



## SPD23040100D139

Cisco® SFP-10G-ER-58.98 Compatible 10GBase-DWDM SFP+ Transceiver C-Band 100GHz (SMF, 1558.98nm, 40km, LC, DOM)

### Product Description

This Cisco® SFP-10G-ER-58.98 compatible SFP+ transceiver provides 10GBase-DWDM throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1558.98nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Cisco® 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 Compliance
- Temperature-stabilized EML 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:

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

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

| Channel # | Frequency (THz) | Center Wavelength (nm) |
|-----------|-----------------|------------------------|
| 17        | 191.7           | 1563.86                |
| 18        | 191.8           | 1563.05                |
| 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                |
| 32        | 193.2           | 1551.72                |
| 33        | 193.3           | 1550.92                |
| 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   |
| Supply Voltage             | Vcc    | -0.5 |         | 4.0  | V    |
| Operating Case Temperature | Tc     | 0    | 25      | 70   | °C   |
| Relative Humidity          | RH     | 5    |         | 95   | %    |
| Data Rate                  |        |      | 10.3125 |      | Gbps |

## Electrical Characteristics

| Parameter                        |                      | Symbol                          | Min.  | Typ. | Max.                | Unit              | Notes |
|----------------------------------|----------------------|---------------------------------|-------|------|---------------------|-------------------|-------|
| Supply Voltage                   |                      | V <sub>CC</sub>                 | 3.135 | 3.3  | 3.465               | V                 |       |
| Module Supply Current            |                      | I <sub>CC</sub>                 |       |      | 450                 | mA                |       |
| Power Dissipation                |                      | P <sub>D</sub>                  |       |      | 1500                | mW                |       |
| Transmitter                      |                      |                                 |       |      |                     |                   |       |
| Input Differential Impedance     |                      | Z <sub>in</sub>                 |       | 100  |                     | Ω                 |       |
| Differential Data Input Swing    |                      | V <sub>in,p-p</sub>             | 180   |      | 700                 | mV <sub>p-p</sub> |       |
| TX_FAULT                         | Transmitter Fault    | V <sub>OH</sub>                 | 2.0   |      | V <sub>CCHost</sub> | V                 |       |
|                                  | Normal Operation     | V <sub>OL</sub>                 | 0     |      | 0.8                 | V                 |       |
| TX_DISABLE                       | Transmitter Disable  | V <sub>IH</sub>                 | 2.0   |      | V <sub>CCHost</sub> | V                 |       |
|                                  | Transmitter Enable   | V <sub>IL</sub>                 | 0     |      | 0.8                 | V                 |       |
| Receiver                         |                      |                                 |       |      |                     |                   |       |
| Output Differential Impedance    |                      | Z <sub>o</sub>                  |       | 100  |                     | Ω                 |       |
| Differential Data Output Swing   |                      | V <sub>out,p-p</sub>            | 300   |      | 850                 | mV <sub>p-p</sub> | 1     |
| Data Output Rise Time, Fall Time |                      | t <sub>r</sub> , t <sub>f</sub> | 28    |      |                     | ps                | 2     |
| RX_LOS                           | Loss of Signal (LOS) | V <sub>OH</sub>                 | 2.0   |      | V <sub>CCHost</sub> | V                 | 3     |
|                                  | Normal Operation     | V <sub>OL</sub>                 | 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. 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      |      | 4       | dBm   | 1     |
| Center Wavelength Range            | $\lambda_c$                                             | 1528.77 |      | 1563.86 | nm    |       |
| Center Wavelength Spacing          |                                                         |         | 100  |         | GHZ   |       |
| Center Wavelength Tolerance        | $\Delta\lambda_c$                                       | -100    |      | 100     | pm    |       |
| Extinction Ratio                   | EX                                                      | 8.2     |      |         | dB    |       |
| Side Mode Suppression Ratio        | SMSR                                                    | 30      |      |         | dB    |       |
| Transmitter and Dispersion Penalty | TDP                                                     |         |      | 2.0     | dB    |       |
| Relative Intensity Noise           | RIN                                                     |         |      | -128    | dB/Hz |       |
| Optical Return Loss Tolerance      | ORLT                                                    |         |      | 21      | dB    |       |
| Pout @ TX-Disable Asserted         | Poff                                                    |         |      | -30     | dBm   |       |
| Eye Diagram                        | IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-ER compatible |         |      |         |       |       |
| Receiver                           |                                                         |         |      |         |       |       |
| Center Wavelength                  | $\lambda_c$                                             | 1528    |      | 1565    | nm    |       |
| Receiver Sensitivity (Pavg)        | S                                                       |         |      | -15     | dBm   |       |
| Receiver Overload (Pavg)           | POL                                                     | -1      |      |         | dBm   |       |
| Optical Return Loss                | ORL                                                     | 26      |      |         | dB    |       |
| LOS De-Assert                      | LOSD                                                    |         |      | -16     | 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  $2^{31}-1$  test pattern @10.3125Gbps.
3. Measured with PRBS  $2^{31}-1$  test pattern, 10.3125Gb/s, BER<10<sup>-12</sup>.
4. Comply with IEEE 802.3-2005.

