



## Datasheet

## 10GBASE-LR SFP+1310nm 10km DOM Transceiver

SFP-10GLR-31



### Features

- Hot-pluggable SFP+ footprint
- Supports 9.95 to 10.5Gb/s bit rates
- Power dissipation < 1W
- RoHS-6 compliant (lead-free)
- Commercial temperature range 0 to 70° C
- Single 3.3V power supply
- Maximum link length of 10km
- Uncooled 1310nm DFB laser
- Receiver limiting electrical interface
- Duplex LC connector
- Built-in digital diagnostic functions

### Application

- 10GBASE-LR/LW 10G Ethernet
- 1200-SM-LL-L 10G Fibre Channel

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## Description

10Gb/s Enhanced Small Form Factor Pluggable SFP+ transceivers are designed for use in 10-Gigabit Ethernet links up to 10km over Single Mode fiber. They are compliant with SFF-8431, SFF-8432 and IEEE 802.3ae 10GBASE-LR/LW, and 10G Fibre Channel 1200-SM-LL-L Digital diagnostics functions are available via a 2-wire serial interface.

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 transceiver is compliant per the RoHS Directive 2011/65/EU.

## Product Specifications

## I.General Specifications

Parameter	Symbol	Min	Type	Max	Unit	Note
Bit Rate	BR	9.95		10.5	Gb/s	1
Bit Error Ratio	BER			$10^{-12}$		2
Max. Supported Link Length	$L_{MAX}$		10		km	1

## Notes:

- 1.10GBASE-LR, 10GBASE-LW, 1200-SM-LL-L 10GFC.
2. Tested with a  $2^{31} - 1$  PRBS.



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## II. Absolute Maximum Ratings

Parameter	Symbol	Min	Type	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>OP</sub>	0		70	° C	
Relative Humidity	RH	0		85	%	1
Receiver Optical Damage Threshold	RxDamage	5			dBm	

Note:

Non-condensing.

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

Parameter	Symbol	Min	Type	Max	Unit	Ref.
Supply Voltage	V <sub>CC</sub>	3.14	3.30	3.46	V	
Supply Current	I <sub>CC</sub>		200	285	mA	
Transmitter (Tx)						
Input differential impedance	R <sub>in</sub>		100	120	Ω	1
Differential data input swing	V <sub>in,pp</sub>	180		850	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>		0.8	V	



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## Receiver (Rx)

Differential data output swing	$V_{out,pp}$	300	850	mV	2,5
Output rise time and fall time	$T_r, T_f$	28		ps	3
LOS Fault	$V_{LOS\ fault}$	2	Vcc	V	4
LOS Normal	$V_{LOS\ norm}$	Vee	0.8	V	4
Power Supply Noise Tolerance	$V_{CCT}/V_{CCR}$	Per SFF-8431 Rev 4.1		mVpp	

## Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into  $100\Omega$  differential termination.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern.  
Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative.
4. LOS is an open collector output. Should be pulled up with  $4.7k\Omega$  –  $10k\Omega$  on the host board. Normal operation is logic 0; loss of signal is logic 1.
5. 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.

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### IV. Optical Characteristics (TOP = 0 to 70 °C, VCC = 3.14 to 3.46 V)

Parameter	Symbol	Min	Type	Max	Unit	Note
<b>Transmitter</b>						
Optical Modulation Amplitude (OMA)	P <sub>OMA</sub>	-5.2			dBm	
Average Launch Power	P <sub>AVE</sub>	-8.2		+0.5	dBm	1
Optical Wavelength	λ	1260		1355	nm	
Side-Mode Suppression Ratio	SMSR	30			dB	
Optical Extinction Ratio	ER	3.5				
Transmitter and Dispersion Penalty	TDP			3.2	dB	
Average Launch power when Tx is OFF	P <sub>OFF</sub>			-30	dBm	
Tx Jitter	Txj	Per 802.3ae requirements				
Relative Intensity Noise	RIN			-128	dB/Hz	
<b>Receiver</b>						
Receiver Sensitivity (OMA) @ 10.3Gb/S	R <sub>SENS1</sub>			-12.6	dBm	2
Receiver Sensitivity (OMA) @ 10.3Gb/s	R <sub>SENS2</sub>			-10.3	dBm	3
Average Receive Power	P <sub>AVE</sub>	-14.2		+0.5	dBm	
Optical Center Wavelength	λ <sub>C</sub>	1260		1600	nm	
Receiver Reflectance	R <sub>RX</sub>			-12	dB	



