

10GBASE-LRM SFP+ 1310nm 2km DOM Transceiver

SFP-10GLRM-31



Application

- 10G Base-LR/LW
- 10G Fiber Channel
- SONET / SDH

Features

- Hot-pluggable
- Supports 8.5 to 11.3 Gb/s bit rates
- Power dissipation < 1W
- RoHS compliant
- Commercial temperature range 0° C to 70° C
- Single 3.3V power supply
- SMF links up to 2km
- 1310nm FP transmitter, PIN photo-detector
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface

Description

FS' SFP-10GLRM2-31 is a very compact 10Gb/s optical transceiver module for serial optical communication applications at 10Gb/s. The SFP-10GLRM2-31 converts a 10Gb/s serial electrical data stream to 10Gb/s optical output signal and a 10Gb/s optical input signal to 10Gb/s serial electrical data streams. The high speed 10Gb/s electrical interface is fully compliant with SFI specification.

The high performance 1310nm FP transmitter and high sensitivity PIN receiver provide superior performance for Ethernet applications at up to 2km links.

The SFP+ Module compliants with SFF-8431, SFF-8432 and IEEE 802.3ae 10GBASE-LR. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

The fully SFP compliant form factor provides hot pluggability, easy optical port upgrades and low EMI emission.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit
Storage Temperature	T_S	-40		85	° C
Case Operating Temperature	T_A	0		70	° C
Maximum Supply Voltage	V _{CC}	-0.5		4.0	V
Relative Humidity	RH	0		85	%

II. Electrical Characteristics ($T_{OP} = 0$ to 70 ° C, $V_{CC} = 3.13$ to 3.47 Volts)

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Supply Voltage	V _{CC}	3.135		3.465	V	
Supply Current	I _{CC}			300	mA	
Power Consumption	P			1.0	W	
Transmitter						
Input differential impedance	R _{in}		100		Ω	1
Tx Input Single Ended DC Voltage Tolerance (Ref V _{ee} T)	V	-0.3		4	V	
Differential input voltage swing	V _{in,pp}	180		700	mV	2
Transmit Disable Voltage	V _D	2		V _{CC}	V	3
Transmit Enable Voltage	V _{EN}	V _{ee}		V _{ee} + 0.8	V	

Receiver

Single Ended Output Voltage Tolerance	V	-0.3		4.0	V	
Rx Output Diff Voltage	V_O	300		850	mV	
Rx Output Rise and Fall Time	T_r/T_f			7.5	Ps	4
LOS Fault	$V_{LOS\ fault}$	2		V_{CC_HOST}	V	5
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.8	V	5

Notes:

- 1.Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
- 2.Per SFF-8431 Rev 3.0
- 3.Into 100 ohms differential termination.
- 4.20%~80%
- 5.LOS is an open collector output. Should be pulled up with 4.7k – 10k Ω on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

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

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Transmitter (Tx)						
Center Wavelength	λ_t	1290	1310	1330	nm	
Spectral Width	λ_{rms}			4	nm	
Peak Launch Power	P_{avg}	-8.2		0.5	dBm	1
Optical Power OMA	P_{oma}	-5.2			dBm	
Laser Off Power	P_{off}			-30	dBm	
Extinction Ratio	ER	3.5			dB	
Transmitter Dispersion Penalty	TDP			3.2	dB	2
Relative Intensity Noise	R_{in}			-128	dB/Hz	3
Optical Return Loss Tolerance		20			dB	

Receiver

Center Wavelength	λ_r	1260		1355	nm	
Receiver Sensitivity	Sen			-12.6	dBm	4
Stressed Sensitivity (OMA)	Sen _{ST}			-10.3	dBm	4
Los Assert	LOS _A	-30			dBm	
Los Dessert	LOS _D			-13.5	dBm	
Los Hysteresis	LOS _H	0.5			dB	
Overload	Sat	0			dBm	5
Receiver Reflectance	Rrx			-12	dB	

Notes:

