

# 10GBASE-ER SFP+ 1550nm 40km DOM Transceiver

SFP-10GER-55



## Application

- 10GBASE-ER/EW
- OTN G.709 OTU1e/2/2e FEC bit rates
- 4x, 8x and 10x Fibre Channel
- CPRI option 2 through 8

## Features

- Hot-pluggable SFP+ footprint
- Cooled 1550nm EML laser
- Duplex LC connector
- 3.1G through 11.3G bit rates
- Limiting electrical interface receiver
- Built-in digital diagnostic functions
- 40km link length
- 0° C to 70° C temperature range
- RoHS-6 compliant (lead-free)

## Description

10Gb/s Pluggable SFP+ transceivers are Enhanced Small Form Factor Pluggable SFP+ transceivers designed for use in 10-Gigabit multi-rate links up to 40km of G.652 single mode fiber. They are compliant with SFF-8431 1 , SFF-8432 2 and 10GBASE- ER/EW; support 4x, 8x and 10x Fibre Channel, as well as CPRI option 2 through 8, over 40km links.

Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472 . The transceivers are RoHS compliant per Directive 2011/65/EU.

## Product Specifications

### I. General Specifications

Data Rate Specifications	Symbol	Min	Typ.	Max	Units	Ref.
<b>Bit Rate</b>	BR	3.144		11.3168	Gb/s	1
<b>Max. Supported Link Length</b>	L MAX			40	km	2

#### Notes:

1. Tested with a 231 – 1 PRBS pattern at the BER defined in Table IV.
2. Over G.652 single mode fiber.

## II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	Ts	-40		85	° C	
Case Operating Temperature	Top	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	Typ.	Max	Unit	Ref.
Supply Voltage	Vcc	3.14	3.30	3.46	V	
Power Dissipation	Pdiss			1.5	W	1
<b>Transmitter (per Lane)</b>						
Input differential impedance	VinT	-0.3		4.0	V	
Differential data input swing	Vin,pp	120		1200	mVpp	3
Transmit Disable Voltage			50		mV	
Transmit Enable Voltage		15			mV	

### Receiver (per Lane)

<b>Differential data output swing</b>	Vout,pp	300		850	mV	2
<b>Output rise time and fall time</b>	Tr, Tf	28			ps	3
<b>LOS asserted</b>	VLOS A	Vcc-0.8		Vcc	V	4
<b>LOS de-asserted</b>	VLOS D	Vee		Vee+0.8	V	4
<b>Power Supply Noise Tolerance</b>	VccT/VccR		Per SFF-8431 Rev 3.0		mVpp	5

#### Notes:

1. Measured at 70° C, 3.3V and beginning of life.
2. Internally AC coupled.
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. 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. See Section 2.8.3 of SFF-8431 Rev 4.1.

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

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.	
<b>Transmitter (per Lane)</b>							
<b>Average Launch Power</b>	<b>Average</b>	PAVE	1	2	dBm		
	<b>OMA</b>	POMA-TDP	-2.1		dBm	1	
<b>Optical Wavelength</b>	$\lambda$	1530		1565	nm		
<b>Side-Mode Suppression Ratio</b>	SMSR	30			dB		
<b>Optical Extinction Ratio</b>	ER	8.2			dB		
<b>Average Launch power when Tx is OFF</b>	POFF			-30	dBm		
<b>Relative Intensity Noise</b>	RIN			-128	dB/Hz		
<b>Transmitter and Dispersion Penalty</b>	TDP			3	dB		
<b>Receiver (per Lane)</b>							
<b>Optical Center Wavelength</b>	$\lambda_C$	1260		1600	nm		
<b>Sensitivity</b>	<b>3.1G - 10.7G</b>	<b>Average</b>	RSAVE1		-16	dBm	1,2
		<b>OMA</b>	RSOMA		-14.1	dBm	2,3
	<b>11.3G</b>	<b>Average</b>	RSAVE2		-15	dBm	1,2
<b>Stressed Sensitivity</b>	<b>10.3G</b>	<b>OMA</b>	RSOMA		-11.3	dBm	2,3
<b>Overload</b>		ROVL	-1		dBm	2,3	
<b>Receiver Reflectance</b>		Rrx		-27	dB		