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LOS De-Assert LOS De-Assert  $LOS_D$  -17 dBm

LOS Assert	$LOS_A$	-30			dBm	
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LOS Hysteresis 0.5 dB

## Notes:

1. Average power figures are informative only, per IEEE 802.3ae.
2. Valid between 1260 and 1355 nm. Measured with worst ER; BER<10-12; 2<sup>31</sup> – 1 PRBS.
3. Valid between 1260 and 1355 nm. Per IEEE 802.3ae.

## V. Digital Diagnostic Specifications

10GBASE-LR SFP+ transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

Parameter	Symbol	Min	Type	Max	Units	Ref.
Accuracy						
Internally measured transceiver temperature	$\Delta DD_{Temperature}$			3	°C	
Internally measured transceiver supply voltage	$\Delta DD_{Voltage}$			3	%	
Measured TX bias current	$\Delta DD_{Bias}$			10	%	1
Measured TX output power	$\Delta DD_{Tx-Power}$			2	dB	
Measured RX received average optical power	$\Delta DD_{Rx-Power}$			2	dB	



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## Dynamic Range for Rated Accuracy

Internally measured transceiver temperature	DD <sub>Temperature</sub>	-40	85	°C		
Internally measured transceiver temperature	DD <sub>Voltage</sub>	3.1	3.5	V		
Measured TX bias current	DD <sub>Bias</sub>	10	90	mA		
Measured TX output power	DD <sub>Tx-Power</sub>	-8.2	+0.5	dBm		
Measured RX received average optical power	DD <sub>Rx-Power</sub>	-14.2	+0.5	dBm		

## Max Reporting Range

Internally measured transceiver temperature	DD <sub>Temperature</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	+2	dBm		
Measured RX received average optical power	DD <sub>Rx-Power</sub>	-22	+2	dBm		

