

# 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)
- Industrial temperature range -40° C to 85° C
- Single 3.3V power supply
- Maximum link length of 400m on
- 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 200 MHz-km				33		
<b>50µm</b>	400 MHz-km	Lmax			66		m
	OM2 500 MHz-km				82		
	OM3 2000 MHz-km				300		
	OM4 4700 MHz-km				400		

#### Notes:

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

## II. Absolute Maximum Ratings

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

### Notes:

1. Non-condensing..

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

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
<b>Supply Voltage</b>	V <sub>CC</sub>	3.14		3.46	V	
<b>Supply Current</b>	I <sub>CC</sub>			289	mA	
<b>Transmitter</b>						
<b>Input differential impedance</b>	R <sub>in</sub>		100		Ω	1
<b>Differential data input swing</b>	V <sub>in,pp</sub>	180		700	mV	
<b>Transmit Disable Voltage</b>	V <sub>D</sub>	2		V <sub>CC</sub>	V	
<b>Transmit Enable Voltage</b>	V <sub>EN</sub>	V <sub>EE</sub>		V <sub>EE</sub> + 0.8	V	
<b>Receiver</b>						
<b>Differential data output swing</b>	V <sub>out,pp</sub>	300		850	mV	2,6
<b>Output rise time and fall time</b>	t <sub>r</sub>	28			ps	3
<b>LOS asserted</b>	V <sub>LOS fault</sub>	2		V <sub>CC_HOST</sub>	V	4
<b>LOS de-asserted</b>	V <sub>LOS norm</sub>	V <sub>EE</sub>		V <sub>EE</sub> +0.8	V	4
<b>Power Supply Noise Tolerance</b>	V <sub>CC_T/V<sub>CC_R</sub></sub>		Per SFF-8431 Rev 4.1		mV <sub>pp</sub>	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>Λ</sup>9 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 70 °C, VCC = 3.14 to 3.46 V)**

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>	$P_{AVE}$	-5		-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>	$RIN_{12}OMA$			-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.
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### Dynamic Range for Rated Accuracy

Internally measured transceiver temperature	DD <sub>Temp</sub>	-40		85	°C	
Internally measured transceiver supply voltage	DD <sub>Voltage</sub>	3.14		3.46	V	
Measured TX bias current	DD <sub>Bias</sub>	0		20	mA	
Measured TX output power	DD <sub>Tx-Power</sub>	-9		-2.5	dBm	
Measured RX received average optical power	DD <sub>Rx-Power</sub>	-20		0	dBm	

### Max Reporting Range

Internally measured transceiver temperature	DD <sub>Temp</sub>	-40		125	°C	
Internally measured transceiver supply voltage	DD <sub>Voltage</sub>	2.8		4.0	V	
Measured TX bias current	DD <sub>Bias</sub>	0		20	mA	
Measured TX output power	DD <sub>Tx-Power</sub>	-10		-3	dBm	
Measured RX received average optical power	DD <sub>Rx-Power</sub>	-22		0	dBm	

