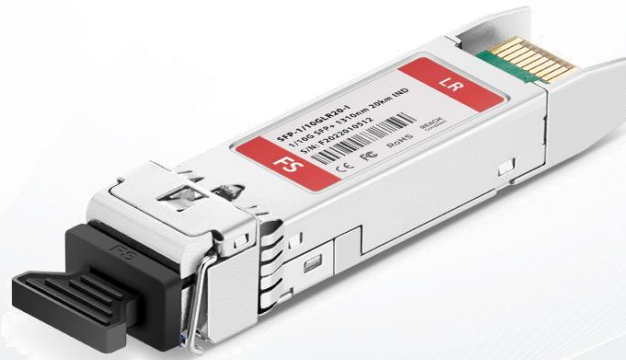


1/10GBASE-LR SFP+ 1310nm 20km Industrial DOM Transceiver

SFP-1/10GLR20-I



Application

- 10GBASE-LR/LW
- 1/10G Ethernet

Standards

- IEEE 802.3ae
- SFP+ MSA
- SFF-8431 Rev 3.0
- SFF-8472 Rev 10.2

Features

- Operating Data Rate 1.25 to 10.3125Gb/s
- Link Lengths at 10G 20km with DFB 1310nm
- LC Duplex Connector
- Low Power Consumption <1.3W
- Single 3.3V±5% Power Supply
- Industrial Temperature Range: -40~85°C
- Digital Diagnostic Monitoring (DOM) Supported
- Hot Pluggable
- Class 1 Laser Safety

Description

FS's SFP+ transceiver supports up to 20km link lengths over OS2 SMF via duplex LC connectors and is suitable for 1/10G Ethernet and Data Center applications. It is compliant with IEEE 802.3ae, SFP+ MSA, SFF-8472 and SFF-8431 standards. The built-in digital diagnostics monitoring (DDM) allows access to real-time operating parameters.

The SFP-1/10GLR20-I is for industrial operating temperature range and can work in harsh industrial environments, such as telecommunication, data processing & management, the application of industrial and factory automation, outdoor applications, rail and intelligent transportation systems (ITSs), marine, oil and gas, mining etc.

Products Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	T_S	-40	85	°C
Supply Voltage	V_{CC}	-0.3	4.0	V
Relative Humidity	RH	0	95	%

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature Range	T_c	-40		85	°C
Power Supply Voltage	V_{CC}	3.14	3.3	3.46	V
Bit Rate	BR	1.25		10.3125	Gb/s
Bit Error Ratio	BER			10^{-12}	
Max. Supported Link Length	L			20	km

III. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
Transmitter					
Nominal Wavelength	λ	1260	1310	1355	nm
Side Mode Suppression Ratio	SMSR	30			dB
Spectral Width	$\Delta\lambda$			1	nm
Optical Output Power	P_{AV}	-2		4	dBm
Extinction Ratio	ER	3.5			dB
Average Launch Power of OFF Transmitter	P_{OFF}			-35	dBm
Relative Intensity Noise	R_{IN}			-128	dB/Hz
Optical Return Loss Tolerance	ORLT	-15			dB
Receiver					
Center Wavelength	λ	1260		1610	nm
Average Receiver Power	P_{AVG}	-14.4		1	dBm
Receiver Sensitivity² (OMA)	R_{SENSE}^1			-15	dBm
Receiver Reflectance	R_{REFL}			-15	dB
Assert LOS	LOS_A	-30			dBm
De-assert LOS	LOS_D			-17	dBm
LOS Hysteresis		0.5			dB

Notes

1. OMA = OMA_{min} – TDP, sum of all penalties incorporated, incl. aging and interoperability margin.

2. Achieved with worst case jitter stress at δt , and maximum reflection at γt , Jitter total @ δt , BER<10⁻¹² = 0.28UI (informative)