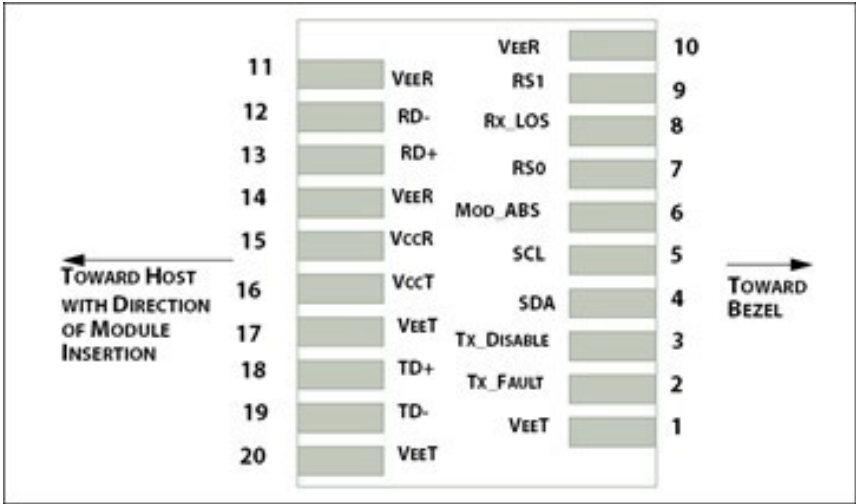
## Pin Descriptions

| Pin | Symbol     | Name/Descriptions                                                       | Ref. |
|-----|------------|-------------------------------------------------------------------------|------|
| 1   | VeeT       | Transmitter Ground.                                                     | 1    |
| 2   | TX_Fault   | Transmitter Fault (LVTTTL-O) - High indicates a fault condition.        | 2    |
| 3   | TX_Disable | Transmitter Disable (LVTTTL-I) – High or open disables the transmitter. | 3    |
| 4   | SDA        | Two wire serial interface Data Line (LVCMOS-I/O) (MOD-DEF2).            | 4    |
| 5   | SCL        | Two wire serial interface Clock Line (LVCMOS-I/O) (MOD-DEF1)            | 4    |
| 6   | MOD_ABS    | Module Absent (Output), connected to VeeT or VeeR in the module.        | 5    |
| 7   | RS0        | Rate Select 0 – Not used, Presents high input impedance.                |      |
| 8   | RX_LOS     | Receiver Loss of Signal (LVTTTL-O).                                     | 2    |
| 9   | RS1        | Rate Select 1 – Not used, Presents high input impedance.                |      |
| 10  | VeeR       | Receiver Ground.                                                        | 1    |
| 11  | VeeR       | Receiver Ground.                                                        | 1    |
| 12  | RD-        | Inverse Received Data out (CML-O).                                      |      |
| 13  | RD+        | Received Data out (CML-O).                                              |      |
| 14  | VeeR       | Receiver Ground.                                                        |      |
| 15  | VccR       | Receiver Power - +3.3V.                                                 |      |
| 16  | VccT       | Transmitter Power - +3.3 V.                                             |      |
| 17  | VeeT       | Transmitter Ground.                                                     | 1    |
| 18  | TD+        | Transmitter Data In (CML-I).                                            |      |
| 19  | TD-        | Inverse Transmitter Data In (CML-I).                                    |      |
| 20  | VeeT       | Transmitter Ground.                                                     | 1    |