## Notes:

1. Accuracy of measured Tx bias current is 10% of the actual bias current from the laser driver to the laser.

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## VI. Pin Description

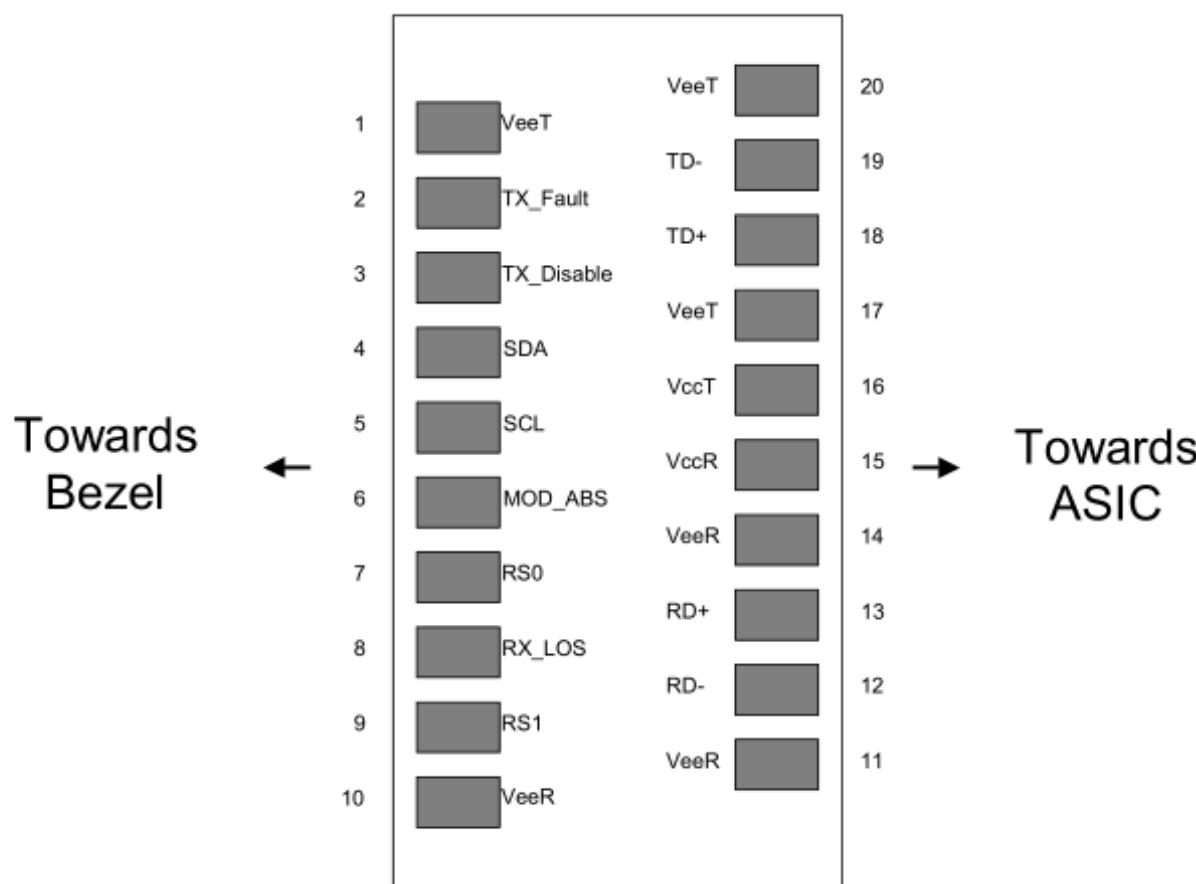


Figure 1. Diagram of Host Board Connector Block Pin Numbers and Names.

Pin	Symbol	Name/Description	Ref.
1	V <sub>EET</sub>	Transmitter 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	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	2
7	RS0	Rate Select 0.	4

