

10GBASE-LRL SFP+ 1310nm 2km Industrial DOM Transceiver

SFP-10GLRL-31-I



Application

- OBSAI ,CPRI
- 2/4/8G FC Data Storage Channel

Standards

- IEEE 802.3ae
- SFF-8431 Rev 3.0
- SFF-8472 Rev 10.2
- FC-P1-4 Rev 7.0

Features

- Supports 10.52Gbps Bit Rate
- Hot-pluggable SFP+ Footprint
- 1310nm FP Laser and PIN Photo-detector
- Low Power Consumption< 1.2W
- -40°C to 85°C Operating Temperature Range
- Single +3.3V $\pm$ 5% Power Supply

Description

The 10Gigabit 1310nm Transceiver is designed to transmit and receive serial optical data links up from 2.1Gb/s to 10.52 Gb/s data rate over 2km single mode fiber. The transceiver is compliant with SFF-8432, FC-P1-4, 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. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	Ts	-40	85	°C
Relative Humidity	RH	0	95	%
Supply Voltage	Vcc	-0.3	4.0	V

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature	Tc	-40		85	°C
Power Supply Voltage	Vcc	3.14	3.3	3.46	V
Bit Rate	BR	2.1		10.52	Gb/s
Bit Error Ratio	BER			10 ⁻¹²	
Max Supported Link Length	L			2	km

III. Optical Characteristics

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Transmitter						
Nominal Wavelength	λ	nm	1260	1310	1360	
Side Mode Suppression Ratio(FP)	SMSR	dB	30			
Spectral Width RMS(FP)	$\Delta\lambda$	nm			3	
Spectral Width(FP)	$\Delta\lambda$	nm			1	
Optical Modulation Amplitude	P _{OMA}	dBm	-5.2			
Optical Output Power	P _{av}	dBm	-8.2		0.5	
Extinction Ratio	ER	dB	3.5			
Transmitterand Dispersion Penalty	TDP	dB			3.2	
Average Launch Power of OFF Transmitter	P _{OFF}	dBm			-35	
Relative Intensity Noise	RIN	dB/Hz			-128	
Optical Return Loss Tolerance	ORLT	dB			12	
Receiver						
Center Wavelength	λ	nm	1260		1610	
Receiver Overload		dBm	0.5			1
Receiver Sensitivity	R _{SENSE1}	dBm			-14.4	1
Receiver Sensitivity (OMA)	R _{SENSE2}	dBm			-12.6	

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Receiver Reflectance	R_{REFL}	dB			-12	
Assert LOS	LOS_A	dBm	-30			
De-Assert LOS	LOS_D	dBm			-17	
LOS Hysteresis		dB	0.5			

Note:
1. Sensitivity for 10G PRBS 27-1 and BER better than or equal to 10E-12.

IV. Electrical Characteristics

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Supply Voltage	V_{CC}	V	3.14	3.3	3.46	
Supply Current	I_{CC}	mA			285	
Transmitter						
Input Differential Impedance	R_{IN}	Ω	80	100	120	1
Differential Data Input Swing	V_{IN}	mVp-p	180		700	
Transmit Disable Voltage	V_{DIS}	V	2		V_{CCHOST}	
Transmit Enable Voltage	V_{EN}	V	V_{EE}		$V_{EE}+0.8$	
Transmit Fault Assert Voltage	V_{FA}	V	2.2		V_{CCHOST}	
Transmit Fault De-Assert Voltage	V_{FDA}	V	V_{EE}		$V_{EE}+0.4$	

Parameter	Symbol	Unit	Min.	Typ.	Max.	Note
Receiver						
Differential Data Output Swing	V_{OD}	mVp-p	450	600	800	
Output Rise Time	t_{RISE}	ps	25			
Output Fall Time	t_{FALL}	ps	25			
LOS Fault	V_{LOSFT}	V	2		V_{CCHOST}	
LOS Normal	V_{LOSNR}	V	V_{EE}		$V_{EE}+0.8$	

