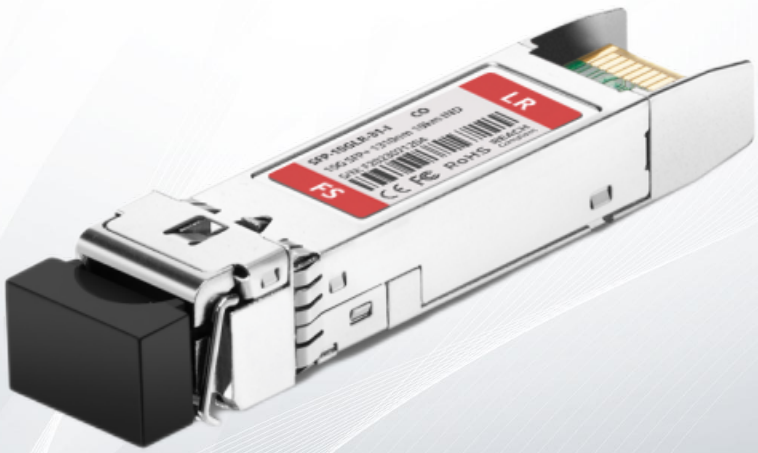
10GBASE-LR SFP+ 1310nm 10km Industrial DOM Transceiver

SFP-10GLR-31-I



Application

- 10GBASE-LR/LW 10G Ethernet
- 8G/10GFC
- CPRI rates 2.4576 Gb/s, 4.9152Gb/s, 6.144Gb/s, 9.8304 Gb/s

Features

- Hot-pluggable SFP+ footprint
- Supports 9.95 to 10.52Gb/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 10km
- Uncooled 1310nm DFB laser
- Receiver limiting electrical interface
- Duplex LC connector
- Built-in digital diagnostic functions

Description

The 10G LR 10Gigabit 1310nm DFB Transceiver is designed to transmit and receive serial optical data links up from 2.1 Gb/s to 10.52 Gb/s data rate over 10km singlemode fiber. The Transceiver is compliant with SFF-8432, 10GFC, FC-PI-4, IEEE802.3ae and applicable portions of SFF-8431. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

Product Specifications

I. General Specifications

Data Rate Specifications	Symbol	Min	Typ.	Max	Units	Ref.
Bit Rate	BR	2.1		10.52	Gb/s	1
Bit Error Ratio	BER			10^{-12}		2
Max. Supported Link Length	L MAX			40	km	1

Notes:

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

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	-40		85	°C	
Relative Humidity	RH	0		85	%	1
Receiver Optical Damage Threshold	RxDamage	5			dBm	

Note:

Non-condensing.

III. Electrical Characteristics (TOP = -40 to 85 °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	
Supply Current	I_{CC}		200	285	mA	
Transmitter						
Input differential impedance	R_{in}	80	100	120	Ω	1
Differential data input swing	Vin,pp	180		700	mVpp	
Transmit Disable Voltage	V_D	2		V_{CCHOST}	V	
Transmit Enable Voltage	V_{EN}	V_{EE}		V_{EE}+0.8	V	
Transmit Fault Assert Voltage	V_{FA}	22		V_{CCHOST}	V	
Transmit Fault De-Assert Voltage	V_{FDA}	V_{EE}		V_{EE}+0.4	V	

Receiver

Differential data output swing	V_{OD}	450	600	850	mVp-p	
Output rise time and fall time	Tr, Tf	25			ps	
LOS Fault	V_{LOSFT}	2		V_{CCHOST}	V	
LOS Normal	V_{LOSNR}	V_{EE}		V_{EE}+0.8	V	

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100 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 – 10k 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.

IV. Optical Characteristics (TOP = -40 to 85 ℃, VCC = 3.14 to 3.46 V))

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Transmitter						
Optical Modulation Amplitude (OMA)	P_{OMA}	-5.2			dBm	
Average Launch Power	P_{AVE}	-8.2		+0.5	dBm	1
Optical Wavelength	λ	1260		1360	nm	
Side-Mode Suppression Ratio	SMSR	30			dB	
Optical Extinction Ratio	ER	3.5			dB	
Transmitter and Dispersion Penalty	TDP			3.2	dB	
Average Launch power when Tx is OFF	P_{OFF}			-35	dBm	
Relative Intensity Noise	RIN			-128	dB/Hz	
Receiver						
Receiver Sensitivity (OMA) @ 10.3Gb/S	R_{SENS1}			-12.6	dBm	2
Receiver Sensitivity (OMA) @ 10.3Gb/s	R_{SENS2}			-10.3	dBm	3
Average Receive Power	P_{AVE}	-14.2		+0.5	dBm	
Optical Center Wavelength	λ_C	1260		1610	nm	
Receiver Reflectance	Rrx			-12	dB	

LOS De-AssertLOS De-Assert	LOS_D			-17	dBm	
LOS Assert	LOS_A	-30			dBm	

Notes:

1. Sensitivity for 10G PRBS 231-1 and BER better than or equal to 10E-12
2. The stressed sensitivity value in the table are for system level BER measurements which include the effects of CDR circuit.

