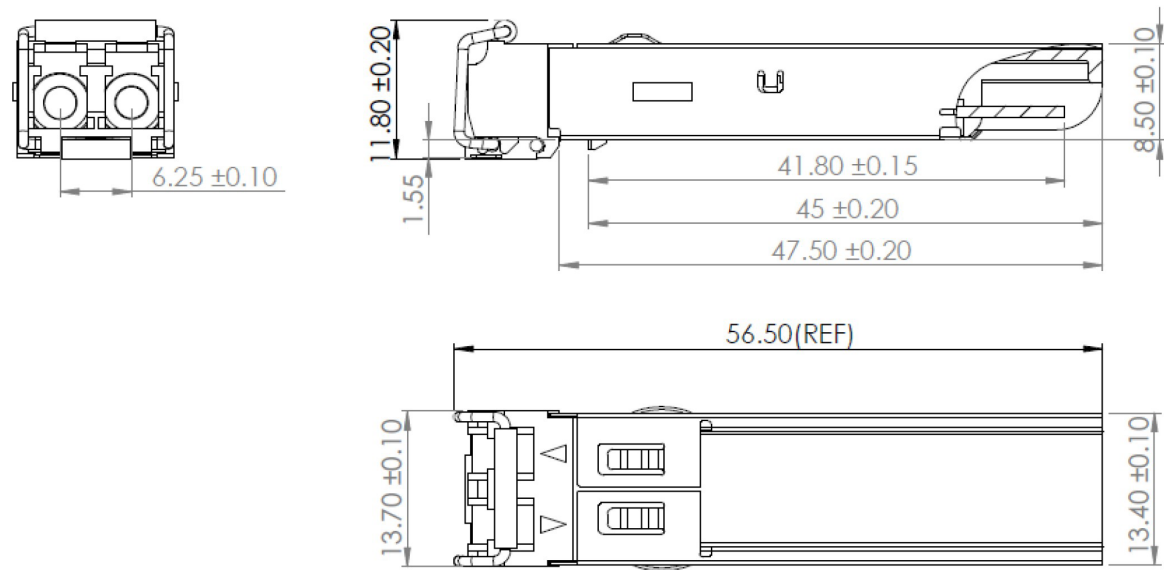
Pin-Out of Connector Block on the Host Board

## Recommended Circuit Schematic



**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)                 |

# 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.