Note:
1. Differential between TD+ / TD-

V. Pin Function Definitions

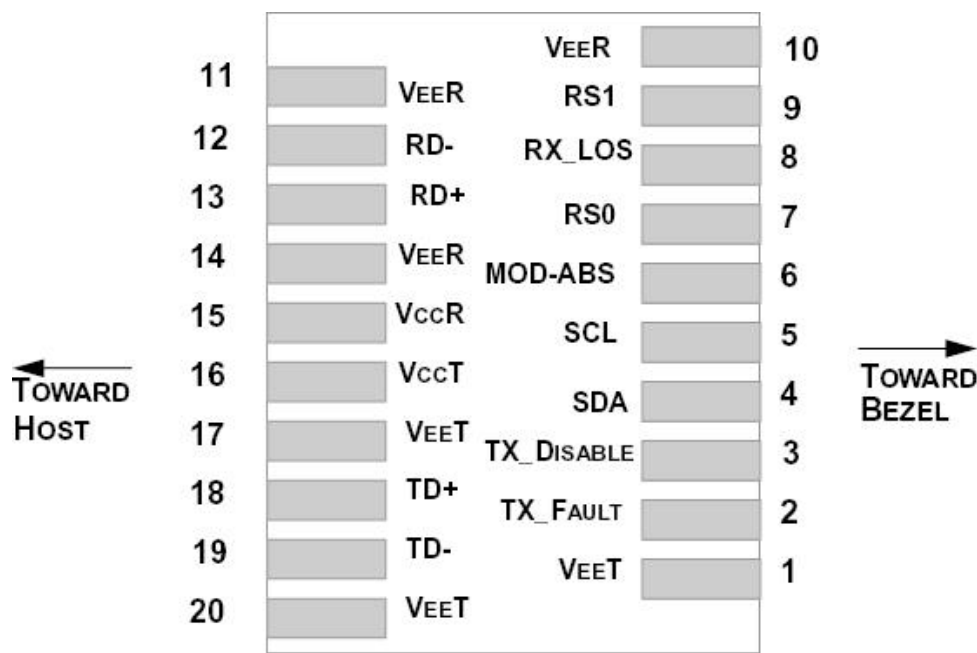
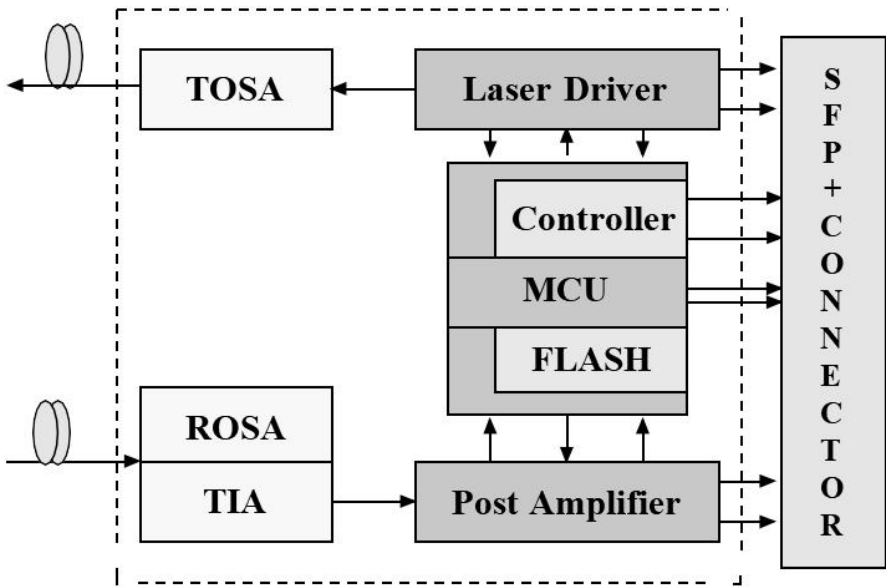