#### Notes:

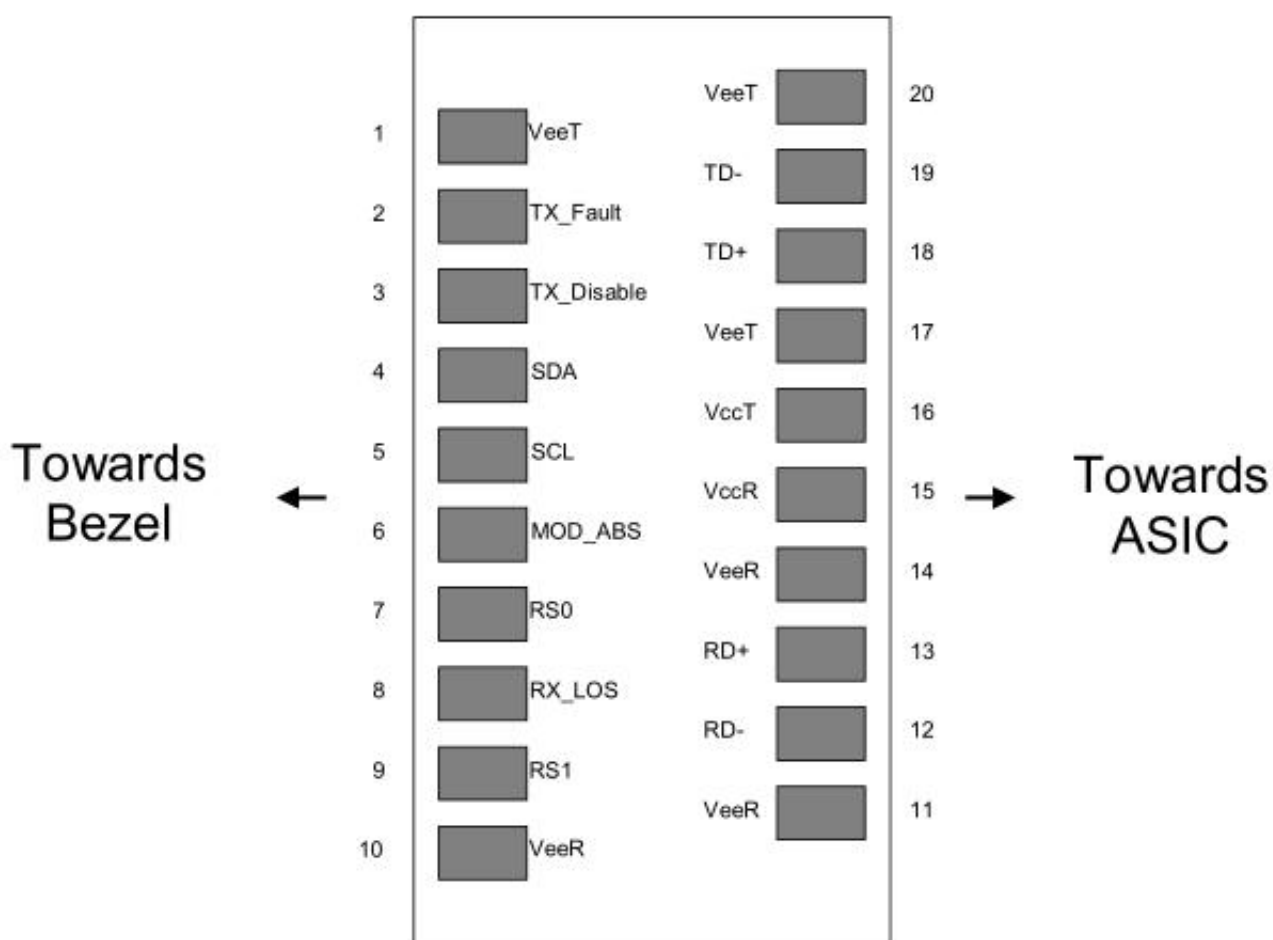
1. Accuracy of Measured Tx Bias Current is 10% of the actual Bias Current from the laser driver to the laser.

## 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. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. 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. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V <sub>EET</sub>	Transmitter Ground(Common with Receiver Ground)	1