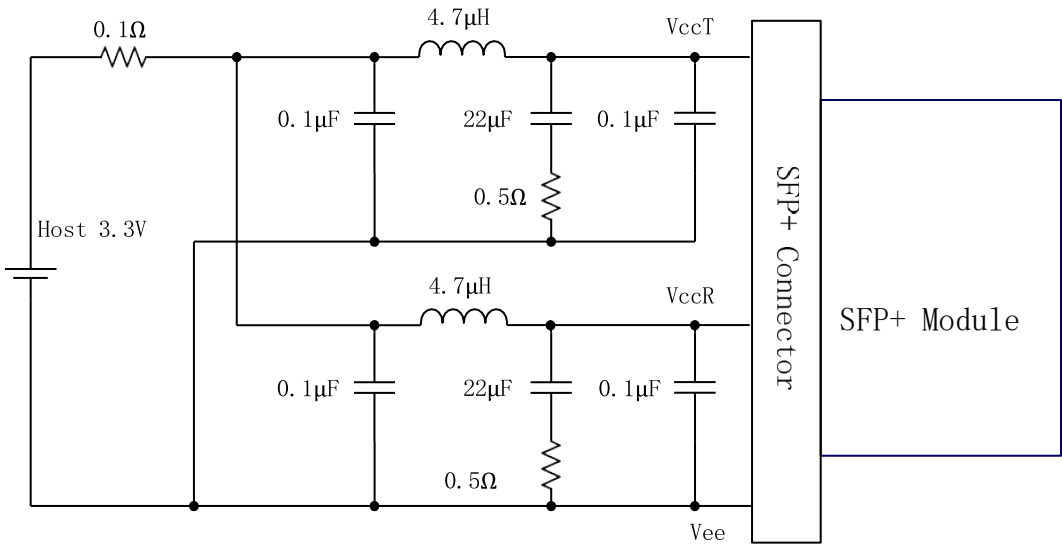
## Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccT.
4. 2-Wire Serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
5. This is the ground return that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.