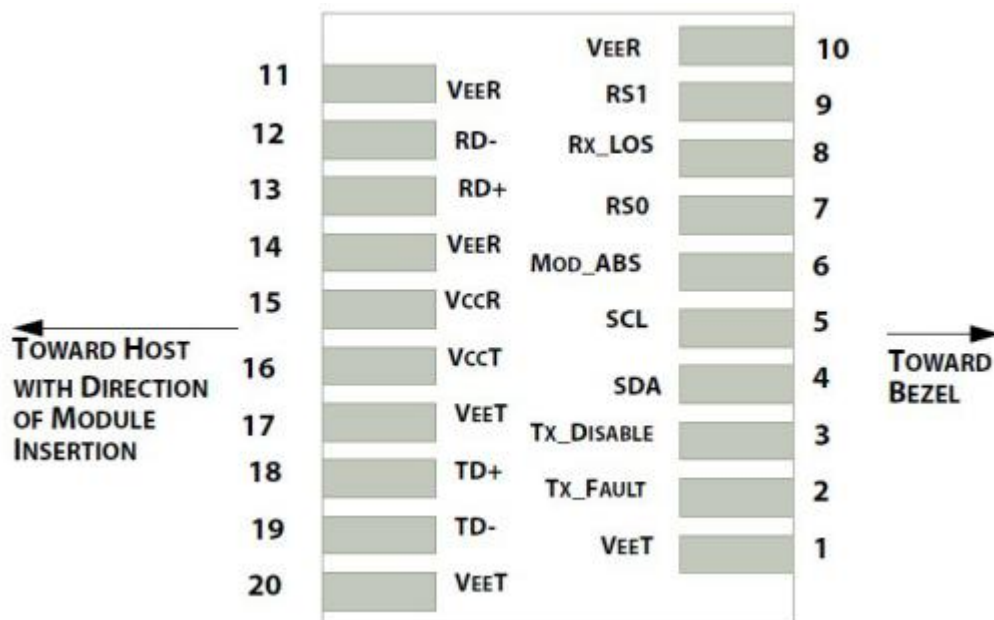
1. Average power figures are informative only, per IEEE802.3aq.
2. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3ae.
3. 12dB reflection.
4. Conditions of stressed receiver tests per IEEE802.3ae. CSRS testing requires the host board to be SFF-8431 compliant.
5. Receiver overload specified in OMA and under the worst comprehensive stressed condition.

IV. Timing Characteristics

Parameter	Symbol	Min	Typ.	Max	Unit
TX_Disable Assert Time	t _{off}			10	us
TX_Disable Negate Time	t _{on}			1	ms
Time to Initialize Include Reset of TX_FAULT	t _{int}			300	ms
TX_FAULT from Fault to Assertion	t _{fault}			100	us
TX_Disable Time to Start Reset	t _{reset}	10			us
Receiver Loss of Signal Assert Time	T _{A,RX_LOS}			100	us
Receiver Loss of Signal Deassert Time	T _{D,RX_LOS}			100	us
Rate-Select Chage Time	t _{ratesel}			10	us
Serial ID Clock Time	t _{serial-clock}			100	kHz

V. Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name.



Pin	Symbol	Name/Description	Ref.
1	V _{EET}	Transmitter Ground	1
2	Tx Fault	Transmitter Fault	2
3	T _{DIS}	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	
5	SCL	2 wire serial interface clock input (SCL)	
6	MOD_ABS	Module Absent, connect to VeeR or VeeT in the module	2
7	RS0	Rate select0,optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s	
8	LOS	Receiver Loss of Signal Indication	4
9	RS1	Rate select0,optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s;when low, input data rate <=4.5Gb/s	
10	VeeR	Module receiver ground	1

11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data out put	
13	RD+	Receiver non-inverted data out put	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data out put	
19	TD-	Transmitter non-inverted data out put	
20	VeeT	Module transmitter ground	1

Notes:

- 1.The module ground pins shall be isolated from the module case.
- 2.This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.
- 3.This pin shall be pulled up with 4.7K-10Kohms to VccT in the module.
- 4.This pin is an open collector/drain output pin and shall be pulled up with 4.7K-10Kohms to Host_Vcc on the host board.