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	Typ.	Max	Units	Ref.
			Accuracy			
Internally measured transceiver temperature	$\Delta DD_{Temperature}$			3	ºC	
Internally measured transceiver supply voltage	$\Delta DD_{Voltage}$			3	%	
Measured TX bias current	ΔDD_{Bias}			10	%	1
Measured TX output power	$\Delta DD_{Tx\text{-}Power}$			2	dB	
Measured RX received average optical power	$\Delta DD_{Rx\text{-}Powe}$			2	dB	

Dynamic Range for Rated Accuracy

Internally measured transceiver temperature	$DD_{Temperature}$	-40		85	ºC	
Internally measured transceiver temperature	$DD_{Voltage}$	3.1		3.5	V	
Measured TX bias current	DD_{Bias}	10		90	mA	
Measured TX output power	$DD_{Tx-Power}$	-8.2		+0.5	dBm	
Measured RX received average optical power	$DD_{Rx-Powe}$	-14.2		+0.5	dBm	

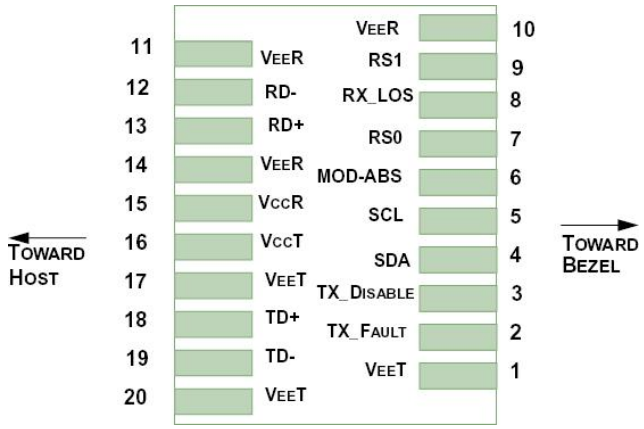
Max Reporting Range

Internally measured transceiver temperature	$DD_{Temperature}$	-40		125	ºC	
Internally measured transceiver supply voltage	$DD_{Voltage}$	2.8		4.0	V	
Measured TX bias current	DD_{Bias}	0		20	mA	
Measured TX output power	$DD_{Tx-Power}$	-10		+2	dBm	
Measured RX received average optical power	$DD_{Rx-Power}$	-22		+2	dBm	

Notes:

