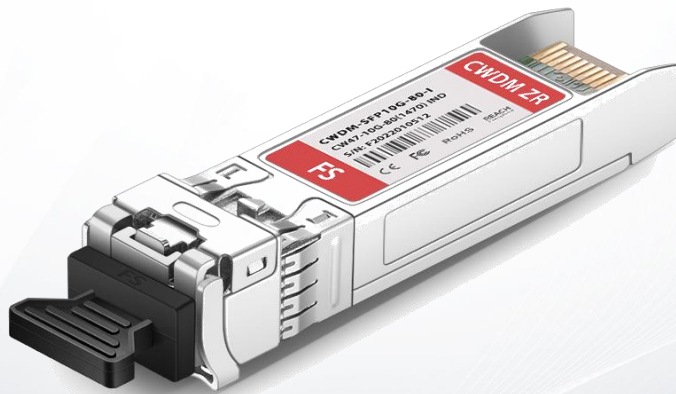


10G CWDM SFP+ 1470nm~1610nm 80km Industrial DOM Transceiver

CWDM-SFP10G-80-I



Application

- 10GBASE-ZR/ZW
- 10G SONET/SDH, OTU2/2e

Standards

- IEEE Std 802.3ae-2002
- SFP+ MSA
- SFF-8431
- SFF-8472

Features

- Up to 11.3Gbps Data Links
- Up to 80km Transmission on SMF
- CWDM EML Transmitter and APD Receiver
- Duplex LC Connector
- Low Power Consumption <1.8W
- Industrial Temperature Range: -40~85°C
- Single 3.3V Power Supply
- Metal Enclosure for Lower EMI
- Hot Pluggable SFP+ Footprint
- 2-Wire Interface with Integrated Digital Diagnostic Monitoring

Description

FS’s SFP+ transceiver supports up to 80km link lengths over single-mode fiber (SMF) and is suitable for 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 CWDM-SFP10G-80-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
Relative Humidity	RH	5	95	%
Power Supply Voltage	V _{CC}	-0.3	4	V
Signal Input Voltage		V _{CC} -0.3	V _{CC} +0.3	V

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Case Operating Temperature	T _{OP}	-40		85	°C	
Power Supply Voltage	V _{CC}	3.14	3.3	3.47	V	
Data Rate	BR		10.3125	11.3	Gbps	
Transmission Distance	T _D			80	km	

Coupled FiberSingle mode fiber9/125um SMF

III. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter						
Average Launched Power	PO	0		5	dBm	1
Extinction Ratio	ER	6			dB	
Center Wavelength	λ_C	$\lambda_C-6.5$		$\lambda_C+6.5$	nm	2
Spectrum Band Width (-20dB)	σ			1.0	nm	
SMSR		30			dB	
Transmitter OFF Output Power	P _{off}			-30	dBm	
Output Eye Mask	Compliant with IEEE 802.3ae					
Receiver						
Input Optical Wavelength	λ	1270		1610	nm	
Receiver Sensitivity	R _{SEN}			-23.0	dBm	3
Input Saturation Power (Overload)	R _{SAT}	-6			dBm	
LOS Assert	LOS _A	-35			dBm	
LOS De-assert	LOS _D			-24	dBm	
LOS Detect Hysteresis	P _{hys}	0.5			dB	

Notes

- 1. Launched power (avg.) is power coupled into a single mode fiber with master connector.
- 2. λ_C refer to wavelength selection.
- 3. Measured with conformance test signal for BER = 10⁻¹².@10.3125Gbps, PRBS=2³¹-1, NRZ, Optical source with worst ER, Wavelength between 1471nm and 1611nm; back to back.

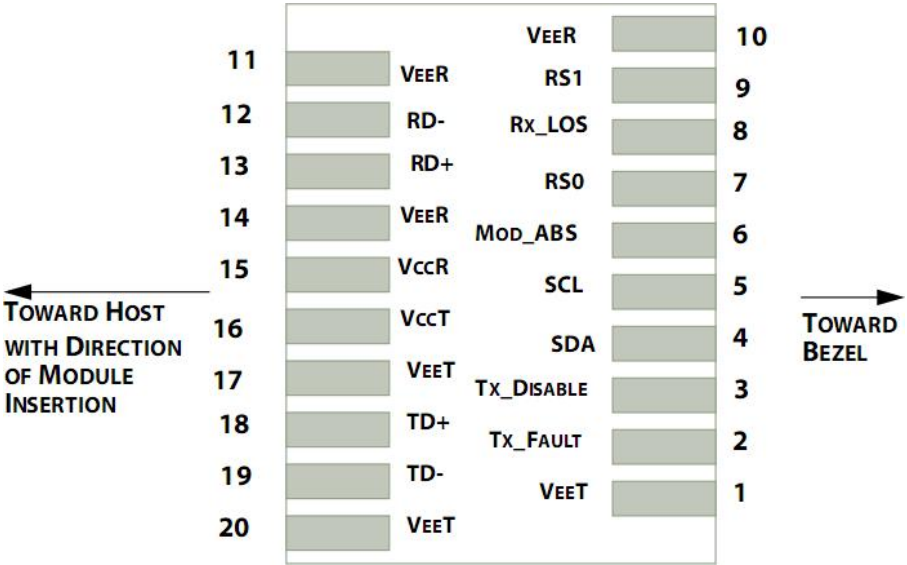
IV. Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Supply Voltage	V _{CC}	3.14	3.3	3.46	V	
Supply Current	I _{CC}			460	mA	1
				545		
				515		
				610		
Transmitter						
Input Differential Impedance	R _{IN}		100		Ω	2
Single Ended Data Input Swing	V _{IN-PP}	180		700	mV	
Transmit Disable Voltage	V _{DIS}	2		V _{CC}	V	3
Transmit Enable Voltage	V _{EN}	V _{EE}		V _{EE} +0.8	V	
Receiver						
Differential Data Output Swing	V _{OUT-PP}	400		800	mV	4
LOS Output High Level	V _{LOSF-H}	2		V _{CCHOST}	V	5
LOS Output Low Level	V _{LOS-L}	V _{EE}		V _{EE} +0.8	V	5

