

# 10GBASE-SR SFP+ 850nm 300m DOM Transceiver

SFP-10GSR-85



## Application

- 10GBASE-SR/SW 10G Ethernet
- 1200-Mx-SN-I 10G Fibre Channel

## Features

- Hot-pluggable SFP+ footprint
- Supports 9.95 to 10.5 Gb/s bit rates
- Power dissipation < 1W
- RoHS-6 compliant (lead-free)
- Commercial temperature range 0° C to 70° C
- Single 3.3V power supply
- Up to 300m Transmission on MMF
- 4700 MHz-km OM4 MMF
- Heated 850nm VCSEL laser
- Receiver limiting electrical interface
- Duplex LC connector
- Built-in digital diagnostic functions

## Description

10Gb/s SFP+ transceivers are designed for use in 10-Gigabit Ethernet links over multimode fiber. They are compliant with SFF-8431, SFF-8432, IEEE 802.3ae 10GBASE-SR/SW and 10G Fibre Channel 1200-Mx-SN-I. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

The transceiver is a “limiting module”, i.e., it employs a limiting receiver. Host board designers using an EDC PHY IC should follow the IC manufacturer’s recommended settings for interoperating the host-board EDC PHY with a limiting receiver SFP+ module. The optical transceivers are compliant per the RoHS Directive 2011/65/EU.

## Product Specifications

### I.General Specifications

| Parameter              | Symbol | Min  | Typ. | Max               | Unit | Ref. |
|------------------------|--------|------|------|-------------------|------|------|
| <b>Bit Rate</b>        | BR     | 9.95 |      | 10.5              | Gb/s | 1    |
| <b>Bit Error Ratio</b> | BER    |      |      | 10 <sup>-12</sup> |      | 2    |

### Maximum Supported Distances

| Fiber Type    | 850nm OFL Bandwidth |      |  |     |   |  |
|---------------|---------------------|------|--|-----|---|--|
| <b>62.5µm</b> | 160 MHz-km          | Lmax |  | 26  | m |  |
|               | OM1<br>200 MHz-km   |      |  | 33  |   |  |
| <b>50µm</b>   | 400 MHz-km          | Lmax |  | 66  | m |  |
|               | OM2<br>500 MHz-km   |      |  | 82  |   |  |
|               | OM3<br>2000 MHz-km  |      |  | 300 |   |  |
|               | OM4<br>4700 MHz-km  |      |  | 400 |   |  |

#### Notes:

1. 10GBASE-SR/SW.
2. Tested with a 2 31 – 1 PRBS.

## II. Absolute Maximum Ratings

| Parameter                  | Symbol          | Min  | Typ. | Max | Unit | Ref. |
|----------------------------|-----------------|------|------|-----|------|------|
| Maximum Supply Voltage     | V <sub>CC</sub> | -0.5 |      | 4.0 | V    |      |
| Storage Temperature        | T <sub>S</sub>  | -40  |      | 85  | ° C  |      |
| Case Operating Temperature | T <sub>A</sub>  | 0    |      | 70  | ° C  |      |
| Relative Humidity          | RH              | 0    |      | 85  | %    | 1    |

### Notes:

1.Non-condensing..

## III. Electrical Characteristics (TOP= 0 to 70 ° C, VCC = 3.14 to 3.46Volts)

| Parameter      | Symbol          | Min  | Typ. | Max  | Unit | Ref. |
|----------------|-----------------|------|------|------|------|------|
| Supply Voltage | V <sub>CC</sub> | 3.14 |      | 3.46 | V    |      |
| Supply Current | I <sub>CC</sub> |      |      | 289  | mA   |      |

### Transmitter

|                               |                    |                 |     |                      |    |   |
|-------------------------------|--------------------|-----------------|-----|----------------------|----|---|
| Input differential impedance  | R <sub>in</sub>    |                 | 100 |                      | Ω  | 1 |
| Differential data input swing | V <sub>in,pp</sub> | 180             |     | 700                  | mV |   |
| Transmit Disable Voltage      | V <sub>D</sub>     | 2               |     | V <sub>CC</sub>      | V  |   |
| Transmit Enable Voltage       | V <sub>EN</sub>    | V <sub>EE</sub> |     | V <sub>EE</sub> +0.8 | V  |   |

### Receiver

|                                |                                     |                 |                      |                      |      |     |
|--------------------------------|-------------------------------------|-----------------|----------------------|----------------------|------|-----|
| Differential data output swing | V <sub>out,pp</sub>                 | 300             |                      | 850                  | mV   | 2,6 |
| Output rise time and fall time | t <sub>r</sub>                      | 28              |                      |                      | ps   | 3   |
| LOS asserted                   | V <sub>LOSfault</sub>               | 2               |                      | V <sub>CCHOST</sub>  | V    | 4   |
| LOS de-asserted                | V <sub>LOSnorm</sub>                | V <sub>EE</sub> |                      | V <sub>EE</sub> +0.8 | V    | 4   |
| Power Supply Noise Tolerance   | V <sub>CC</sub> T/V <sub>CC</sub> R |                 | Per SFF-8431 Rev 4.1 |                      | mVpp | 5   |