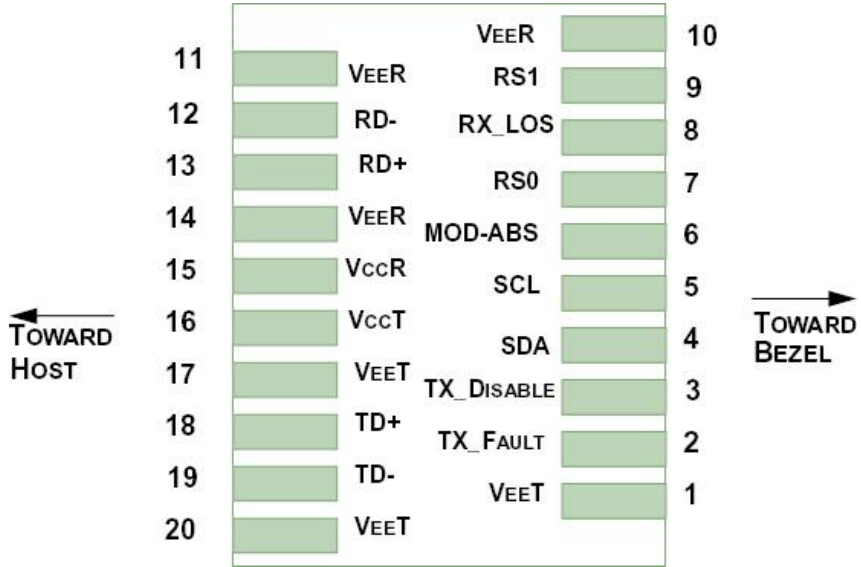
IV. Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V_{CC}	3.14	3.3	3.46	V	
Supply Current	I_{CC}			390	mA	
Transmitter						
Input Differential Impedance	R_{IN}	80	100	120	Ω	1
Differential Data Input Swing	V_{IN}	180		700	mV _{p-p}	
Transmit Disable Voltage	V_{DIS}	2		V_{CCHOST}	V	
Transmit Enable Voltage	V_{EN}	V_{EE}		$V_{EE}+0.8$	V	
Transmit Fault Assert Voltage	V_{FA}	2.2		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	mV _{p-p}	
Output Rise Time	t_{RISE}	25			ps	
Output Fall Time	t_{FALL}	25			ps	
LOS Fault	V_{LOSFT}	2		V_{CCHOST}	V	
LOS Normal	V_{LOSNR}	V_{EE}		$V_{EE}+0.8$	V	