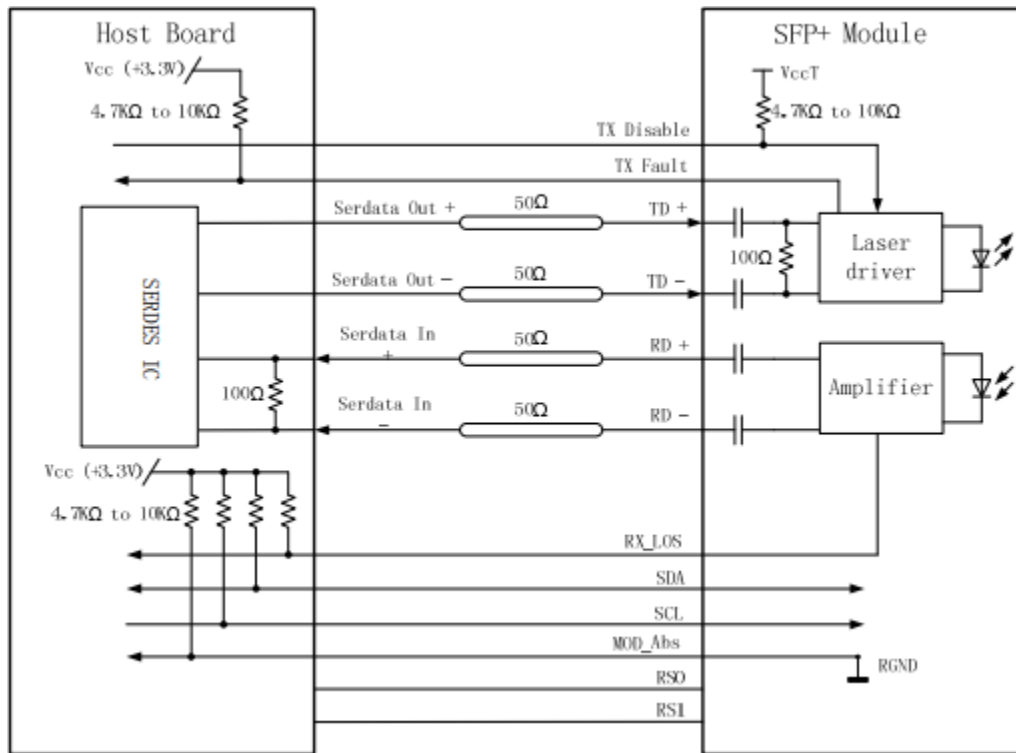
Host PCB SFP+ Pad Assignment Top View



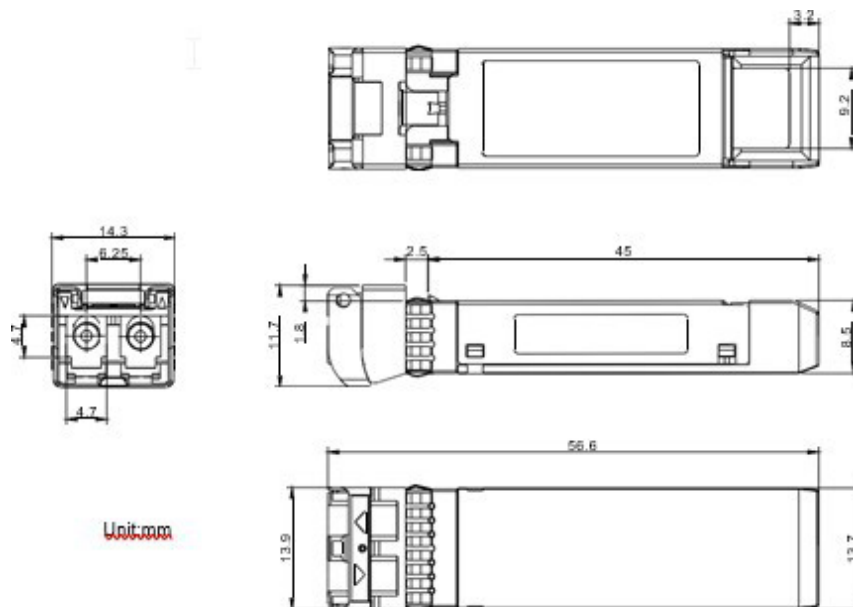
Recommended Host Board Power Supply Filter Network