**Notes:**

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100Ω differential termination.
3. 20 – 80 % . Measured with Module Compliance Test Board and OMA test pattern. Use of four 1' s and four 0' s in sequence in the PRBS<sup>9</sup> is an acceptable alternative. SFF-8431 Rev 4.1.
4. LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.
5. Testing methodology per SFF-8431. Rev 4.1
6. The FTLX8573D3BTL is a “limiting module” , i.e., it employs a limiting receiver. Host board designers using an EDC PHY IC should follow the IC manufacturer' s recommended settings for interoperating the host-board EDC PHY with a limiting receiver SFP+ module.

**IV. Optical Characteristics (TOP = 0 to °C, VCC = 3.14 to 3.46V)**

| Parameter                                      | Symbol                | Min                           | Typ. | Max  | Unit  | Note |
|--|-----------------------|-------------------------------|------|------|-------|------|
| <b>Transmitter (Tx)</b>                        |                       |                               |      |      |       |      |
| <b>Optical Modulation Amplitude (OMA)</b>      |                       |                               | -1.5 |      | dBm   | 1    |
| <b>Average Launch Power</b>                    | $P_{AVE}$             | -7.3                          |      | -1   | dBm   | 2    |
| <b>Optical Wavelength</b>                      | $\lambda$             | 840                           | 850  | 860  | nm    | 1    |
| <b>RMS Spectral Width</b>                      | $\Delta\lambda_{rms}$ |                               |      | 0.45 | dB    | 1    |
| <b>Optical Extinction Ratio</b>                | ER                    | 3.0                           | 5.5  |      | dB    |      |
| <b>Transmitter and Dispersion Penalty</b>      | TDP                   |                               |      | 3.9  | dB    |      |
| <b>Average Launch power of OFF transmitter</b> | $P_{OFF}$             |                               |      | -30  | dBm   |      |
| <b>Tx Jitter</b>                               | $Tx_j$                | Per IEEE 802.3ae requirements |      |      |       |      |
| <b>Encircled Flux</b>                          | <4.5μm                |                               |      | 30   | %     | 3    |
|  | <19μm                 | 86                            |      |      |       |      |
| <b>Relative Intensity Noise</b>                | $RIN_{12OMA}$         |                               |      | -128 | dB/Hz |      |

| Receiver (Rx)   |             |      |     |       |     |   |
|---|-------------|------|-----|-------|-----|---|
| <b>Receiver Sensitivity (OMA) @ 10.3Gb/s</b>          | $R_{SENS1}$ |      |     | -11.1 | dBm | 4 |
| <b>Stressed Receiver Sensitivity (OMA) @ 10.3Gb/s</b> | $R_{SENS2}$ |      |     | -7.5  | dBm | 5 |
| <b>Maximum Input Power</b>                            | $P_{MAX}$   | +0.5 |     |       | dBm |   |
| <b>Wavelength Range</b>                               | $\lambda_C$ | 840  |     | 860   | nm  |   |
| <b>Receiver Reflectance</b>                           | $LOS_D$     |      |     | -12   | dB  |   |
| <b>LOS De-Assert</b>                                  | $LOS_A$     |      |     | -14   | dBm |   |
| <b>LOS Assert</b>                                     | $LOS_A$     | -30  | -23 |       | dBm |   |
| <b>LOS Hysteresis</b>                                 |             | 0.5  |     |       | dB  |   |

**Notes:**

1. Per Tradeoff Table 52.8, IEEE 802.3ae 2005
2. Average Power figures are informative only, per IEEE802.3ae.
3. Measured into Type A1a (50/125  $\mu$ m multimode) fiber per ANSI/TIA/EIA-455-203-2.
4. Measured with worst ER; BER<10<sup>-12</sup>; 231 – 1 PRBS.
5. Per IEEE 802.3ae.