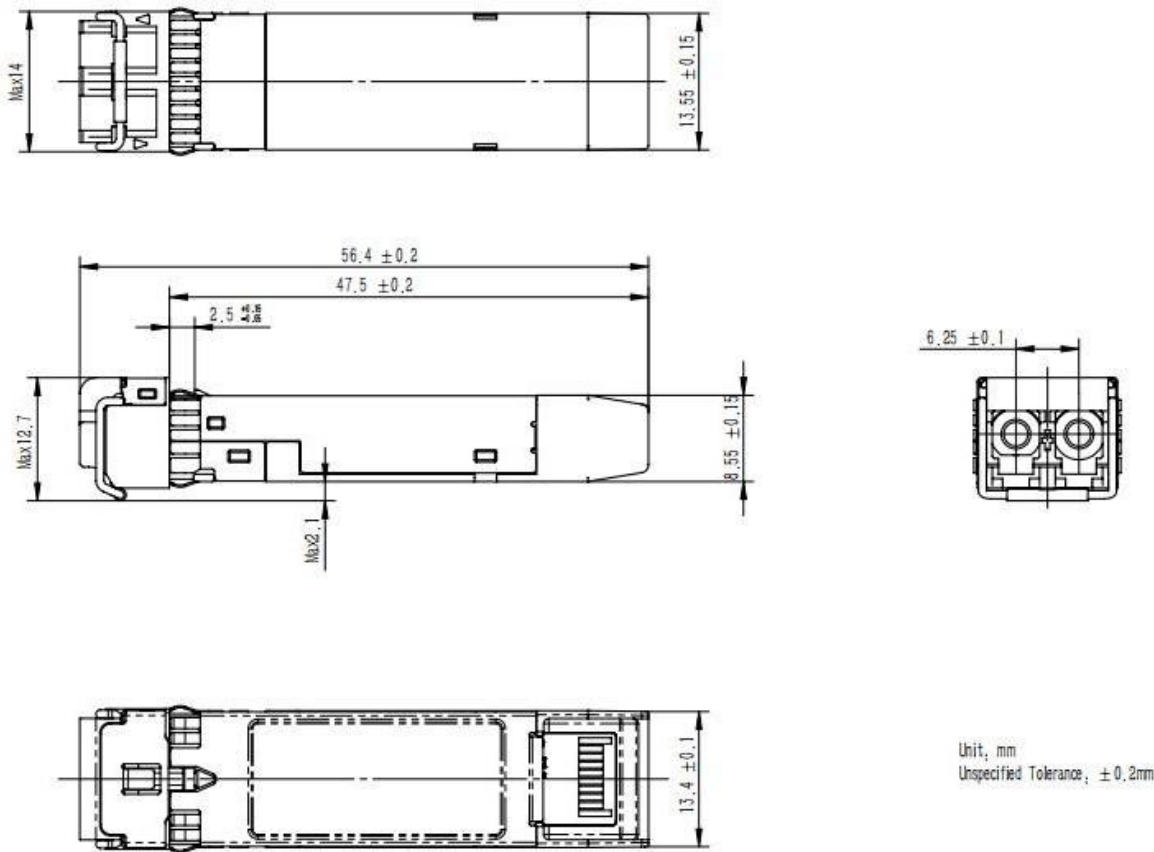
Figure1. Pin Definitions of the Module High Speed Inputs/Outputs

Pin No.	Symbol	Name	Definition
1,17,20	V _{ee} T	Transmitter Signal Ground	These pins should be connected to signal ground on the host board.
2	TX Fault	Transmitter Fault Out (OC)	Logic "1" Output = Transmitter Fault Logic "0" Output = Normal Operation This pin is open collector compatible, and should be pulled up to Host Vcc with a 10kΩ resistor.
3	TX Disable	Transmitter Disable In (LVTTL)	Logic "1" Input (or no connection) = Laser off Logic "0" Input = Laser on This pin is internally pulled up to VccT with a 10kΩ resistor.
4	SDA	Module Definition Identifiers	Serial ID with SFF8472 Diagnostics Module Definition pins should be pulled up to Host Vcc with 10kΩ resistors.
5	SCL		
6	MOD-ABS		
7	RS0	Receiver Rate Select (LVTTL) Transmitter Rate Select (LVTTL)	These pins have an internal 33kΩ pull-down to ground. A signal on either of these pins will not affect module performance.
9	RS1		
8	LOS	Loss of Signal Out (OC)	This pin is open collector compatible, and should be pulled up to Host Vcc with a 10kΩ resistor.
10,11,14	V _{ee} R	Receiver Signal Ground	These pins should be connected to signal ground on the host board.
12	RD-	Receiver Negative DATA Out (CML)	Light on = Logic "0" Output Receiver DATA output is internally AC coupled and series terminated with a 50Ω resistor.
13	RD+	Receiver Positive DATA Out (CML)	Light on = Logic "1" Output Receiver DATA output is internally AC coupled and series terminated with a 50Ω resistor.
15	V _{cc} R	Receiver Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure3. Recommended power supply filter
16	V _{cc} T	Transmitter Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure3. Recommended power supply filter
18	TD+	Transmitter Positive DATA In (CML)	Logic "1" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100Ω resistor.
19	TD-	Transmitter Negative DATA In (CML)	Logic "0" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100Ω resistor.