## Recommended Application Interface Block Diagram



## Mechanical Specifications

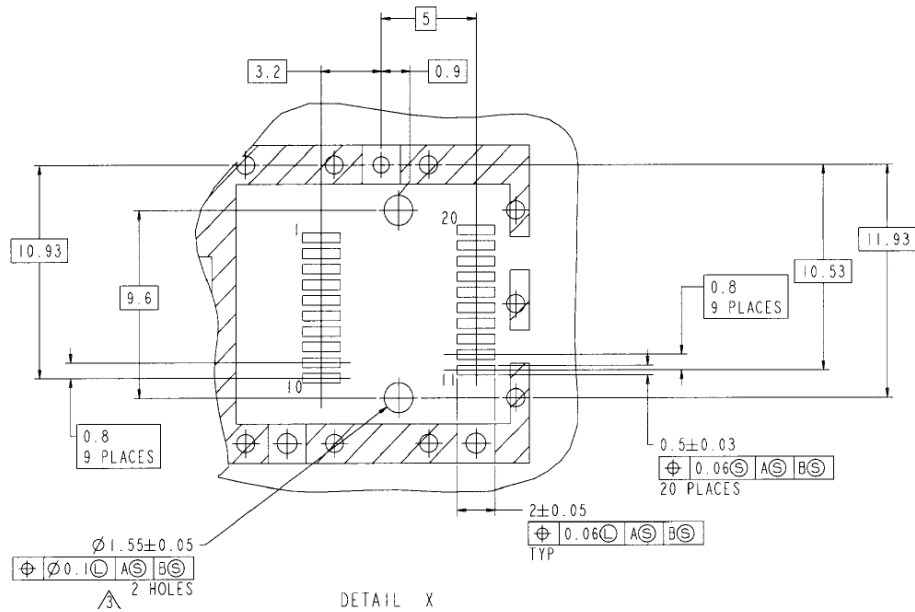
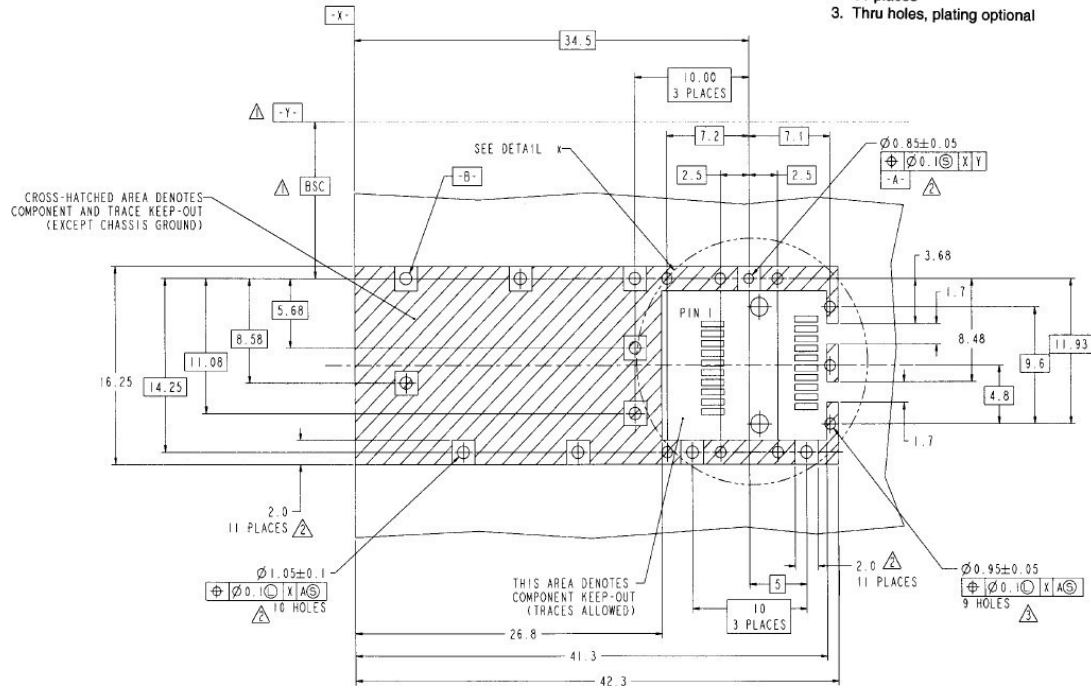




## PCB Layout Recommendation

### Notes:

1. Datum and basic dimensions established by customer
2. Pads and vias are chassis ground, 11 places
3. Thru holes, plating optional



# 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.