**V.Digital Diagnostic Specifications**

The transceiver can be used in host systems that require either internally or externally calibrated digital diagnostics.

| Parameter   | Symbol          | Min  | Typ. | Max | Units | Ref. |
|---|-----------------|------|------|-----|-------|------|
| <b>Accuracy</b>                                       |                 |      |      |     |       |      |
| <b>Internally measured transceiver temperature</b>    | $DD_{Temp}$     | -3   |      | 3   | °C    |      |
| <b>Internally measured transceiver supply voltage</b> | $DD_{Voltage}$  | -100 |      | 100 | mV    |      |
| <b>Measured TX bias current</b>                       | $DD_{Bias}$     | -10  |      | 10  | %     | 1    |
| <b>Measured TX output power</b>                       | $DD_{Tx-Power}$ | -2   |      | 2   | dB    |      |
| <b>Measured RX received average optical power</b>     | $DD_{Rx-Power}$ | -2   |      | 2   | dB    |      |

| Parameter   | Symbol          | Min  | Typ. | Max  | Units | Ref. |
|---|-----------------|------|------|------|-------|------|
| <b>Dynamic Range for Rated Accuracy</b>               |                 |      |      |      |       |      |
| <b>Internally measured transceiver temperature</b>    | $DD_{Temp}$     | 0    |      | 70   | °C    |      |
| <b>Internally measured transceiver supply voltage</b> | $DD_{Voltage}$  | 3.14 |      | 3.46 | V     |      |
| <b>Measured TX bias current</b>                       | $DD_{Bias}$     | 0    |      | 20   | mA    |      |
| <b>Measured TX output power</b>                       | $DD_{Tx-Power}$ | -9   |      | -2.5 | dBm   |      |
| <b>Measured RX received average optical power</b>     | $DD_{Rx-Power}$ | -20  |      | 0    | dBm   |      |
| <b>Max Reporting Range</b>                            |                 |      |      |      |       |      |
| <b>Internally measured transceiver temperature</b>    | $DD_{Temp}$     | -40  |      | 125  | °C    |      |
| <b>Internally measured transceiver supply voltage</b> | $DD_{Voltage}$  | 2.8  |      | 4.0  | V     |      |
| <b>Measured TX bias current</b>                       | $DD_{Bias}$     | 0    |      | 20   | mA    |      |
| <b>Measured TX output power</b>                       | $DD_{Tx-Power}$ | -10  |      | -3   | dBm   |      |
| <b>Measured RX received average optical power</b>     | $DD_{Rx-Powe}$  | -22  |      | 0    | dBm   |      |

**Notes:**

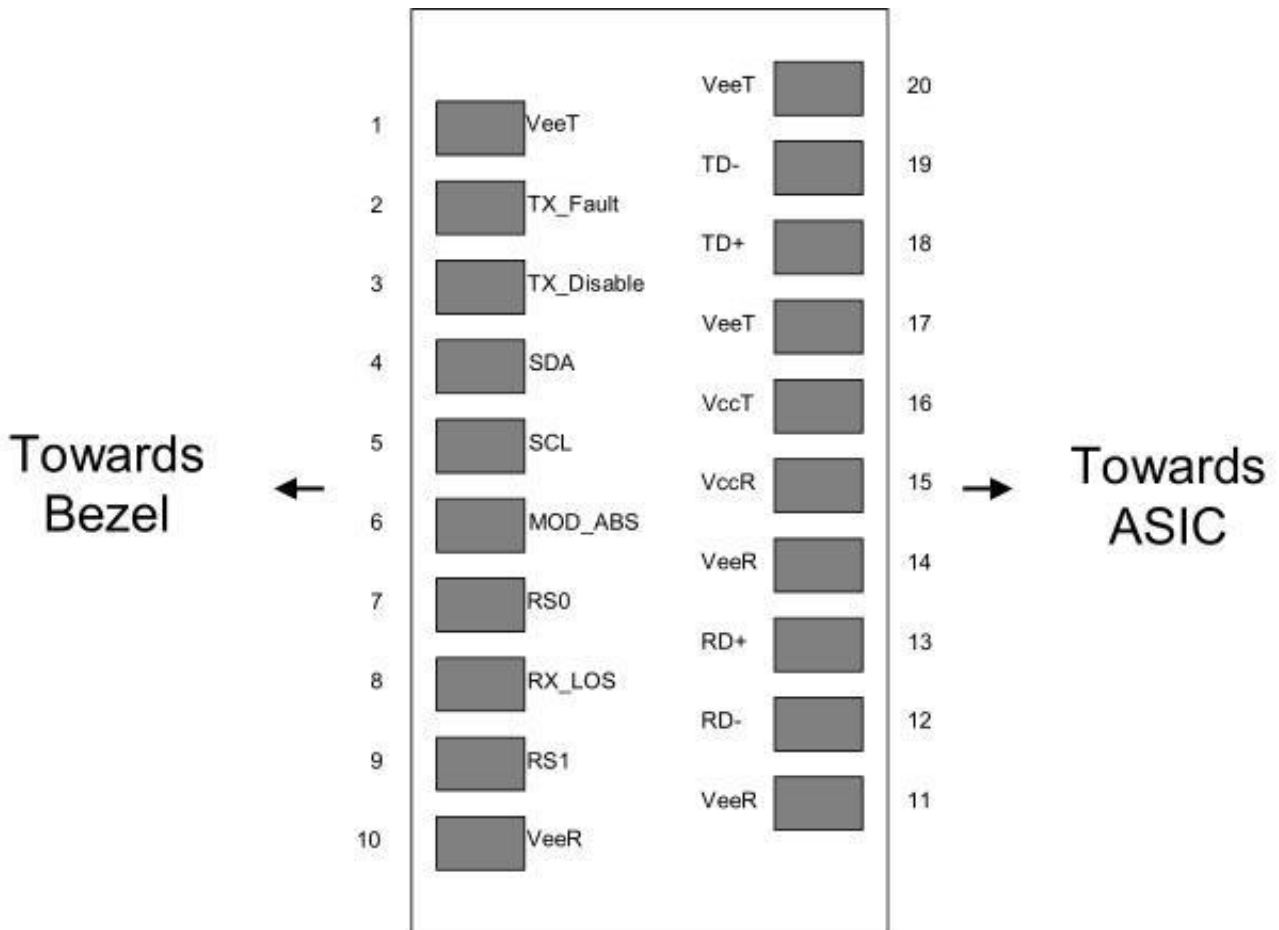
1. Accuracy of Measured Tx Bias Current is 10% of the actual Bias Current from the laser driver to the laser.