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

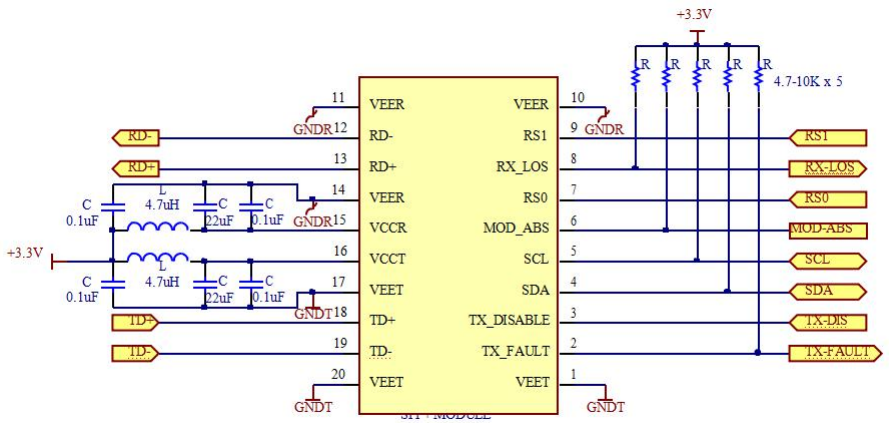
VI. Pin Description



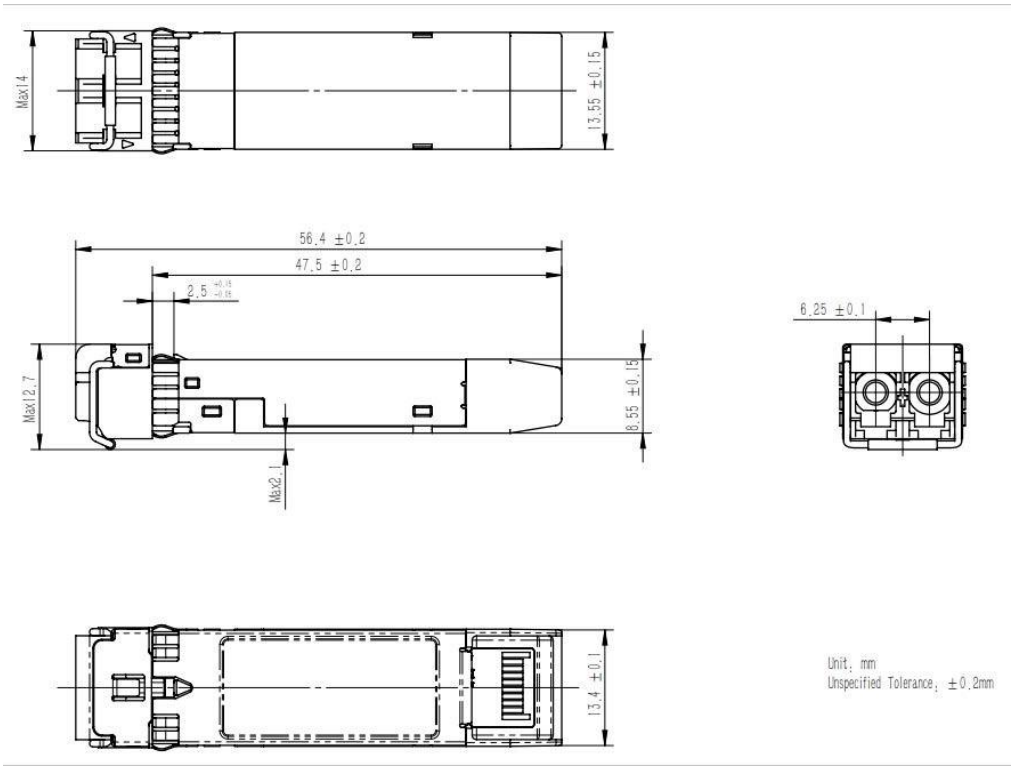
Pin	Symbol	Name/Description	Ref.
1	V_{EET}	Transmitter Ground	1
2	T_{FAULT}	Transmitter Fault	2
3	T_{DIS}	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	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	V_{EER}	Receiver Ground	1
11	V_{EER}	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	V_{EER}	Receiver Ground	1

15	V_{CCR}	Receiver Power Supply	
16	V_{CCT}	Transmitter Power Supply	
17	V_{EET}	Transmitter Ground	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V_{EET}	Transmitter Ground	1

VII.Typical Application Circuit



VIII. Mechanical Specifications



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)



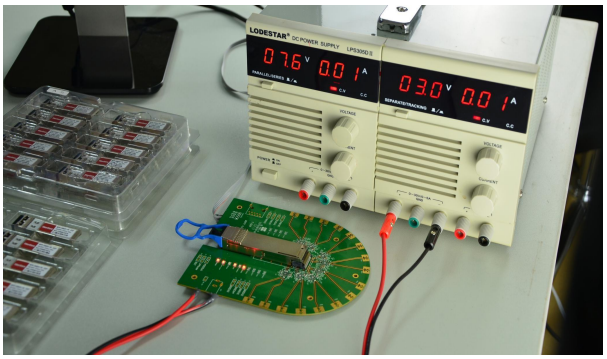
AVAYA 7024XLS(7002QQ-MDA)

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 tracing 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.

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
SFP-10G-T	10GBASE-T SFP+ Copper RJ-45 30m Transceiver
SFP-10GSR-85-I	10GBASE-SR SFP+ 850nm 300m Industrial DOM Transceiver
SFP-10GLR-31-I	10GBASE-LR SFP+ 1310nm 10km Industrial DOM Transceiver
SFP-10GER-31-I	10GBASE-ER SFP+ 1550nm 40km Industrial DOM Transceiver
SFP-10G-T-I	10GBASE-T SFP+ Copper RJ-45 30m Industrial 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.