Note

1. Differential between TD+ / TD-.

V. Pin Definition



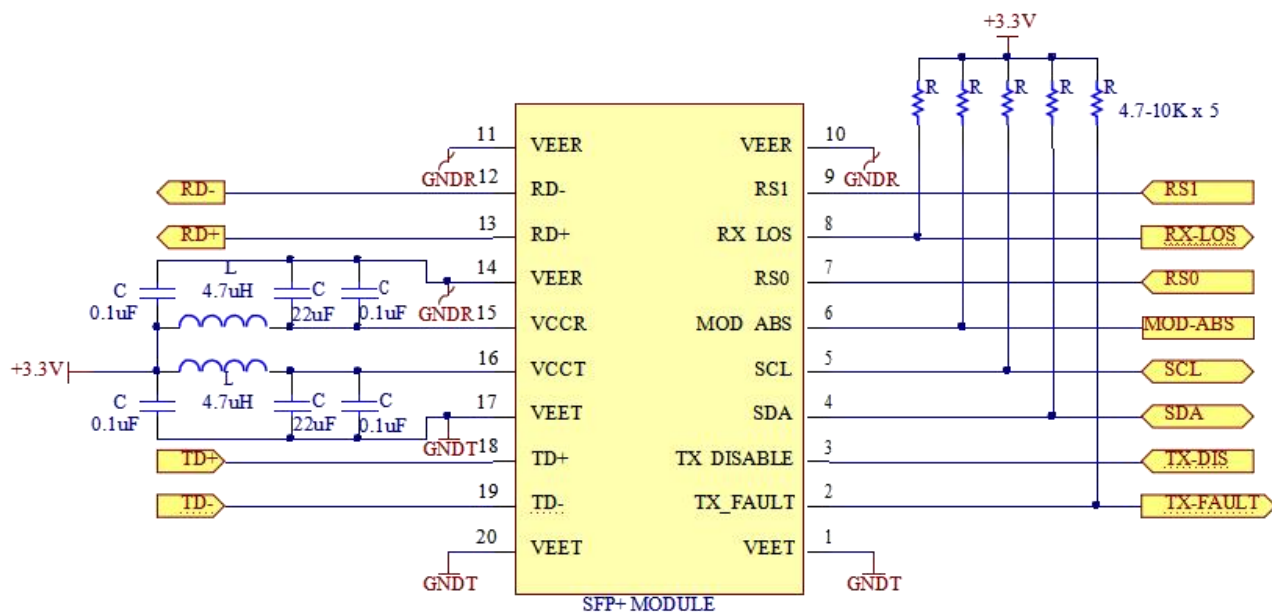
Pin	Symbol	Name/Description	Ref.
1	V _{EE} T	Transmitter Ground (Common with Receiver Ground)	1
2	T _{FAULT}	Transmitter Fault	2
3	T _{DIS}	Transmitter Disable. Laser Output Disabled on High or Open.	3
4	SDA	2-Wire Serial Interface Data Line	4
5	SCL	2-Wire Serial Interface Clock Line	4
6	MOD_ABS	Module 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 _{EE} R	Receiver Ground (Common with Transmitter Ground)	1

Pin	Symbol	Name/Description	Ref.
11	$V_{EE}R$	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	$V_{EE}R$	Receiver Ground (Common with Transmitter Ground)	1
15	$V_{CC}R$	Receiver Power Supply	
16	$V_{CC}T$	Transmitter Power Supply	
17	$V_{EE}T$	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	$V_{EE}T$	Transmitter Ground (Common with Receiver Ground)	1

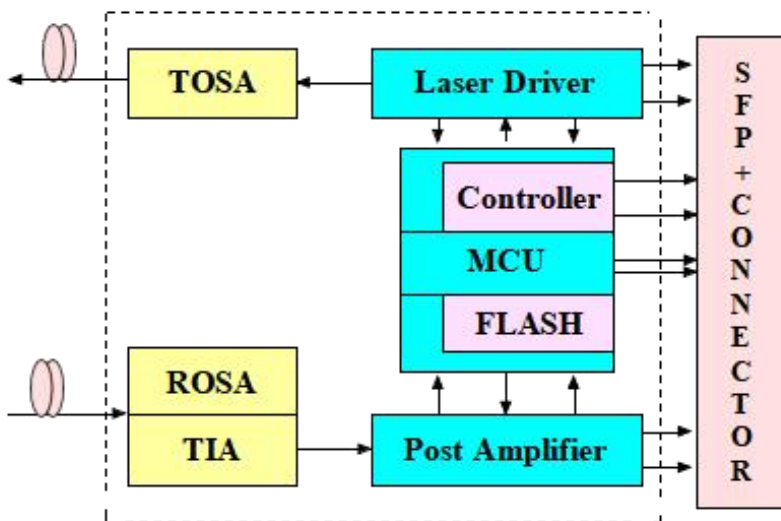
Notes

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 $V_{CC} + 0.3V$. 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. Should be pulled up with 4.7k Ω ~10k Ω 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 Ω ~10k Ω on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