## VI. Pin Description

| Pin | Symbol             | Name/Description   | Ref. |
|-----|--------------------|--|------|
| 1   | V <sub>EET</sub>   | Transmitter Ground(Common with Receiver Ground)                | 1    |
| 2   | T <sub>FAULT</sub> | Transmitter Fault  | 2    |
| 3   | T <sub>DIS</sub>   | Transmitter Disable. Laser output disabled on high or open.    | 3    |
| 4   | SDA                | 2-wire Serial Interface Data Line                              | 4    |
| 5   | SCL                | 2-wire Serial Interface Clock Line                             | 4    |
| 6   | MOD_ABS            | Module Absent. Grounded within the module                      | 4    |
| 7   | RS0                | No connection required   |      |
| 8   | RX_LOS             | Loss of Signal indication. Logic 0 indicates normal operation. | 5    |
| 9   | RS1                | No connection required   |      |
| 10  | V <sub>EER</sub>   | Receiver Ground(Common with Transmitter Ground)                | 1    |
| 11  | V <sub>EER</sub>   | Receiver Ground(Common with Transmitter Ground)                | 1    |
| 12  | RD-                | Receiver Inverted DATA out.<br>AC Coupled.                     |      |
| 13  | RD+                | Receiver Non-inverted DATA out.<br>AC Coupled.                 |      |
| 14  | V <sub>EER</sub>   | Receiver Ground(Common with Transmitter Ground)                | 1    |
| 15  | V <sub>CCR</sub>   | Receiver Power Supply  |      |
| 16  | V <sub>CCT</sub>   | Transmitter Power Supply                                       |      |
| 17  | V <sub>EET</sub>   | Transmitter Ground(Common with Receiver Ground)                | 1    |
| 18  | TD+                | Transmitter Non-Inverted DATA in.<br>AC Coupled.               |      |
| 19  | TD-                | Transmitter Inverted DATA in.<br>AC Coupled.                   |      |
| 20  | V <sub>EET</sub>   | Transmitter Ground(Common with Receiver Ground)                | 1    |