VI. SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP -8472.

The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I2C interface at address A0h and A2h.

The memory is mapped in Table 1.

Detailed ID information(A0h) is listed in Table 2.

And the DDM specification at address A2h.

For more details of the memory map and byte definitions, please refer to the SFF-8472, "Digital Diagnostic Monitoring Interface for Optical Transceivers". The DDM parameters have been internally calibrated.

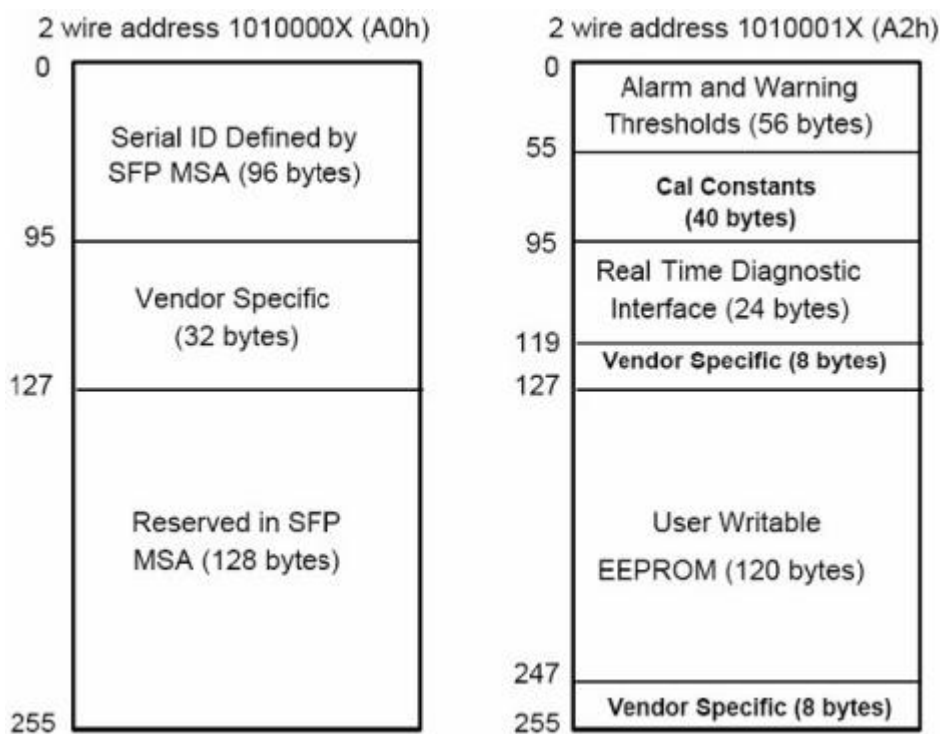


Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	10G Base-IR
11	1	Encoding	NRZ(03h)
12	1	BR,Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)

15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: FS
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: "SFP-10GLRM2-31" (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-62	3	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62

Extended ID Fields

64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	FS's Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)

Vendor Specific ID Fields

96-127	32	Readable	FS specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

Table 2. EEPROM Serial ID Memory Contents (A0h)

