

### **SFP-10GBASE-ER-E-C-C**

Cisco® Compatible TAA 10GBase-ER SFP+ Transceiver (SMF, 1310nm, 40km, LC, DOM, -20 to 85C)

#### **Features:**

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



#### **Applications:**

- 10GBase Ethernet

#### **Product Description**

This Cisco® compatible SFP+ transceiver provides 10GBase-ER throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1550nm via an LC connector. It can operate at temperatures between -20 and 85C. Our transceiver is built to meet or exceed OEM specifications and is guaranteed to be 100% compatible with Cisco®. It has been programmed, uniquely serialized, and tested for data-traffic and application to ensure that it will initialize and perform identically. All of our transceivers comply with Multi-Source Agreement (MSA) standards to provide seamless network integration. Additional product features include Digital Optical Monitoring (DOM) support which allows 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.

ProLabs' 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.")



## 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

## Absolute Maximum Ratings

| Parameter                  | Symbol | Min. | Typ.    | Max. | Unit |
|----------------------------|--------|------|---------|------|------|
| Maximum Supply Voltage     | Vcc    | -0.5 |         | 4.0  | V    |
| Storage Temperature        | TS     | -40  |         | 85   | °C   |
| Operating Case Temperature | Tc     | -40  | 25      | 85   | °C   |
| Data Rate                  |        |      | 10.3125 |      | Gbps |

## Electrical Characteristics (TOP=25°C, Vcc=3.3Volts)

| Parameter                        |                      | Symbol    | Min.  | Typ. | Max.    | Unit  | Notes |
|----------------------------------|----------------------|-----------|-------|------|---------|-------|-------|
| Power Supply Voltage             |                      | Vcc       | 3.135 | 3.3  | 3.465   | V     |       |
| Power Supply Current             |                      | Icc       |       |      | 300     | mA    |       |
| Power Dissipation                |                      | PD        |       |      | 1000    | mW    |       |
| Transmitter                      |                      |           |       |      |         |       |       |
| Input Differential Impedance     |                      | Zin       |       | 100  |         | Ω     |       |
| Differential Data Input Swing    |                      | Vin,p-p   | 180   |      | 700     | mVp-p |       |
| TX_FAULT                         | Transmitter Fault    | VOH       | 2.0   |      | VccHOST | V     |       |
|                                  | Normal Operation     | VOL       | 0     |      | 0.8     | V     |       |
| TX_DISABLE                       | Transmitter Disable  | VIH       | 2.0   |      | VccHOST | V     |       |
|                                  | Transmitter Enable   | VIL       | 0     |      | 0.8     | V     |       |
| Receiver                         |                      |           |       |      |         |       |       |
| Output Differential Impedance    |                      | Zo        |       | 100  |         | Ω     |       |
| Differential Data Output Swing   |                      | VOUT, P-P | 300   |      | 850     | mVp-p | 1     |
| Data Output Rise Time, Fall Time |                      | tr, tf    | 28    |      |         | ps    | 2     |
| RX_LOS                           | Loss of signal (LOS) | VOH       | 2.0   |      | VccHOST | 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. Should be pulled up with 4.7kΩ on the host board.

## Optical Characteristics

| Parameter                                | Symbol                                                  | Min. | Typ. | Max.  | Unit | Notes |
|------------------------------------------|---------------------------------------------------------|------|------|-------|------|-------|
| Transmitter                              |                                                         |      |      |       |      |       |
| Launch Optical Power                     | P <sub>o</sub>                                          | 0    |      | +5    | dBm  | 1     |
| Center Wavelength Range                  | λ <sub>c</sub>                                          | 1260 | 1310 | 1355  | nm   |       |
| Extinction Ratio                         | ER                                                      | 3.5  |      |       | dB   | 2     |
| Optical Modulation Amplitude             | OMA                                                     | -5.2 |      |       | dBm  |       |
| Spectral Width (-20dB)                   | Δλ                                                      |      |      | 1     | nm   |       |
| Side Mode Suppression Ratio              | SMSR                                                    | 30   |      |       | dB   |       |
| Transmitter and Dispersion Penalty       | TDP                                                     |      |      | 3.2   | dB   |       |
| Optical Return Loss Tolerance            | ORLT                                                    |      |      | 12    | dB   |       |
| Pout @TX_Disable Asserted                | P <sub>off</sub>                                        |      |      | -30   | dBm  | 1     |
| Eye Diagram                              | IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-ER compatible |      |      |       |      |       |
| Receiver                                 |                                                         |      |      |       |      |       |
| Center Wavelength                        | λ <sub>c</sub>                                          | 1260 | 1310 | 1355  | nm   |       |
| Receiver Sensitivity (P <sub>avg</sub> ) | S                                                       |      |      | -15   | dBm  | 3     |
| Receiver Overload (P <sub>avg</sub> )    | P <sub>OL</sub>                                         | 0.5  |      |       | dBm  | 3     |
| Stressed Sensitivity (OMA)               |                                                         |      |      | -10.3 | dBm  | 4     |
| Optical Return Loss                      | ORL                                                     | 12   |      |       | dB   |       |
| LOS De-Assert                            | LOS <sub>D</sub>                                        |      |      | -16   | dBm  |       |
| LOS Assert                               | LOS <sub>A</sub>                                        | -30  |      |       | dBm  |       |
| LOS Hysteresis                           |                                                         | 0.5  |      | 4.5   | dB   |       |