<b>Receiver Reflectance</b>	PP			-14	dB	
<b>LOS De-Assert</b>	LOS <sub>D</sub>			-22	dBm	
<b>LOS Assert</b>	LOS <sub>A</sub>	-42			dBm	
<b>LOS Hysteresis</b>	LOSH	0.5			dB	

**Notes:**

1. Measured with worst ER=8.2dB
2. PRBS 2 31 – 1 and BER<1E -12
3. Measured with worst ER=3.0 dB

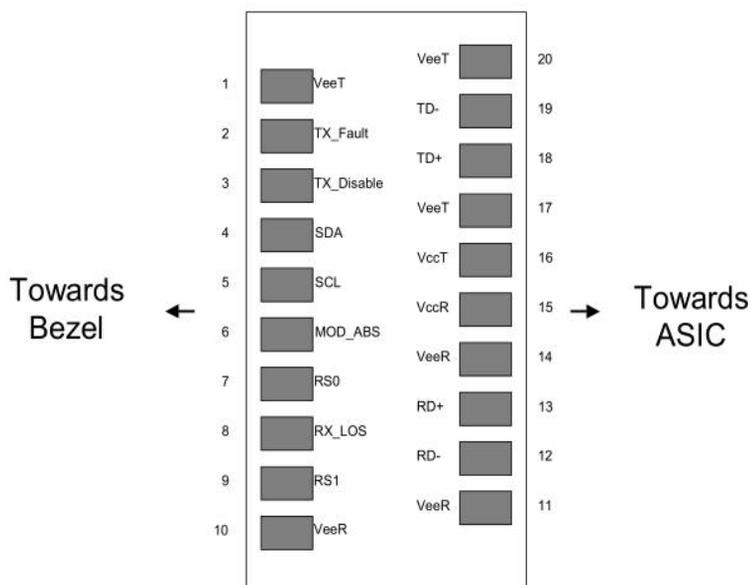
**V. Digital Diagnostic Specifications**

Parameter	Symbol	Units	Min	Max	Accuracy	Ref.
<b>Accuracy</b>						
<b>Transceiver temperature</b>	$\Delta DD_{Temp}$	°C	-5	75	±5°C	1
<b>Transceiver supply voltage</b>	$\Delta DD_{Voltage}$	V	2.8	4.0	±3%	
<b>Transmitter bias current</b>	$\Delta DD_{Bias}$	mA	0	127	±10%	2
<b>Transmitter output power</b>	$\Delta DD_{Tx-Power}$	dBm	-2	+3	±2dB	
<b>Receiver average optical input power</b>	$\Delta DD_{Rx-Power}$	dBm	-20	+1	±2dB	

**Notes:**

1. Internally measured
2. The accuracy of the Tx bias current is 10% of the actual current from the laser driver to the laser

## VI. Pin Description



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

Pin	Symbol	Name/Description	Notes
1	VEET	Transmitter Ground	1
2	TFAULT	Transmitter Fault	2
3	TDIS	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
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS1	Rate Select 1.	4