VII. Digital Diagnostic Monitor Characteristics

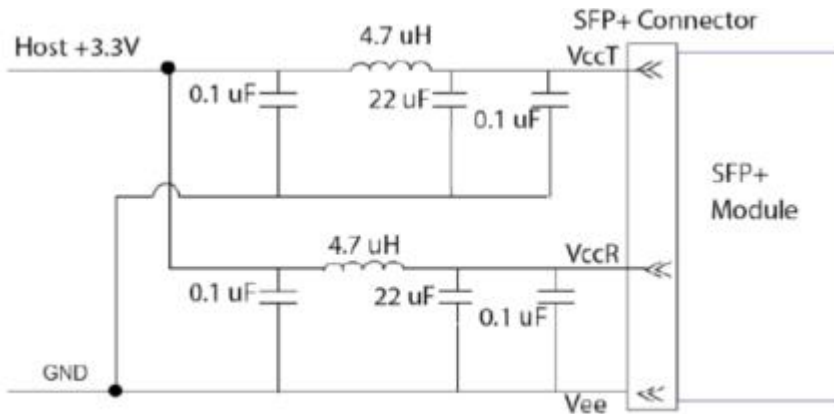
Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	± 3.0	$^{\circ}$ C
98-99	VCC3 Internal Supply Voltage	± 5.0	%
100-101	Laser Bias Current	± 10	%
102-103	Tx Output Power	± 3.0	dBm
104-105	Rx Input Power	± 3.0	dBm

VIII. Regulatory Compliance

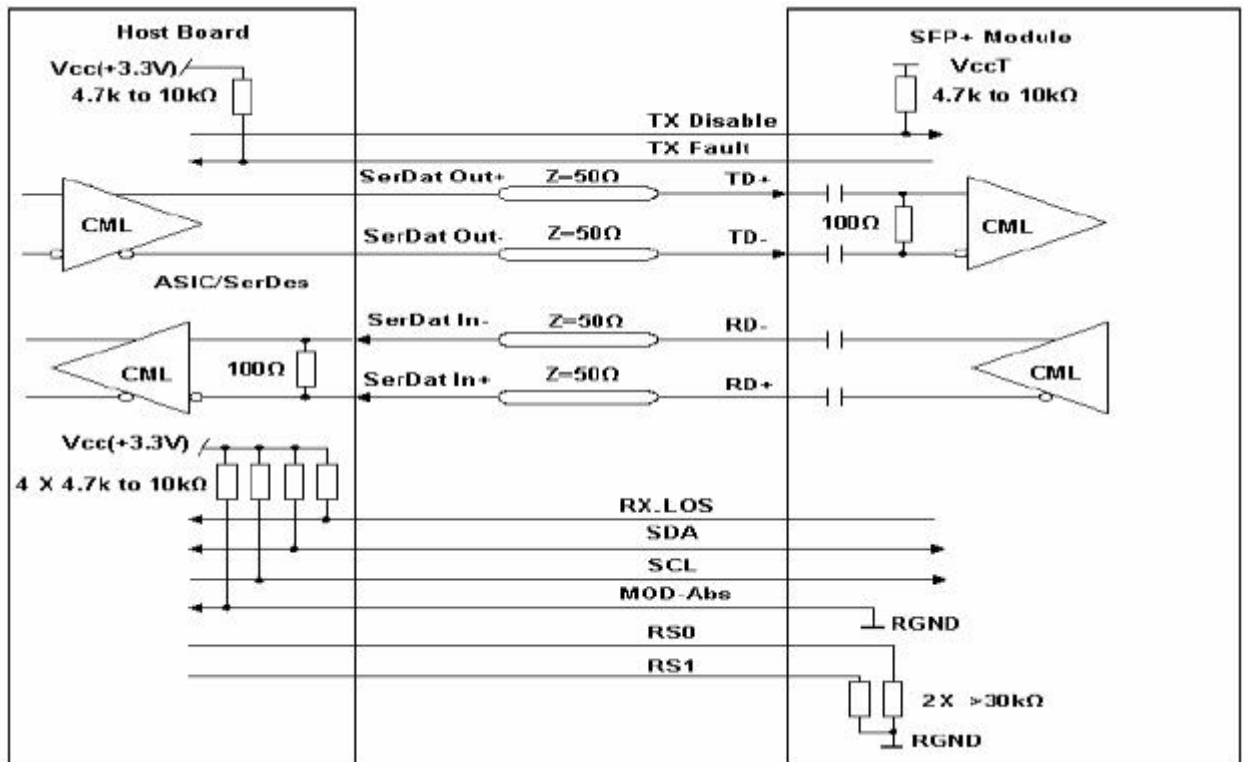
The SFP-10GLRM2-31 complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product

