



## SFP13010G5UD000

MSA Compliant 2.5GBase-LX SFP Transceiver (SMF, 1310nm, 10km, LC, DOM, -40 to 95C)

### Product Description

This Industry Standard SFP transceiver provides 2.5GBase-LX throughput up to 10km over single-mode fiber (SMF) using a wavelength of 1310nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Industry Standard 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:

- Operating Data Rate up to 2.5Gbps
- 10km with 9/125µm SMF
- FP Laser Transmitter and PIN-TIA Photo-Detector
- Hot-Pluggable
- Duplex LC Connector Interface
- Single 3.3V Power Supply
- Operating Temperature: -40 to 95 Celsius
- Power Dissipation: 1.0W
- RoHS Compliant and Lead-Free



### Applications:

- 2500Base Ethernet

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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. | Typ. | Max. | Unit | Notes |
|-----------------------------|--------|------|------|------|------|-------|
| Storage Temperature         | Tstg   | -40  |      | 95   | °C   |       |
| Operating Case Temperature  | Tc     | -40  |      | 95   | °C   |       |
| Maximum Supply Voltage      | Vcc    | -0.5 |      | 3.6  | V    |       |
| Operating Relative Humidity | RH     | 5    |      | 85   | %    |       |
| Data Rate                   |        |      | 2.5  |      | Gbps |       |
| 9µm Core Diameter SMF       |        |      | 10   |      | km   |       |

## Electrical Characteristics

| Parameter                     |         | Symbol | Min. | Typ. | Max.    | Unit  | Notes |
|-------------------------------|---------|--------|------|------|---------|-------|-------|
| Module Supply Voltage         |         | Vcc    | 3.15 | 3.3  | 3.45    | V     |       |
| Module Supply Current         |         | Icc    |      |      | 300     | mA    |       |
| Transmitter                   |         |        |      |      |         |       |       |
| Differential LVPECL Inputs    |         | VIN    | 400  |      | 1600    | mVp-p | 1     |
| Differential Input Impedance  |         | ZIN    | 85   | 100  | 115     | Ω     | 2     |
| Tx_Disable                    | Disable |        | 2    |      | Vcc+0.3 | V     |       |
|                               | Enable  |        | 0    |      | 0.8     |       |       |
| Tx_Fault                      | Fault   |        | 2    |      | Vcc+0.3 | V     |       |
|                               | Normal  |        | 0    |      | 0.5     |       |       |
| Receiver                      |         |        |      |      |         |       |       |
| Differential LVPECL Outputs   |         | VOUT   | 400  | 800  | 1200    | mVp-p | 3     |
| Differential Output Impedance |         | ZOUT   | 85   | 100  | 115     | Ω     |       |
| Tx_Disable Assert Time        |         | t_off  |      |      | 10      | us    |       |
| Tx_LOS                        | LOS     |        | 2    |      | Vcc+0.3 | V     |       |
|                               | Normal  |        | 0    |      | 0.8     |       |       |
| MOD_DEF (0.2)                 |         | VOH    | 2.5  |      |         | V     | 4     |
|                               |         | VOL    | 0    |      | 0.5     |       |       |

## Notes:

1. AC Coupled Inputs. LVPECL Logic. Internally AC Coupled.
2. RIN>100kΩ @DC.
3. AC Coupled Outputs. LVPECL Logic. Internally AC Coupled.
4. With Serial ID.