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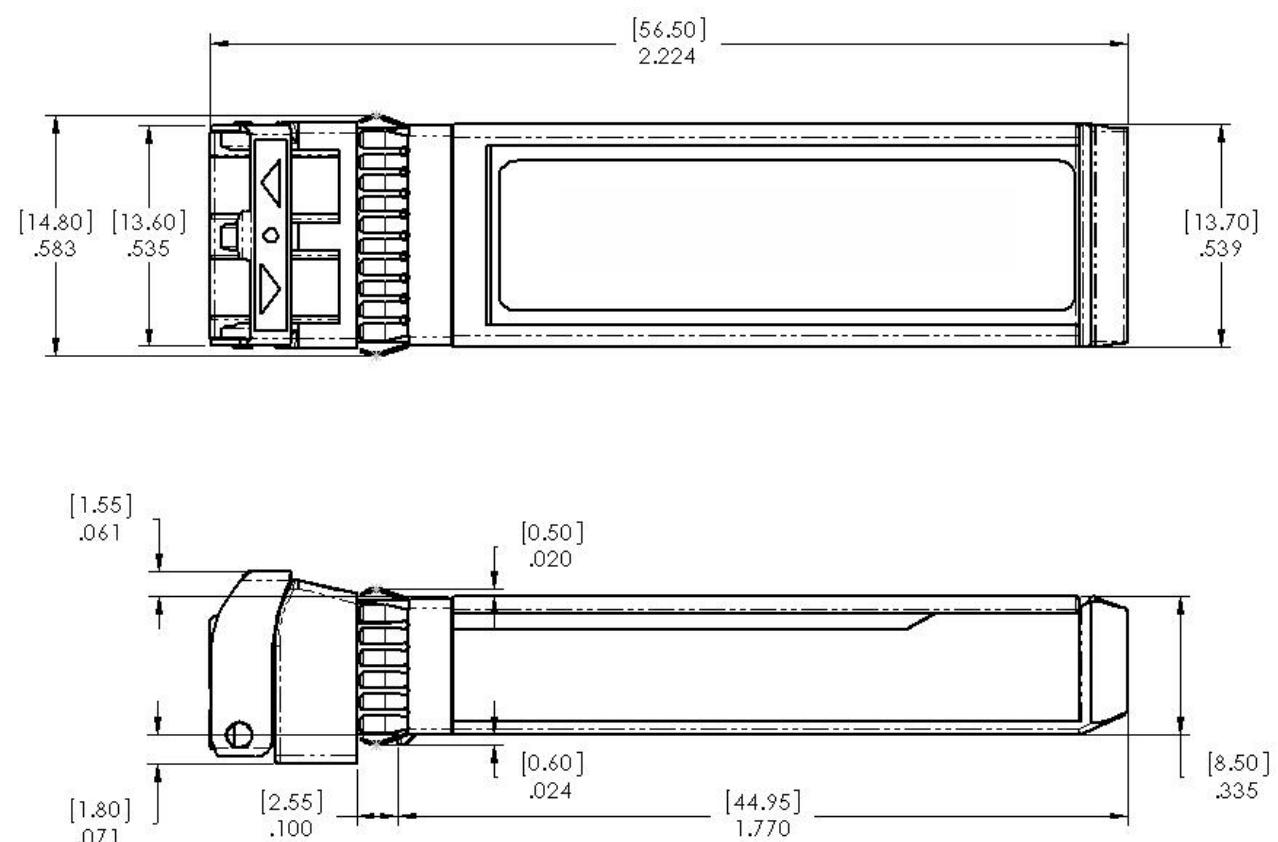
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS1	Rate Select 1.	4
10	V <sub>EER</sub>	Receiver Ground	1
11	V <sub>EER</sub>	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	V <sub>EER</sub>	Receiver Ground	1
15	V <sub>CCR</sub>	Receiver Power Supply	
16	V <sub>CCT</sub>	Transmitter Power Supply	
17	V <sub>EET</sub>	Transmitter 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	1