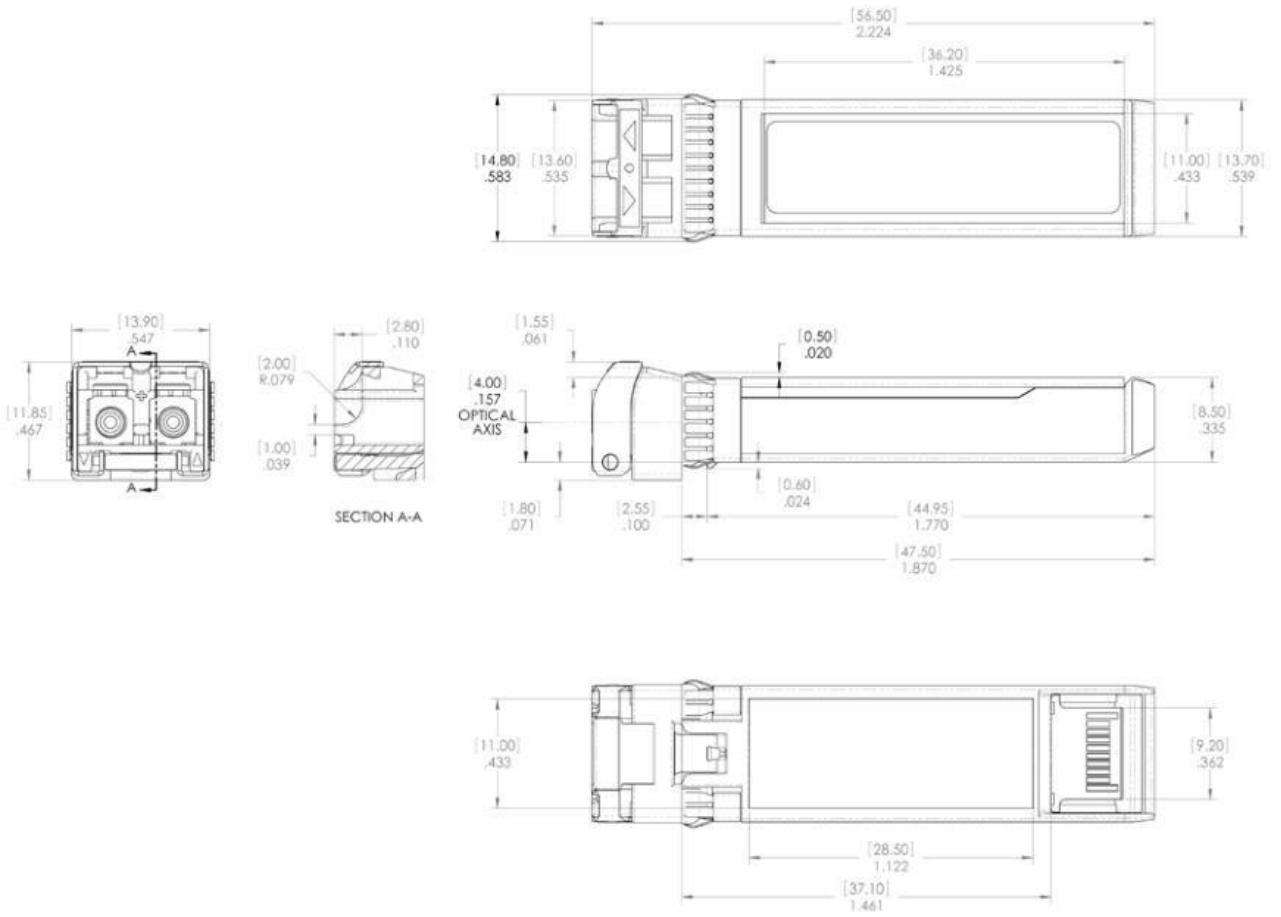
**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. T\_FAULT is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to  $V_{cc} + 0.3V$ . A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to  $<0.8V$ .
3. Laser output disabled on T\_DIS  $>2.0V$  or open, enabled on T\_DIS  $<0.8V$ .
4. Should be pulled up with 4.7k $\Omega$  – 10k $\Omega$  on host board to a voltage between 2.0V and 3.6V. MOD\_ABS pulls line low to indicate module is plugged in.
5. LOS is open collector output. Should be pulled up with 4.7k $\Omega$  – 10k $\Omega$  on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