## Optical Characteristics

| Parameter                 | Symbol          | Min.                  | Typ. | Max. | Unit | Notes |
|---------------------------|-----------------|-----------------------|------|------|------|-------|
| Transmitter               |                 |                       |      |      |      |       |
| Center Wavelength         | $\lambda_C$     | 1260                  | 1310 | 136  | nm   |       |
| Spectral Width (RMS)      | $\Delta\lambda$ |                       |      | 3    | nm   |       |
| Average Output Power      | POUT            | -11.7                 |      | -3   | dBm  | 1     |
| Extinction Ratio          | ER              | 8.2                   |      |      | dB   |       |
| Rise/Fall Time (20-80%)   | Tr/Tf           |                       |      | 150  | ps   |       |
| POUT @Tx_Disable Asserted | POUT            |                       |      | -45  | dBm  |       |
| Output Optical Eye        |                 | ITU-T G.957 Compliant |      |      |      | 2     |
| Receiver                  |                 |                       |      |      |      |       |
| Center Wavelength         | $\lambda_C$     | 1260                  |      | 1600 | nm   |       |
| Receiver Sensitivity      | Pmin            |                       |      | -18  | dBm  | 3     |
| Receiver Overload         | Pmax            | -3                    |      |      | dBm  |       |
| LOS De-Assert             | LOSD            |                       |      | -19  | dBm  |       |
| LOS Assert                | LOSA            | -30                   |      |      | dBm  |       |
| LOS Hysteresis            |                 | 0.5                   |      |      | dB   |       |

### Notes:

1. Output power is coupled into a 9/125 $\mu$ m SMF.
2. Filtered, measured with a PRBS  $2^{23}$ -1 test pattern @2.5Gbps.
3. Minimum average optical power is measured at BER less than  $1E^{-12}$  with  $2^{23}$ -1 PRBS and ER=8.2dB.

## Pin Descriptions

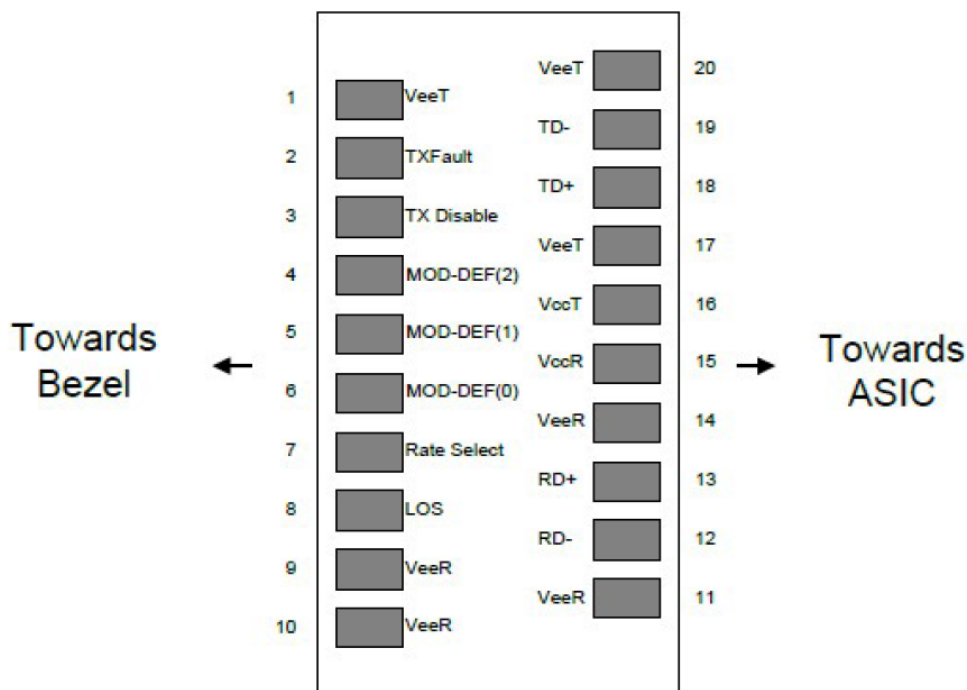
| Pin | Symbol     | Name/Description                                          | Plug Seq. | Notes |
|-----|------------|-----------------------------------------------------------|-----------|-------|
| 1   | VeeT       | Transmitter Ground.                                       | 1         | 5     |
| 2   | Tx_Fault   | Transmitter Fault Indication.                             | 3         | 1     |
| 3   | Tx_Disable | Transmitter Disable. Module disables on “high” or “open.” | 3         | 2     |
| 4   | SDA        | Module Definition 2. 2-Wire Serial ID Interface.          | 3         | 3     |
| 5   | SCL        | Module Definition 1. 2-Wire Serial ID Interface.          | 3         | 3     |
| 6   | MOD_ABS    | Module Definition 0. Grounded within the module.          | 3         | 3     |
| 7   | RS0        | Not Connected. Function Not Available.                    | 3         |       |
| 8   | LOS        | Loss of Signal.                                           | 3         | 4     |
| 9   | RS1        | Receiver Ground.                                          | 1         | 5     |
| 10  | VeeR       | Receiver Ground.                                          | 1         | 5     |
| 11  | VeeR       | Receiver Ground.                                          | 1         | 5     |
| 12  | RD-        | Inverse Receiver Data Out.                                | 3         | 6     |
| 13  | RD+        | Received Data Out.                                        | 3         | 7     |
| 14  | VeeR       | Received Data Out.                                        | 1         | 5     |
| 15  | VccR       | 3.3 ± 5% Receiver Power.                                  | 2         | 7     |
| 16  | VccT       | 3.3 ± 5% Transmitter Power.                               | 2         | 7     |
| 17  | VeeT       | Transmitter Ground.                                       | 1         | 5     |
| 18  | TD+        | Transmit Data In.                                         | 3         | 8     |
| 19  | TD-        | Inverse Transmit Data In.                                 | 3         | 8     |
| 20  | VeeT       | Transmitter Ground.                                       | 1         | 5     |