VI. Principle Diagram



VII. Diagram Mechanical Drawing



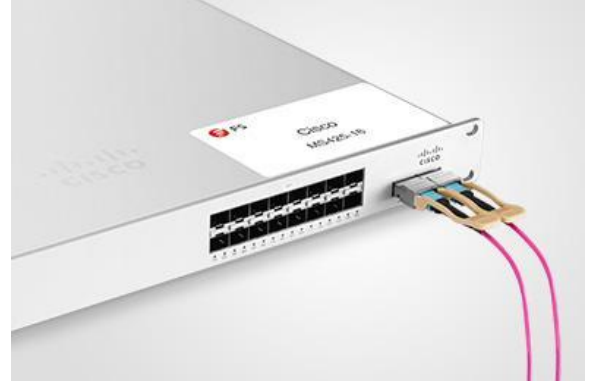
Test Center

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



Force@tm S60-44T

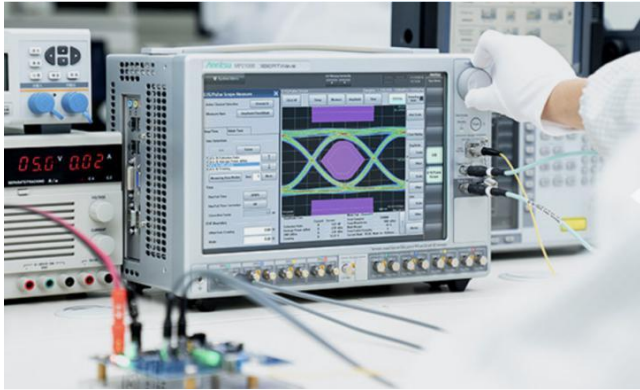


HUAWEI S6720-30L-HI-24S

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 Signal Quality Testing

Equipped with the all-in-one tester integrated 4ch BERT & sampling oscilloscope, and variable optical attenuator to ensure 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 changes 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

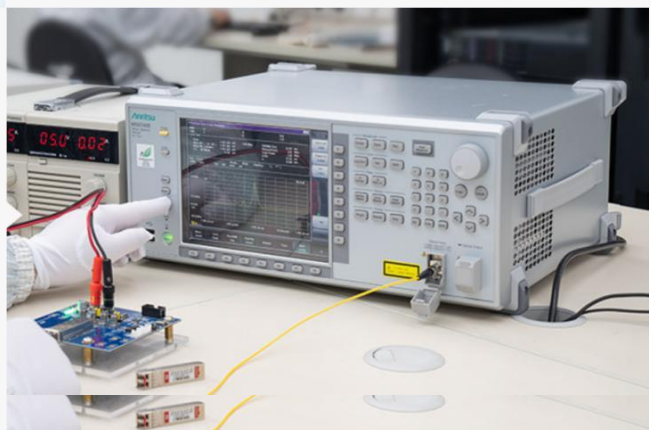
Test the actual transfer data rate and the transmission ability under different protocols with Network Master Pro.

- Ethernet
- Fibre 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-10G-T	10GBASE-T SFP+ Copper RJ-45 30m Transceiver
SFP-10GLRM-31	10GBASE-LRM SFP+ 1310nm 220m DOM Transceiver
SFP-10GSR-85	10GBASE-SR SFP+ 850nm 300m 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-I	10GBASE-T SFP+ Copper RJ-45 30m Industrial Transceiver
SFP-10GSR-85-I	10GBASE-SR SFP+ 850nm 300m Industrial DOM Transceiver
SFP-10GLRL-31-I	10GBASE-LRL SFP+ 1310nm 2km 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

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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