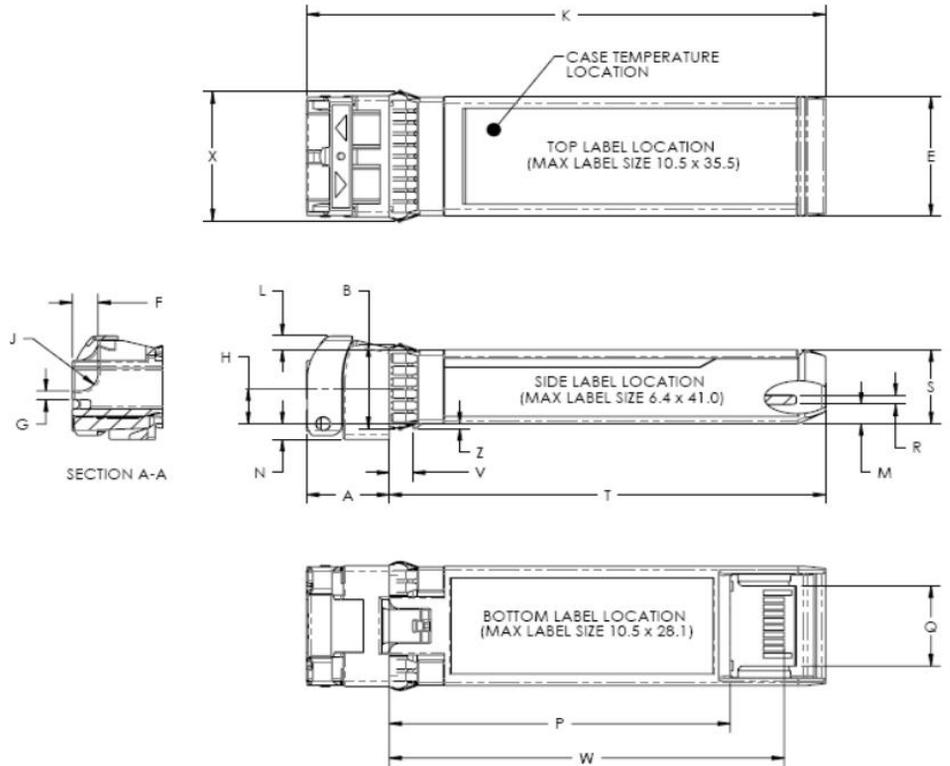
10	VEER	Receiver Ground	1
11	VEER	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	VEER	Receiver Ground	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	
17	VEET	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground	1

**Note:**

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 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 TDIS >2.0V or open, enabled on TDIS <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. .