IX. Recommended Circuit

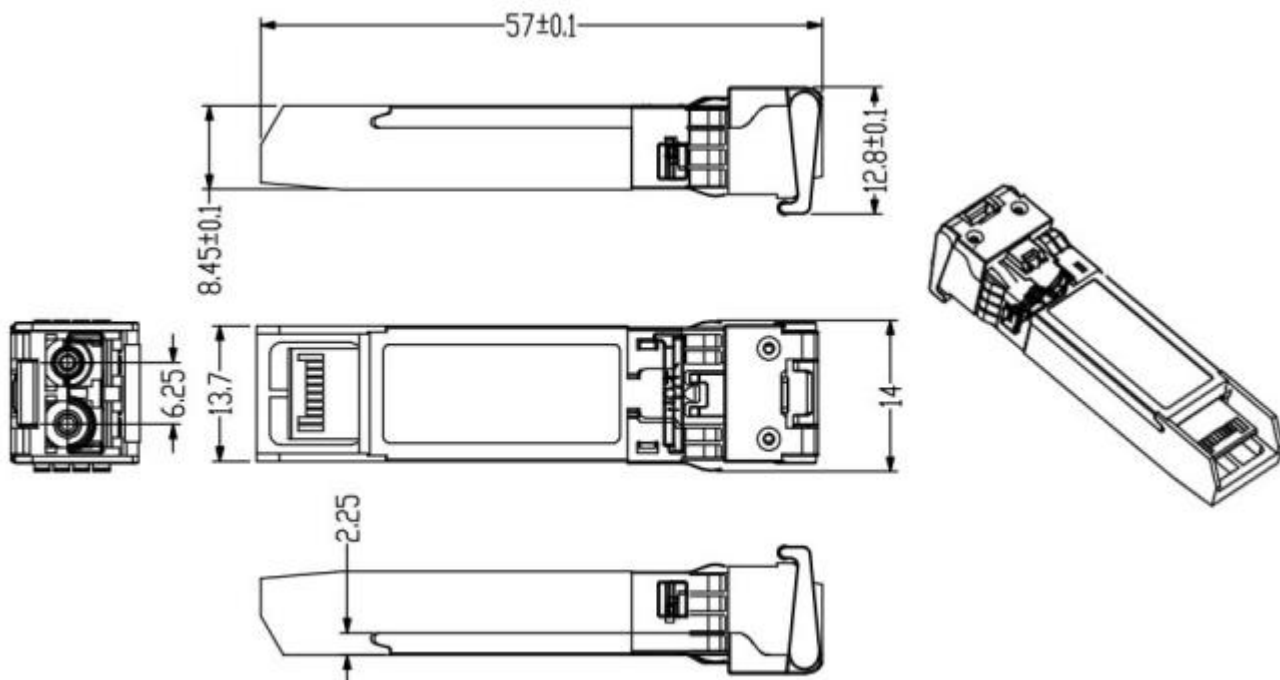


Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit

X. 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



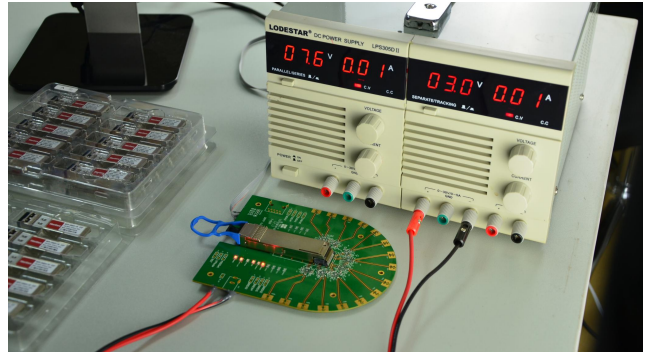
HP 5406R ZL2 V3(J9996A)



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-10GLRM-31	10GBASE-LRM 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	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:

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.



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