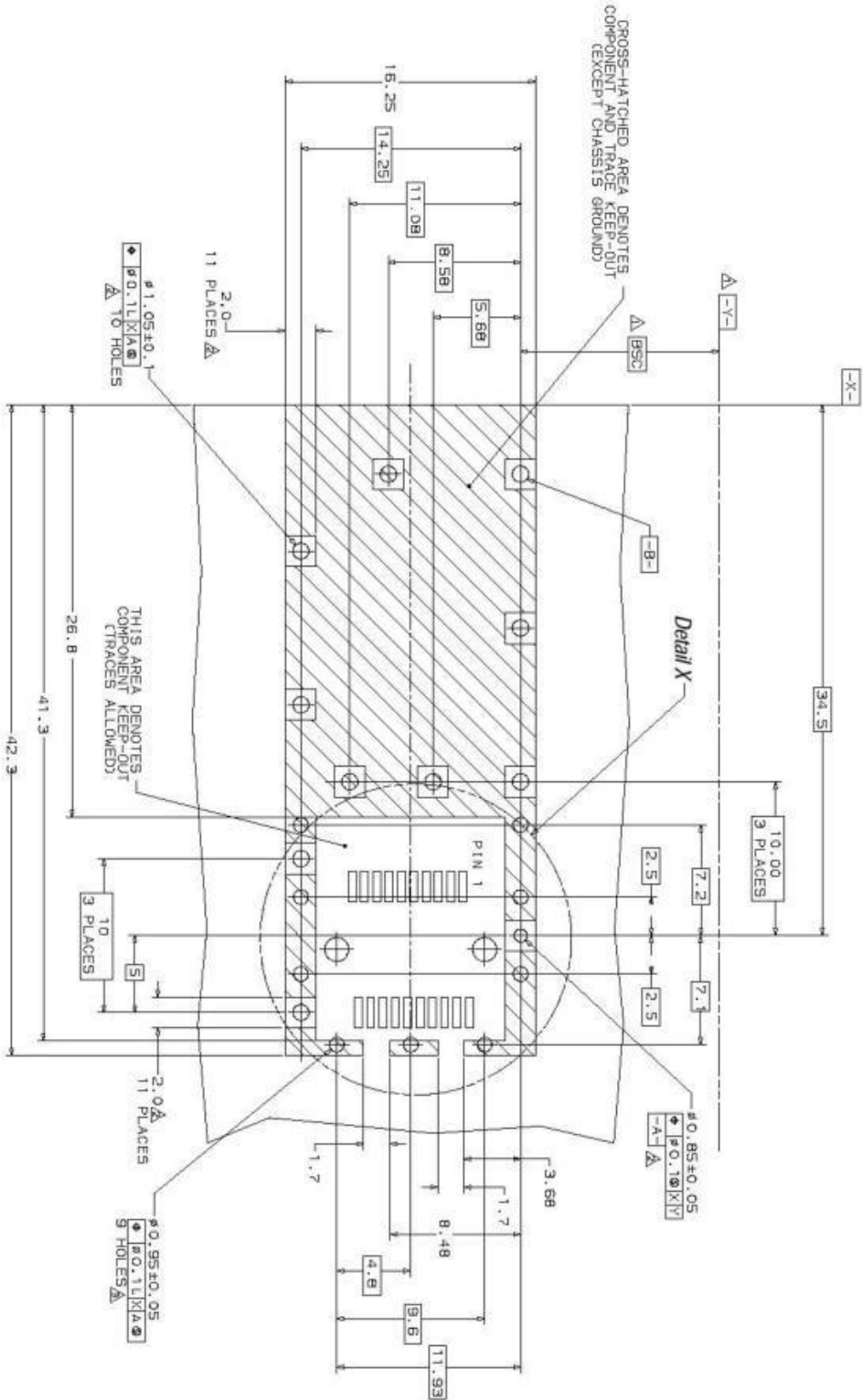




## VII. Mechanical Specifications



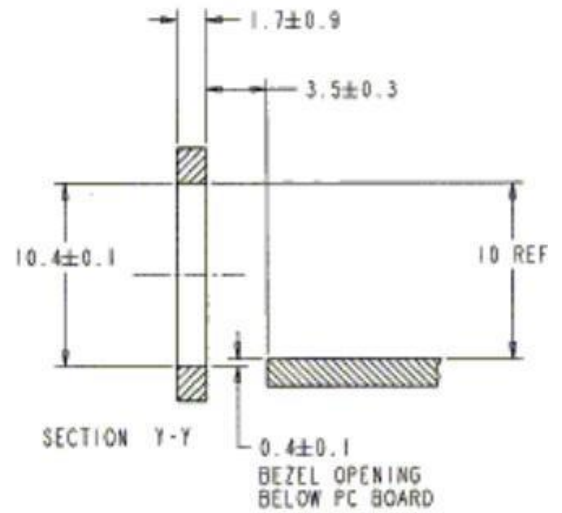
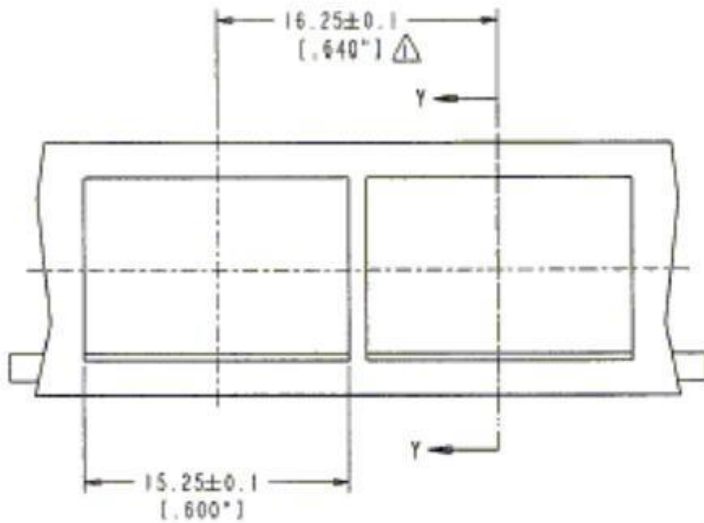
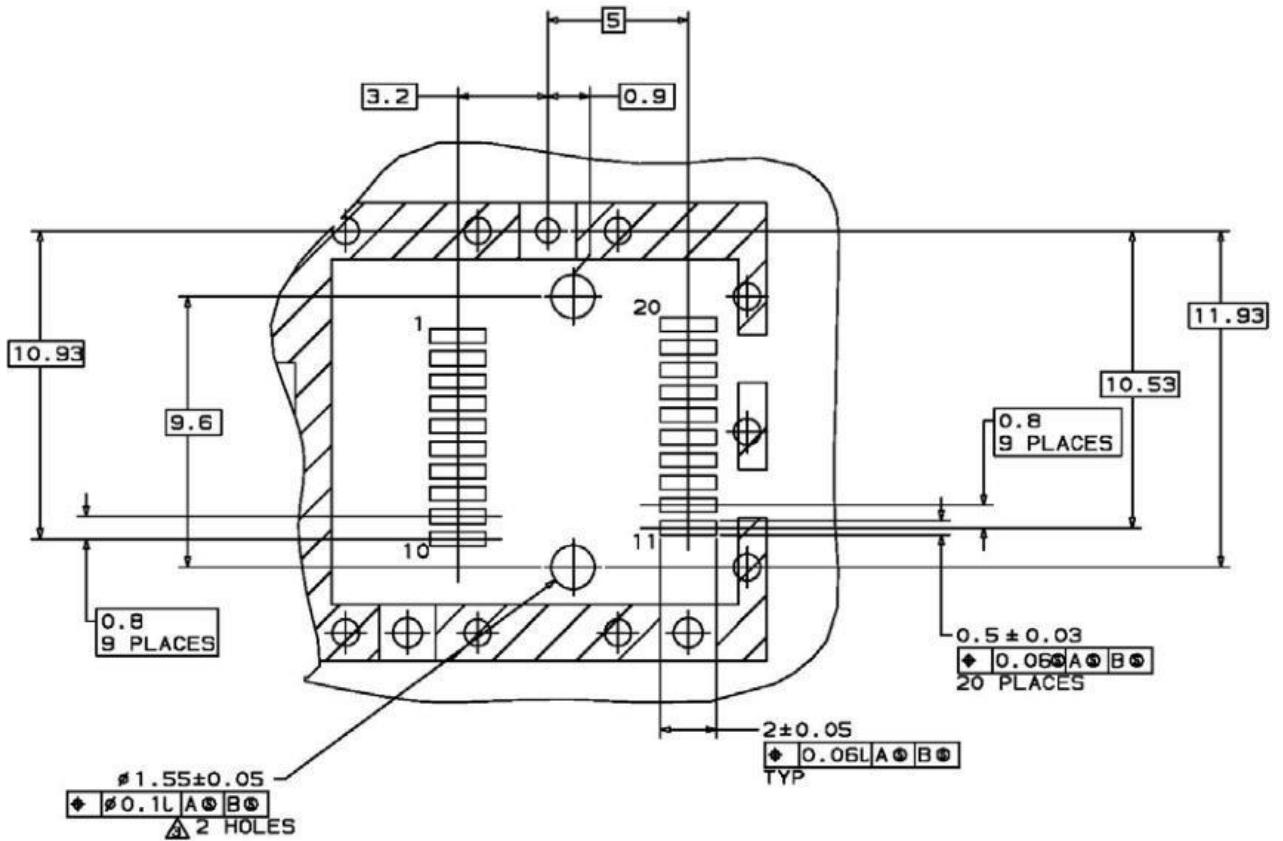
### VIII. Host Board SFP+ Connector Recommendations



△ Datum and Basic Dimension Established by Customer

⊠ Rads and Vias are Chassis Ground, 11 Places