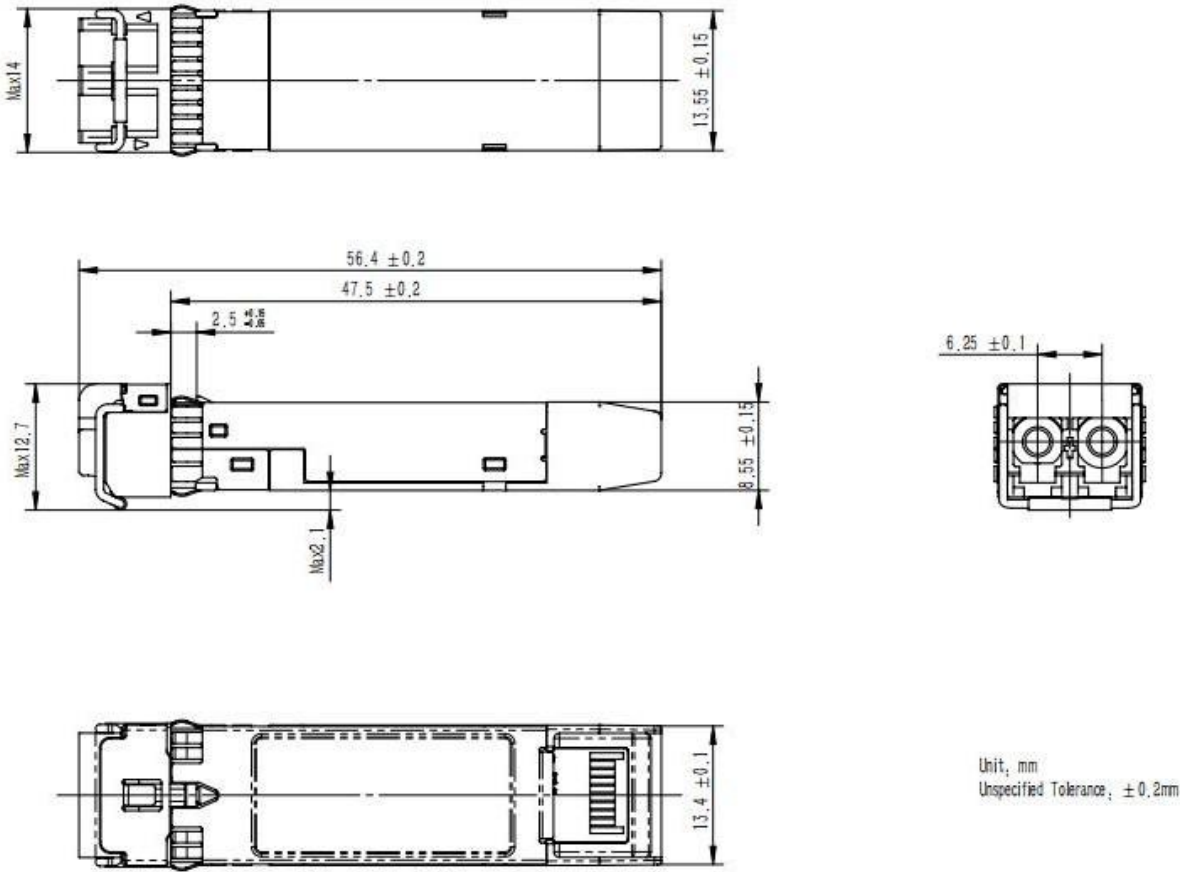
VI. Typical Application Circuit



VII. Principle Diagram



VIII. Diagram Mechanical Drawing



IX. Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015.7	Class 1 (> 1500 Volts)
Electrostatic Discharge (ESD) Immunity	Variation of IEC 61000-4-2	LV 4(Air Discharge: 15KV; Contact Discharge: 8 KV) Performance Criterion: B
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class B FCC Class B	Compliant with Standards
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.