## Notes:

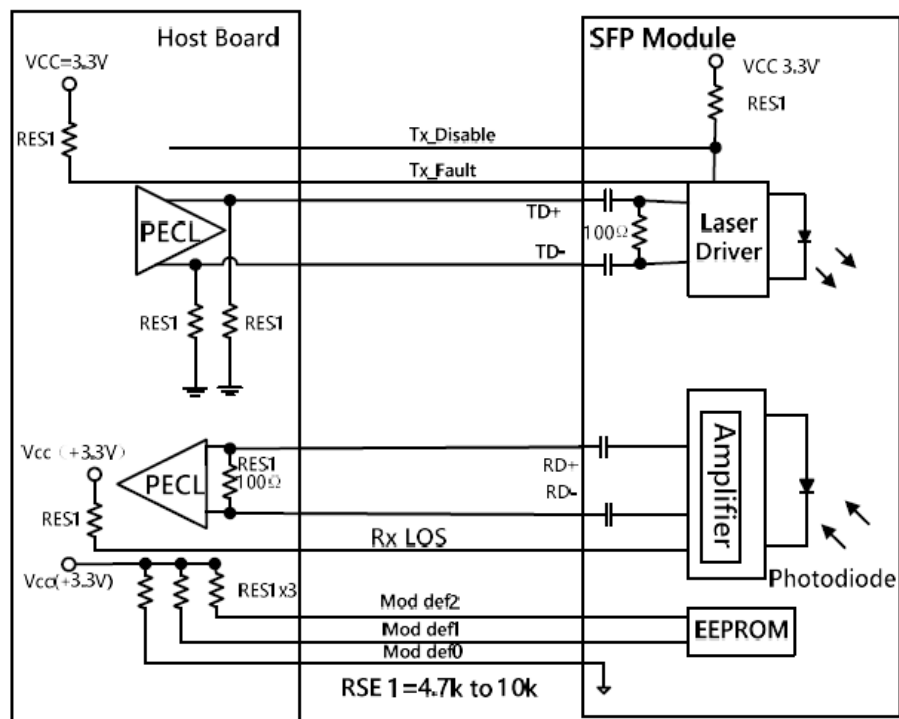
1. Tx\_Fault is an open collector/drain output that should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board to a voltage between 2.0V and VccT/R+0.3V. When “high,” the output indicates a laser fault of some kind. “Low” indicates normal operation. In the “low” state, the output will be pulled to <0.8V.
2. Tx\_Disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kΩ to 10kΩ resistor. Its states are:
  - Low (0V to 0.8V): Transmitter On
  - (>0.8V and <2V): Undefined
  - High (2.0V to 3.465V): Transmitter Disabled
  - Open: Transmitter Disabled.
3. MOD-DEF0, 1, & 2. These are the module definition pins. They should be pulled up with a 4.7kΩ to 10kΩ resistor on the host board. The pull-up voltage shall be VccT or VccR.
  - MOD-DEF0 is grounded by the module to indicate that the module is present.
  - MOD-DEF1 is the clock line of 2-wire serial interface for optional serial ID.
  - MOD-DEF2 is the data line of 2-wire serial interface for optional serial ID.