### Notes:

1. Circuit ground is internally isolated from chassis ground.
2. TFAULT 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 <0.8V.
3. Laser output disabled on  $T_{DIS} > 2.0V$  or open, enabled on  $T_{DIS} < 0.8V$ .
4. Internally pulled down per SFF-8431 Rev 2.0. See Sec. X for the logic table to use for the internal CDRs locking modes.
5. LOS is open collector output. Should be pulled up with 4.7kΩ -10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

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## VII. Mechanical Specifications

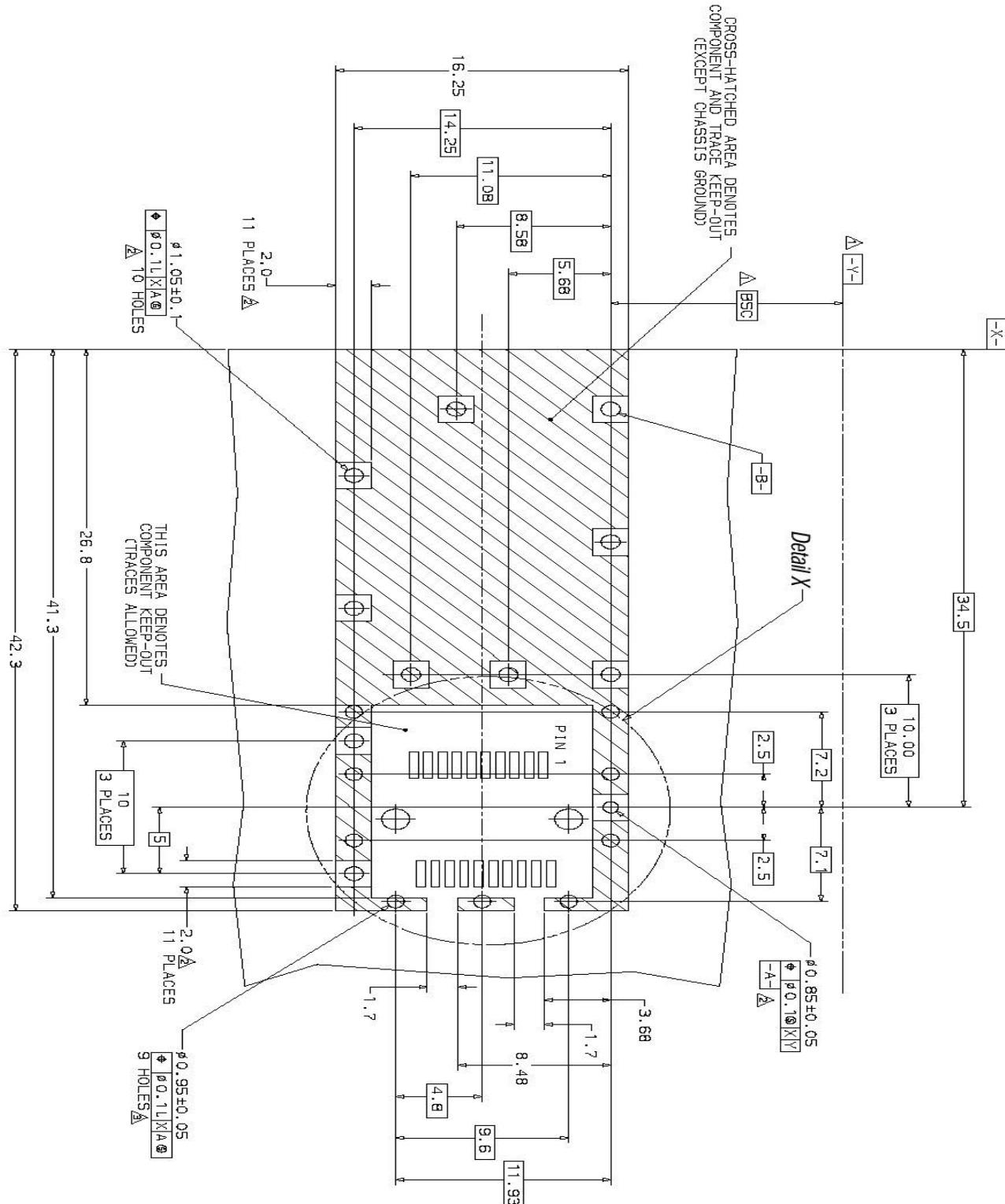


## VIII. PCB Layout and Bezel Recommendations

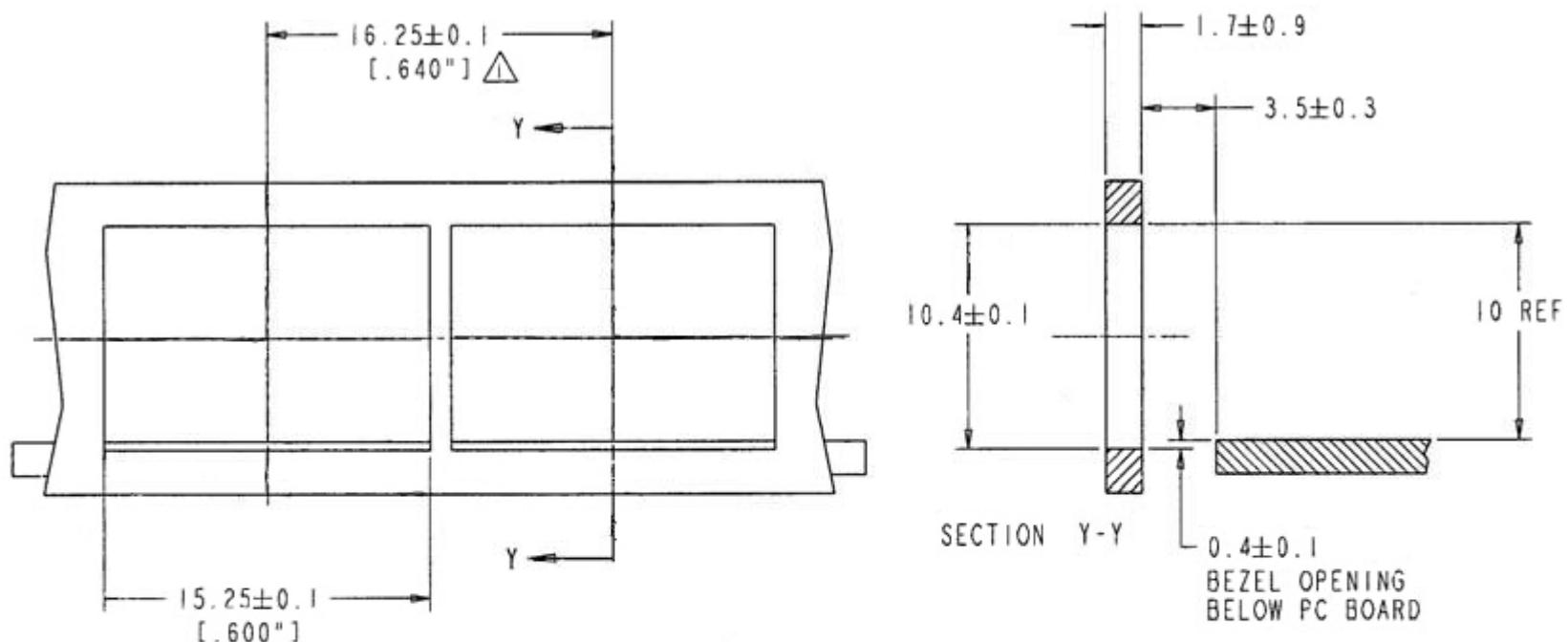
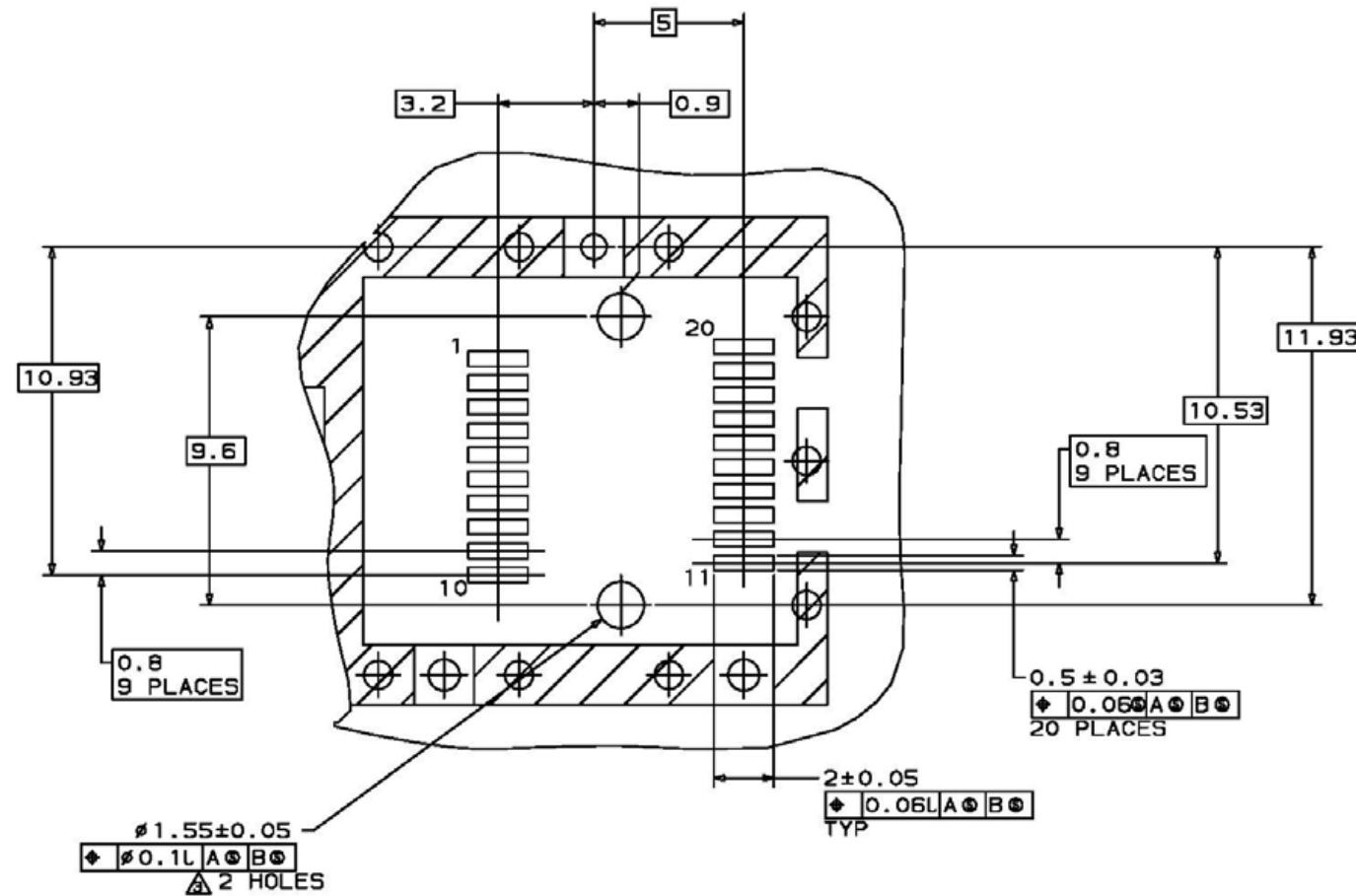
### Datum and Basic Dimension Established by Customer