### Notes:

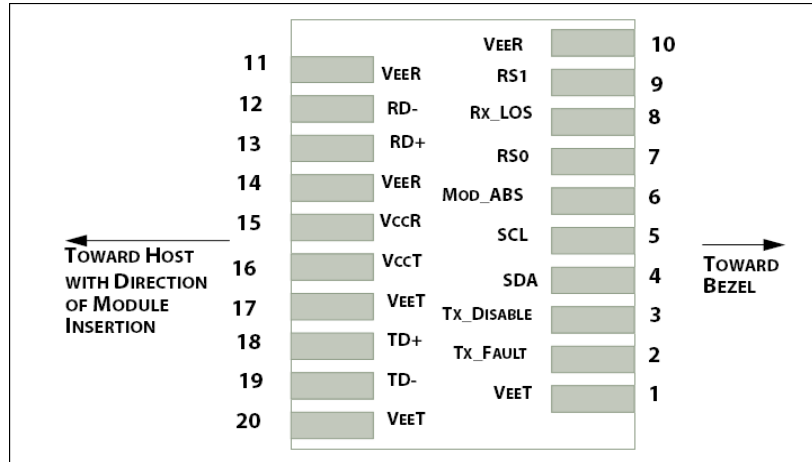
1. The optical power is launched into 9/125μm SMF.
2. Measured with a PRBS 2<sup>31</sup>-1 test pattern @10.3125Gbps
3. Measured with PRBS 2<sup>31</sup>-1 test pattern, 10.3125 Gb/s, BER<10<sup>-12</sup>.
4. Comply with IEEE 802.3-2005.

## Pin Descriptions

| Pin | Symbol     | Name/Descriptions                                                     | Ref. |
|-----|------------|-----------------------------------------------------------------------|------|
| 1   | VeeT       | Transmitter Ground                                                    | 1    |
| 2   | TX_Fault   | Transmitter Fault (LVTTL-O) - High indicates a fault condition        | 2    |
| 3   | TX_Disable | Transmitter Disable (LVTTL-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 (LVTTL-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. Two-Wire Serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
5. This is a ground return that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.



### Recommended Host Board Power Supply Filter Network

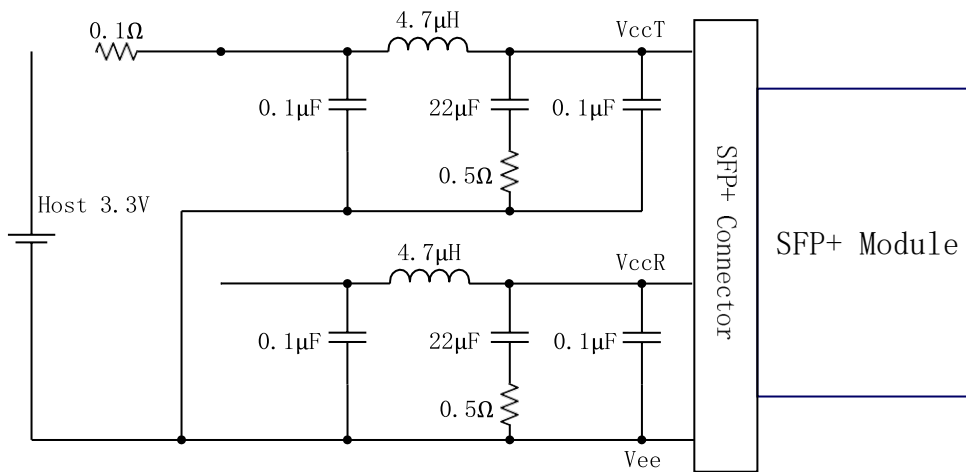
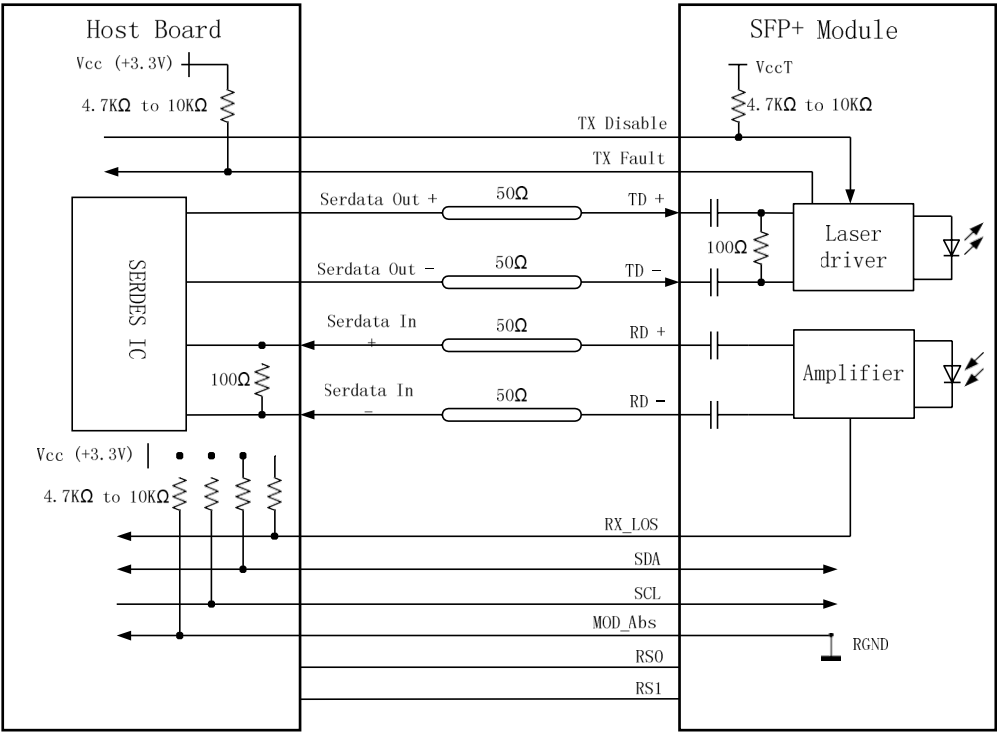