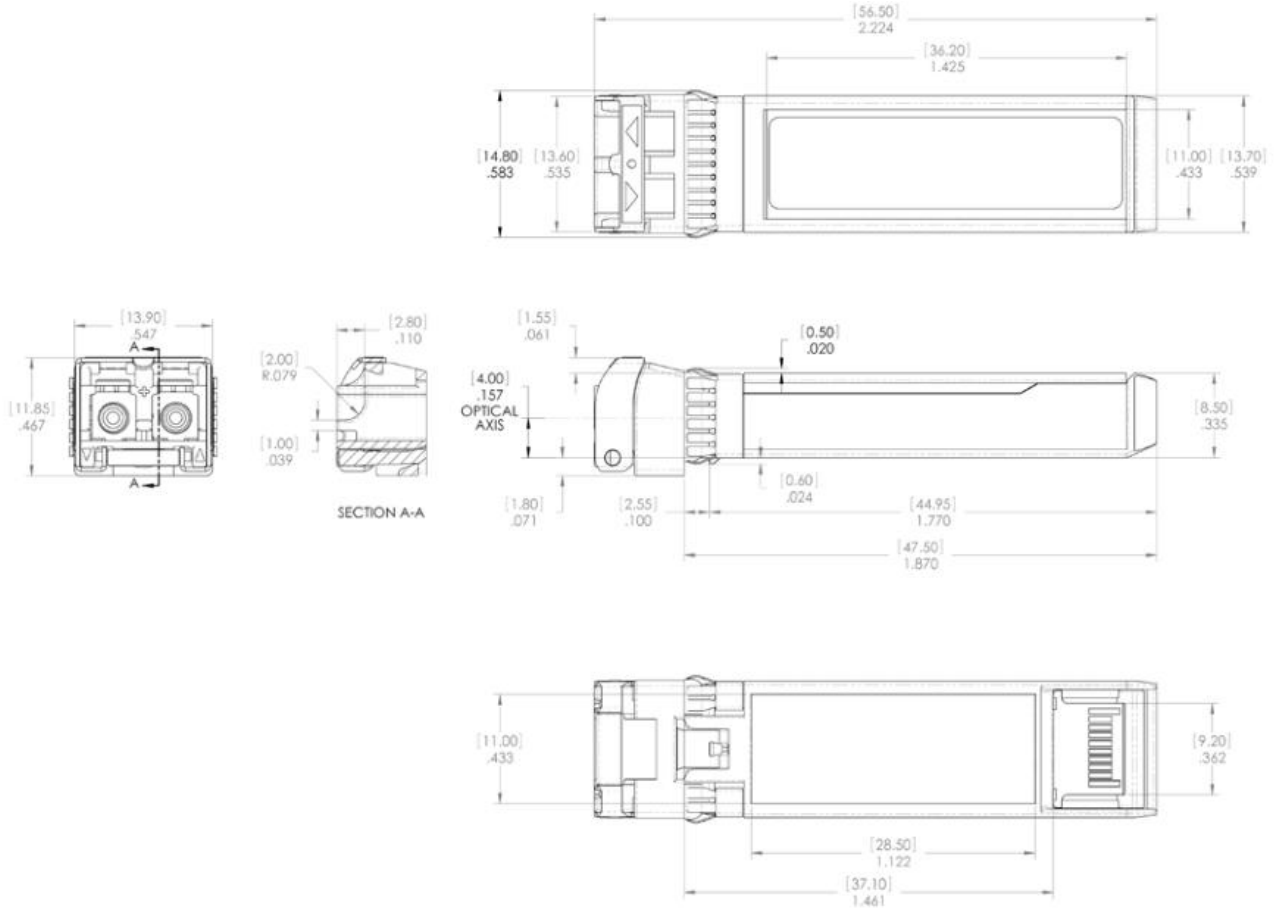
**Notes:**

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 Vcc + 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 <math><0.8V</math>.
3. Laser output disabled on T DIS >2.0V or open, enabled on T DIS <math><0.8V</math>.
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.