 Rads and Vias are Chassis Ground, 11 Places

△ Through Holes are Unplated



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### NOTES:

- 1 MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS  
ARE FOR REFERENCE ONLY
- 2 NOT RECOMMENDED FOR PCI EXPANSION  
CRAD APPLICATIONS

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## Test Center

Only when quality and 100% compatibility is verified and proved do our modules enter the market. This depends on Fiberstore test center which is supported by a variety of mainstream original brand switches and professional staff. We are proud of this test center and believe all of these devices worth the investments, because it brings the best to our customers.

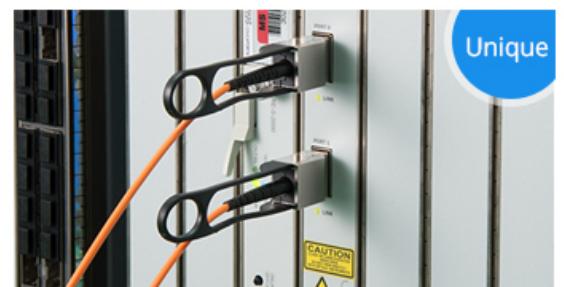
The original switches could be found nowhere but at Fiberstore's test center, eg: Juniper MX960 & EX 4300 series, Cisco Nexus 9396PX & Cisco ASR 9000 Series, HP 5900 Series & HP 5406R ZL2 V3(J9996A), Arista 7050S-64, Brocade ICX7750-26Q & ICX6610-48, Avaya VSP 7000 MDA 2, etc.



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)

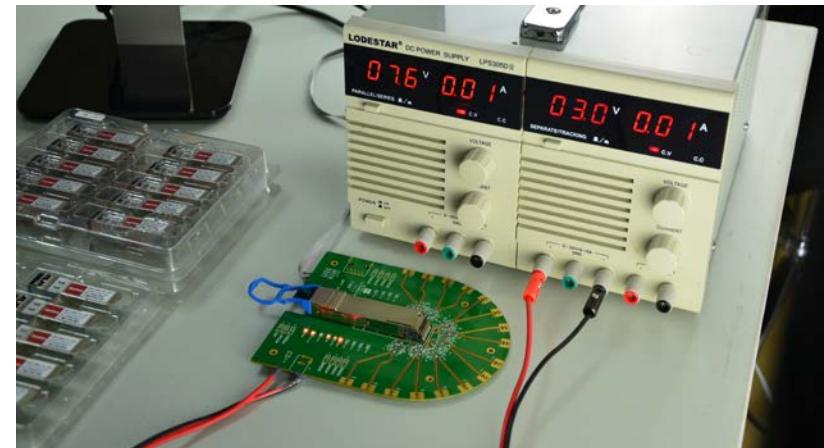


AVAYA 7024XLS(7002QQ-MDA)

## Datasheet

### Test Assured Program

Fiberstore truly understands the value of compatibility and interoperability to each optics. Every module Fiberstore 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 tracing the order, shipment and every part.



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.

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.



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



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## 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

## Note:

Every transceiver is individually tested on corresponding equipment, walks through the testing challenges and 100% compatible with Cisco, Arista, Juniper, Dell, Brocade and other brands.



## Datasheet

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