4. LOS (Loss of Signal) is an open collector/drain output that should be pulled up with a 4.7k $\Omega$  to 10k $\Omega$ . Pull-up voltage between 2.0 and VccT/R+0.3V. When “high,” this output indicates that the receiver optical power is below the worst-case receiver sensitivity (as defined by the standard in use). “Low” indicates normal operation. In the “low” state, the output will be pulled to <0.8V.
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+. These are the differential receiver outputs. They are AC coupled 100 $\Omega$  differential lines which should be terminated with differential 100 $\Omega$  at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 400mV and 2000mV differential (200mV-1000mV single-ended) when properly terminated.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V $\pm$ 5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1 $\Omega$  should be used in order to maintain the required voltage at the SFP input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP transceiver module will result in an in-rush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP module.
8. TD-/+. These are the differential transmitter inputs. They are AC coupled, differential lines with 100 differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 400mV-2000mV (200mV-1000mV single-ended).

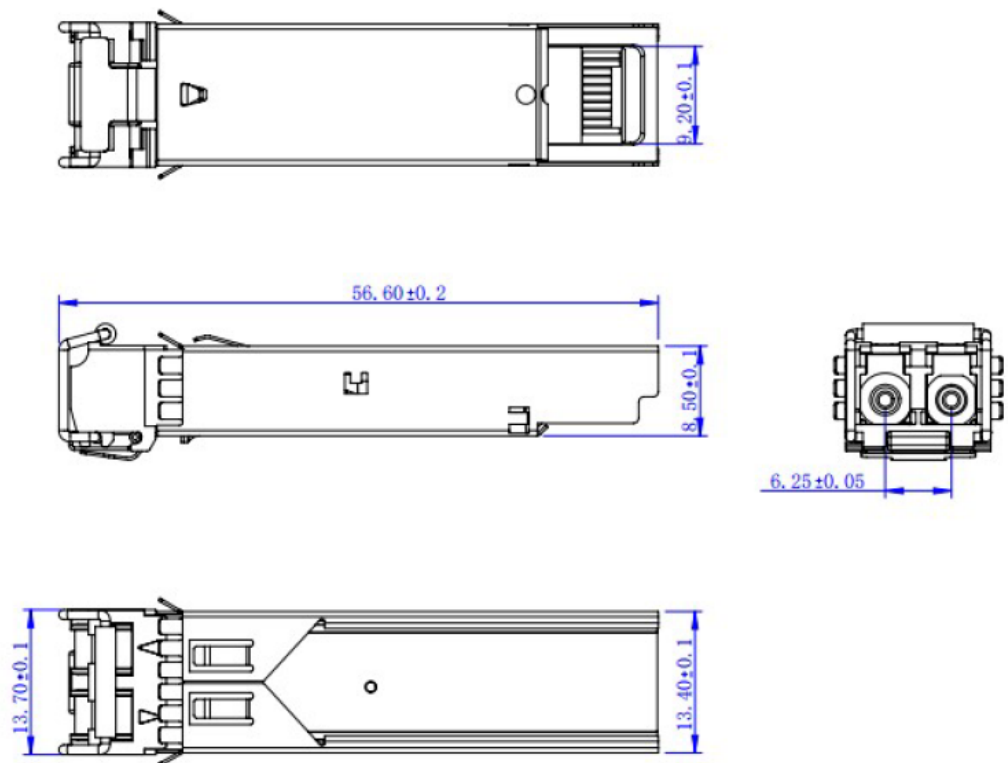
## Electrical Pin-Out Details



Recommended Circuit Schematic



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.