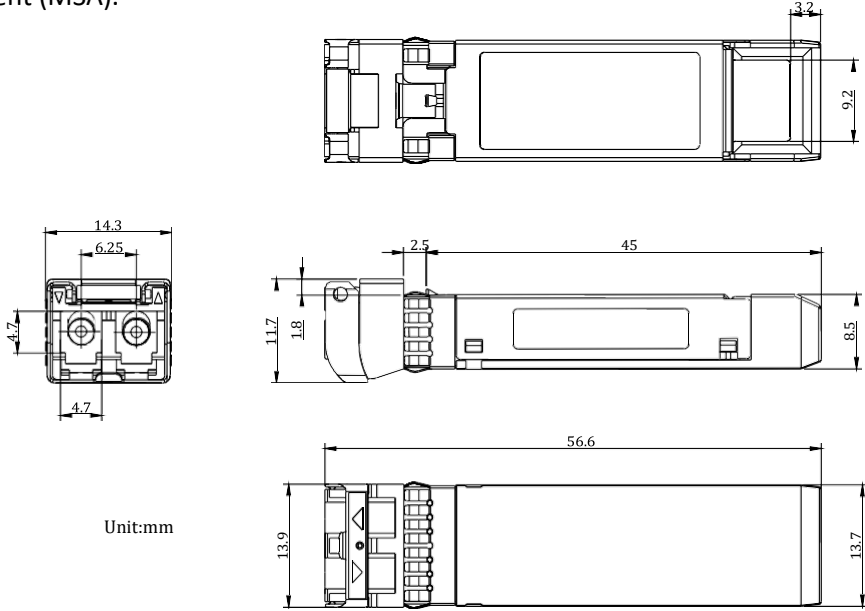
Figure 2. Recommended Host Board Power Supply Filter Network

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).



## About ProLabs

Our extensive experience comes as standard. For over 20 years ProLabs has delivered optical connectivity solutions that give our customers freedom and choice through our ability to provide seamless interoperability. At the heart of our company is the ability to provide state-of-the-art optical transport and connectivity solutions that are compatible with more than 100 optical switching and transport platforms.

## A Complete Portfolio of Network Solutions

ProLabs is focused on innovations in optical transport and connectivity. The combination of our knowledge of optics and networking equipment enables ProLabs to be your single source for optical transport and connectivity solutions from 100Mb to 1.6T while providing innovative solutions that increase network efficiency. We provide the optical connectivity expertise that is compatible with and enhances your switching and transport equipment.

## The Trusted Partner

Customer service is our number one value. ProLabs has invested in people, labs and manufacturing capacity to ensure compatible products, and immediate answers to your questions. With Engineering and Manufacturing offices in the U.K. and U.S. augmented by field offices throughout the U.S., U.K. and Asia, ProLabs is able to be our customers best advocate 24 hours a day.



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