△ Through Holes are Unplated



NOTES:

△ MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY

2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

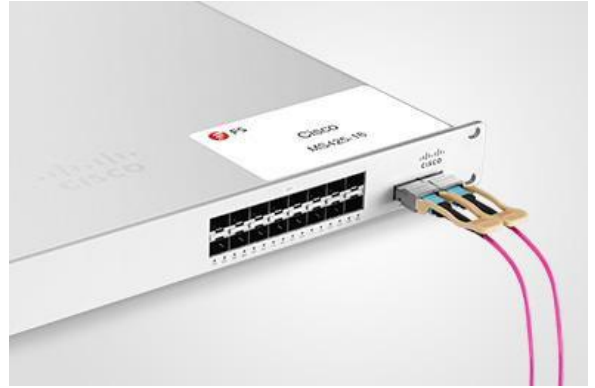
## Test Center

### I. Compatibility Testing

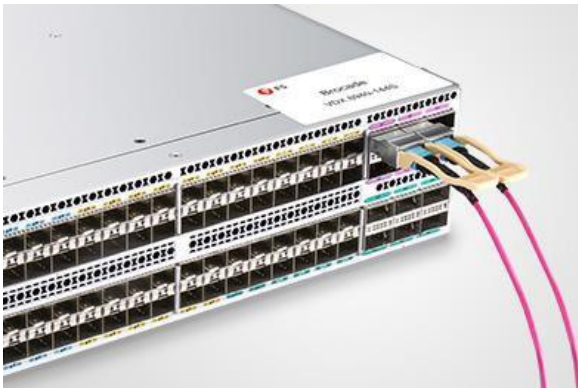
Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force10 S60-44T