## VII. Mechanical Specifications

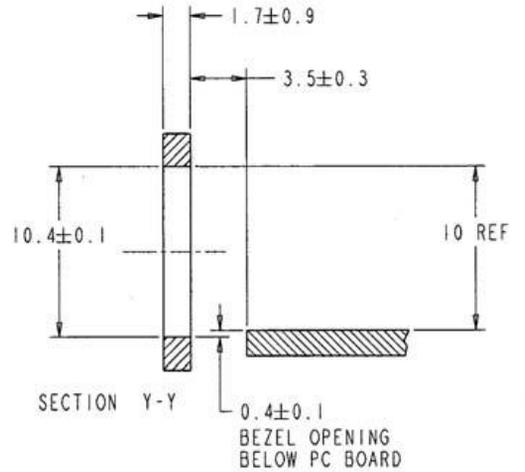
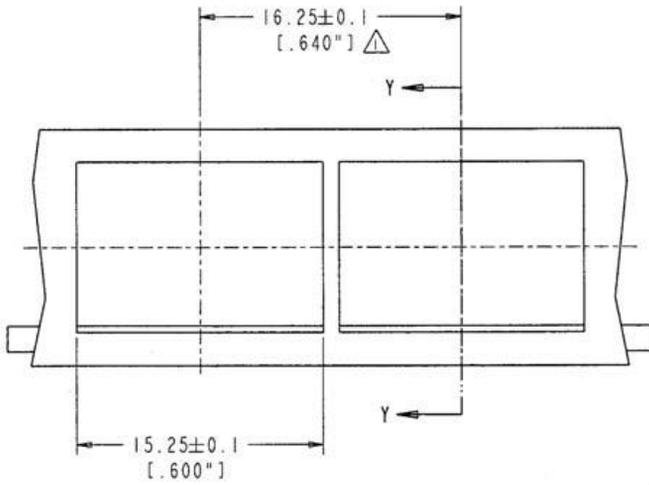
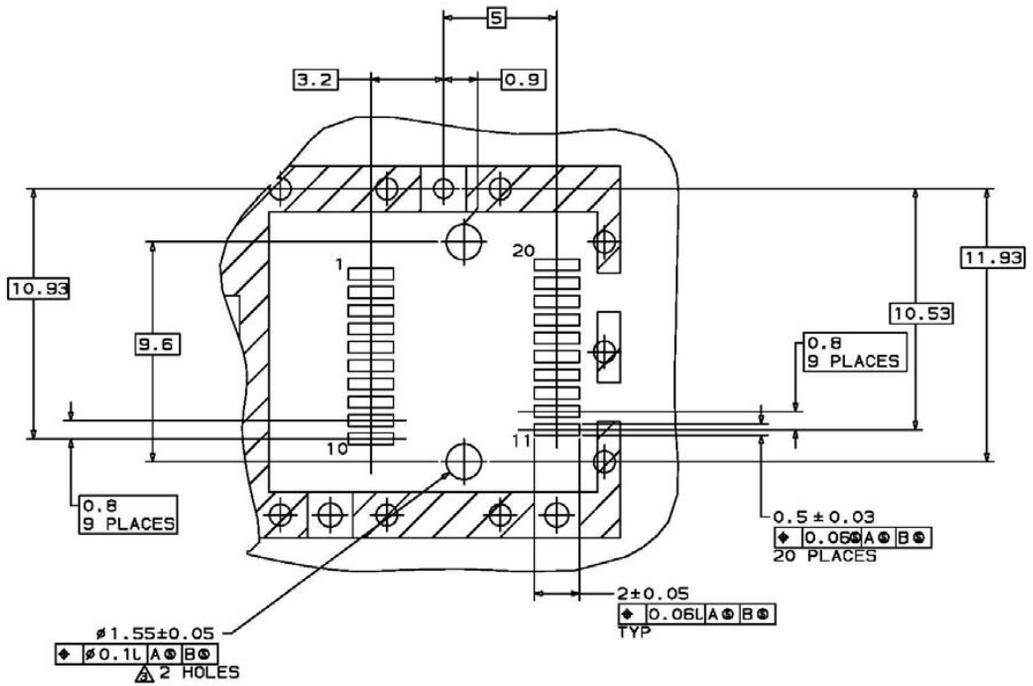
ITEM	DIM (mm)	TOL (mm)
A	9.00	±0.3
B	9.60	±0.5
C	11.90	±0.5
D	13.85	±0.15
E	13.65	±0.15
F	2.80	±0.2
G	1.00	±0.2
H	4.00	REF
J	2.00	±0.2
K	56.50	REF
L	1.60	±0.5
M	2.25	±0.1
N	1.80	±0.1
P	37.10	±0.3
Q	9.15	±0.15
R	1.00	±0.1
S	8.55	±0.15
T	47.50	±0.2
V	2.55	±0.1
W	43.00	±0.2
X	14.70	±0.5
Z	0.55	±0.15



**Note:**

the option of the label on the top side of the transceiver is not recommended.





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

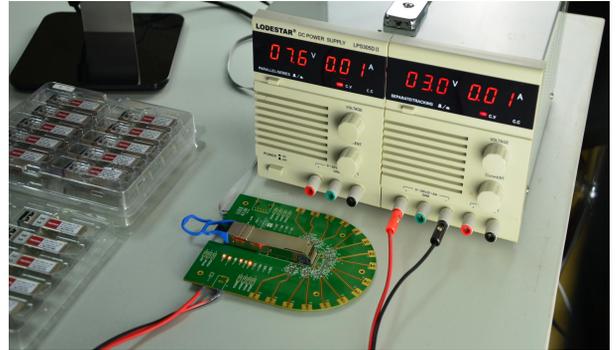
FS.COM truly understands the value of compatibility and interoperability to each optics. Every module FS.COM provides must run through programming and an extensive series of platform diagnostic tests to prove its performance and compatibility. In our test center, we care of every detail from staff to 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.



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.

## Order Information

Part Number	Description
SFP-10GSR-85	10GBASE-SR SFP+ 850nm 300m DOM Transceiver
SFP-10GLRM-31	10G SFP+ 1310nm 2km 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	10G 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:

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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