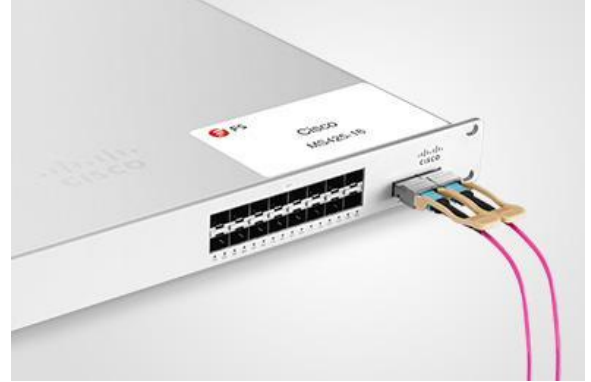
Test Center

I. Compatibility Testing

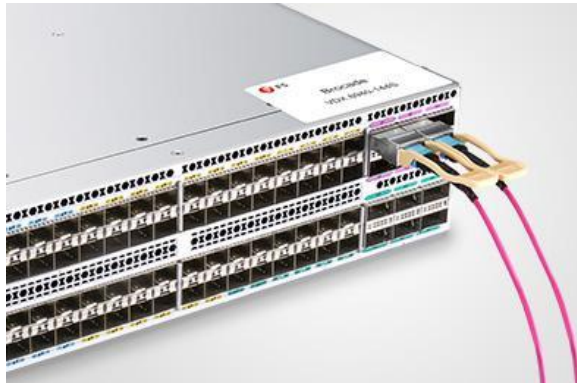
Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force10 S60-44T

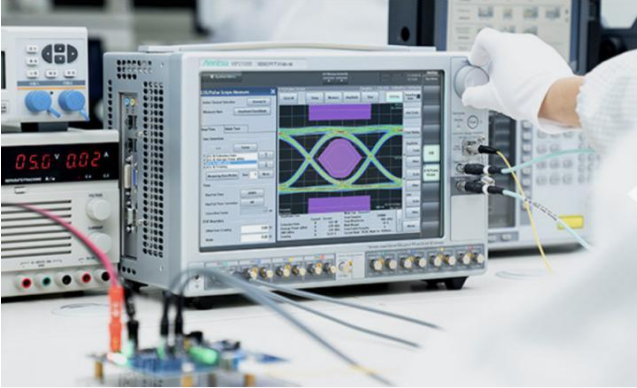


HUAWEI S6720-30L-HI-24S

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.

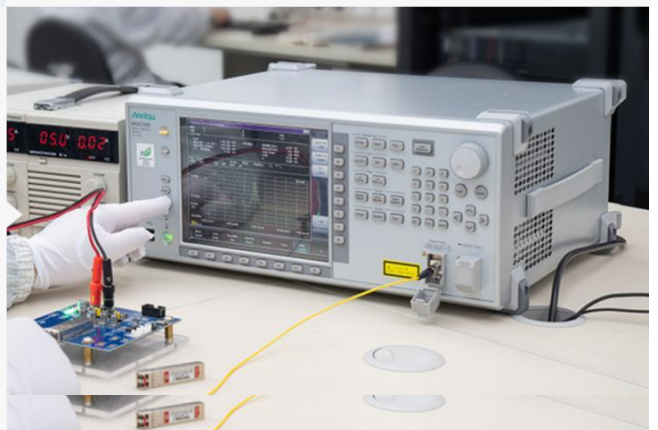
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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-10G-T	10GBASE-T SFP+ Copper RJ-45 80m 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
XFP-10GZR-55	10GBASE-ZR XFP 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-10GLR-31-I	10GBASE-LR SFP+ 1310nm 10km Industrial DOM Transceiver
SFP-1/10GLR20-I	1/10GBASE-LR SFP+ 1310nm 20km Industrial DOM Transceiver
SFP-10GER-31-I	10GBASE-ER SFP+ 1550nm 40km Industrial DOM Transceiver
SFP-10GZR-55-I	10GBASE-ZR SFP+ 1550nm 80km Industrial DOM Transceiver



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