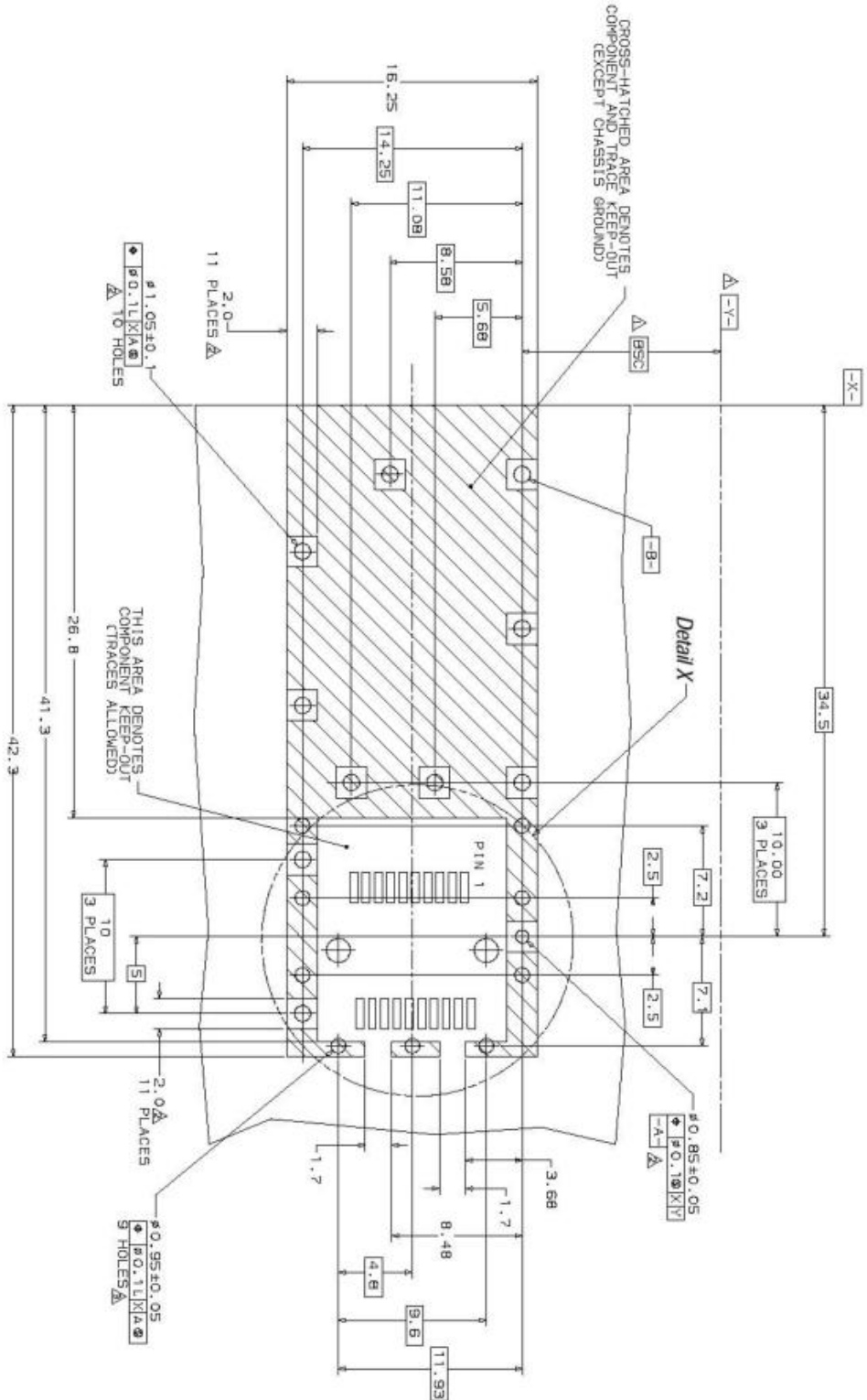




## VII. Mechanical Specifications



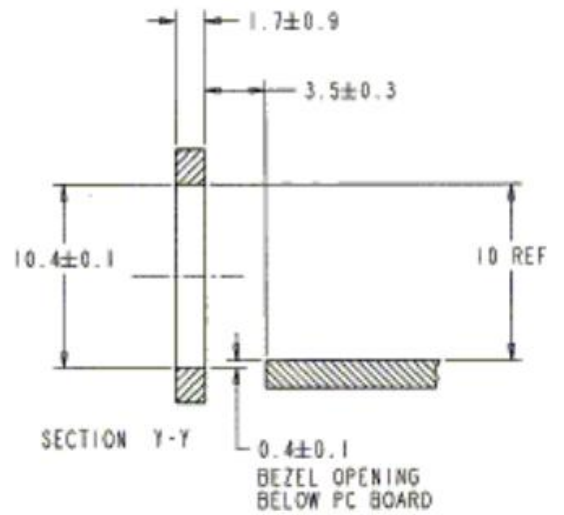
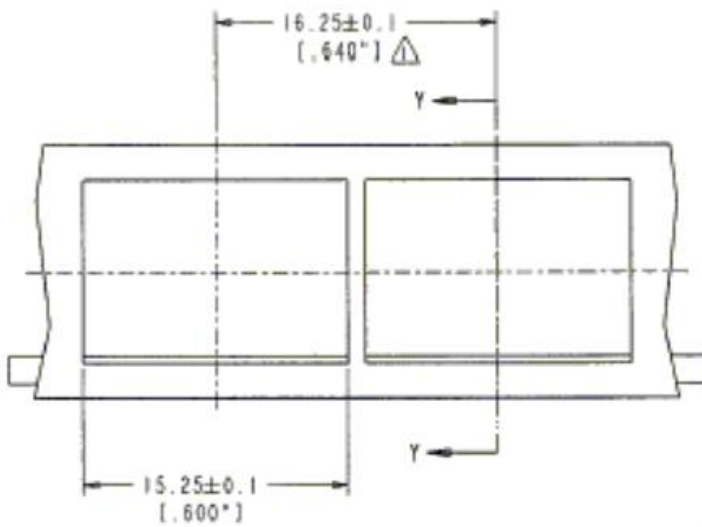
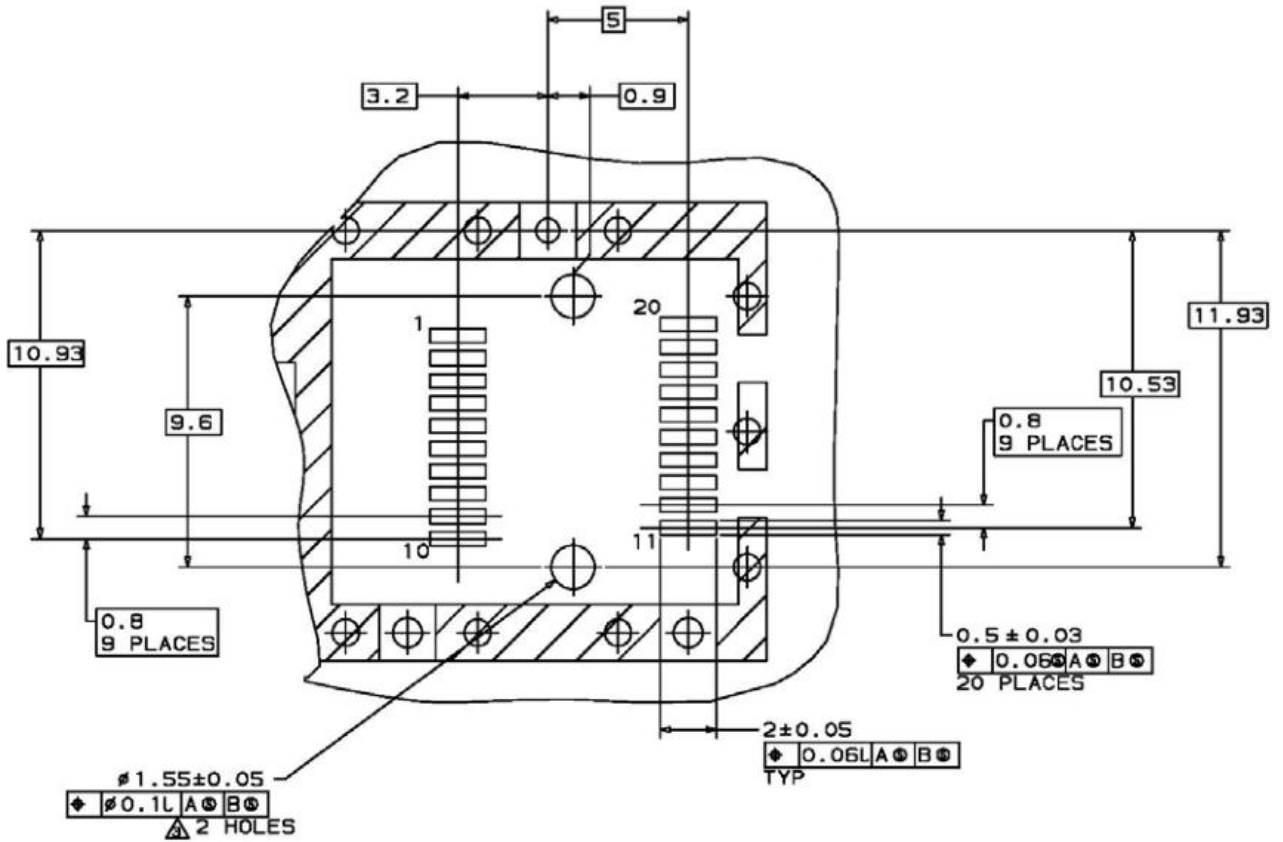
### VIII. Host Board SFP+ Connector Recommendations



▲ Datum and Basic Dimension Established by Customer

▲ Pads 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

FS.COM transceivers are tested to ensure connectivity and compatibility in our test center before shipped out. FS.COM test center is supported by a variety of mainstream original brand switches and groups of professional staff, helping our customers make the most efficient use of our products in their systems, network designs and deployments.