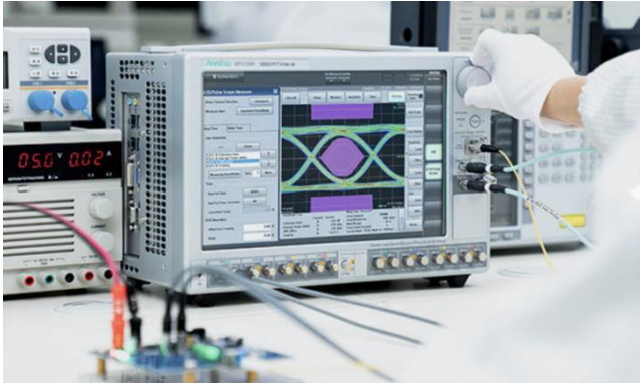


HUAWEI S6720-30L-HI-24S

Above is part of our test bed network equipment. For more information, please click the [Test Bed PDF](#). It will be updated in real time as we expand our portfolio.

## II. Performance Testing

Each fiber optical transceiver has been fully tested in FS Assured Program equipped with world's most advanced analytical equipment to ensure that our transceivers work perfectly on your device.



### 1. TX/RX Single Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator the input and output signal quality.

- Eye Pattern Measurements: Jitter, Mask Margin, etc
- Average Output Power
- OMA
- Extinction Ratio
- Receiver Sensitivity
- BER Curve

### 2. Reliability and Stability Testing

Subject the transceivers to dramatic in temperature on the thermal shock chamber to ensure reliability and stability of the transceivers.

- Commercial: 0°C to 70°C
- Extended: -5°C to 85°C
- Industrial: -40°C to 85°C



### 3. Transfer Rate and Protocol Testing

Test the actual transfer data rate and the transmission ability under different protocols with Networks Master Pro.

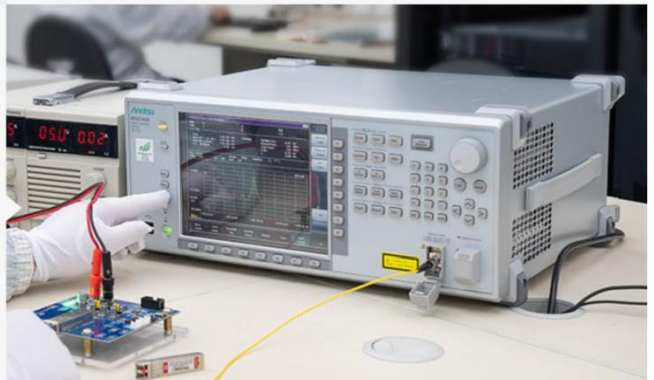
- Ethernet
- Fiber Channel
- SDH/SONET
- CPRI



### 4. Optical Spectrum Evaluation

Evaluate various important parameters with the Optical Spectrum Analyzer to meet the industry standards.

- Center Wavelength, Level
- OSNR
- SMSR
- Spectrum Width



## Order Information

| Part Number   | Description   |
|---------------|---|
| SFP-10GSR-85  | 10GBASE-SR SFP+ 850nm 300m DOM Transceiver                            |
| SFP-10GLRM-31 | 10GBASE-LRM SFP+ 1310nm 220m DOM Transceiver                          |
| SFP-10GLR-31  | 10GBASE-LRSFP+ 1310nm 10km DOM Transceiver                            |
| SFP-10GER-55  | 10GBASE-ERSFP+ 1550nm 40km DOM Transceiver                            |
| SFP-10GZR-55  | 10GBASE-ZR SFP+ 1550nm 80km DOM Transceiver                           |
| SFP-10GZRC-55 | 10GBASE-ZR SFP+ 1550nm 100km DOM Transceiver                          |
| SFP-10GSR-85  | Dual-Rate 1000BASE-SX and 10GBASE-SR SFP+ 850nm 300m DOM Transceiver  |
| SFP-10GLR-31  | Dual-Rate 1000BASE-LX and 10GBASE-LR SFP+ 1310nm 10km DOM Transceiver |

### Notes:

1. 10G SFP+ transceiver module is individually tested on corresponding equipment such as Cisco, Arista, Juniper, Dell, Brocade and other brands, and passes the monitoring of FS.COM intelligent quality control system.



 <https://www.fs.com>



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