The original switches could be found nowhere but at FS.COM test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406R ZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.



Cisco ASR 9000 Series(A9K-MPA-1X40GE)



ARISTA 7050S-64(DCS-7050S-64)



Juniper MX960



Brocade ICX 7750-26Q



Extreme Networks X670V VIM-40G4X



Mellanox M3601Q



Dell N4032F



HP 5406R ZL2 V3(J9996A)



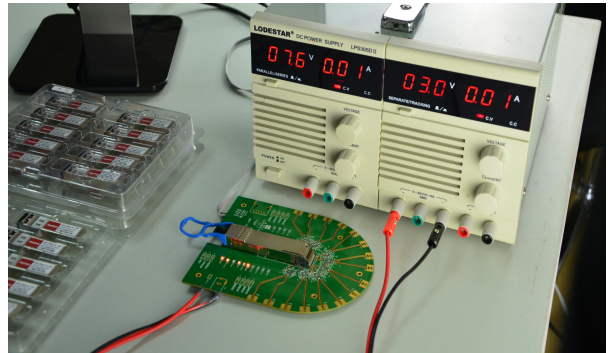
AVAYA 7024XLS(7002QQ-MDA)

## Test Assured Program

FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to facilities—professionally trained staff, advanced test facilities and comprehensive original-brand switches, to ensure our customers to receive the optics with superior quality.



Our smart data system allows effective product management and quality control according to the unique serial number, properly tracking the order, shipment and every part.



Our in-house coding facility programs all of our parts to standard OEM specs for compatibility on all major vendors and systems such as Cisco, Juniper, Brocade, HP, Dell, Arista and so on.



With a comprehensive line of original-brand switches, we can recreate an environment and test each optics in practical application to ensure quality and distance.



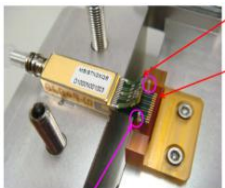
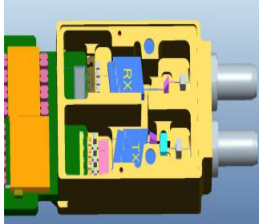
The last test assured step to ensure our products to be shipped with perfect package.



## Core COB Technology

The new chip on board(COB) packing technology was developed by FS R&D team for mass production while reducing costs.



Comparison	Traditional Design	FS Innovative Design
Design	BOX+FPC+PCBA Separate Design	COB+PCBA Integrated Design
Optical Component	 <p>DC-FPC (Bend it softly) RF-FPC</p> <p>Positioning pin for FPC, This pin is fragile, so please handle it with care.</p>	
Performance	Optimal	Optimal

Cost **High**  
(Traditional separate design makes BOX packaging cost very high)

Cost **Low**  
(Packaging cost is greatly reduced without BOX housing and FPC)

## Excellent Quality Control System

FS innovated a self-developed automated and integrated test system, and also equipped with complete sets of advanced testing equipment to ensure modules quality and high performance.



### Performance Testing

One-Click operation, including centre-wavelength, extinction ratio, optical eye diagram, TX power, receiver sensitivity, DDM etc.

### Environmental Testing

Low temp test, storage in 85° C and -40° C for 12 hours. ESD test,  $\pm 8$  and  $\pm 15$  kV discharges as per GR-78-CORE. Connector durability - pull test, min of 10 connections, no more than 30% pullouts.



### Compatibility and Connectivity Testing

Equipped with a variety of mainstream original brand switches, like Cisco, Juniper, Arista, HPE etc. Each transceiver will be tested before delivery.

## 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-LR SFP+ 1310nm 10km DOM Transceiver
SFP-10GER-55	10GBASE-ER SFP+ 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.





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