Notes

- 1. Measured with receive Pin= P_{senr} V_{CC} =3.3V, operation temperature range, without air flow.
- 2. Connected directly to TX data input pins. AC coupled.
- 3. Or open circuit.
- 4. Into 100 ohms differential termination.
- 5. Loss Of Signal is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

V. Pin Definition



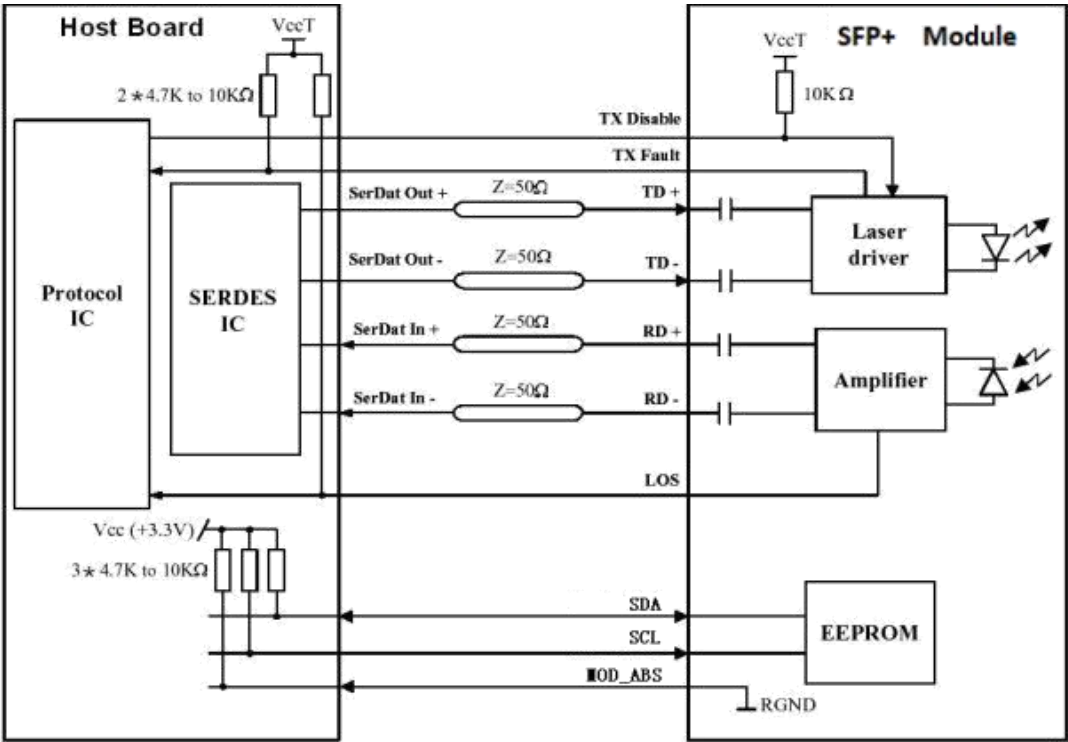
Pin	Symbol	Name/Description	Ref.
1	V _{EE} T	Transmitter Ground (Common with Receiver Ground)	1
2	T _{FAULT}	Transmitter Fault	2
3	T _{DIS}	Transmitter Disable. Laser Output Disabled on High or Open.	3
4	SDA	2-Wire Serial Interface Data Line	4
5	SCL	2-Wire Serial Interface Clock Line	4
6	MOD_ABS	Module Absent. Grounded within the Module	4
7	RS0	No Connection Required	
8	LOS	Loss of Signal Indication. Logic 0 Indicates Normal Operation	5
9	RS1	Internally Connect to Circuit Ground	
10	V _{EE} R	Receiver Ground (Common with Transmitter Ground)	1

Pin	Symbol	Name/Description	Ref.
11	V _{EER}	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 _{EER}	Receiver Ground (Common with Transmitter Ground)	1
15	V _{CCR}	Receiver Power Supply	
16	V _{CCT}	Transmitter Power Supply	
17	V _{EET}	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 _{EET}	Transmitter Ground (Common with Receiver Ground)	1

Notes

- 1. Circuit ground is internally isolated from chassis ground.
- 2. T_{FAULT} is an LVTTTL output. A high output indicates a transmitter fault caused by either the Tx bias current or the Tx output power or the laser temperature 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 4.7kΩ~10kΩ on host board to a voltage between 3.3V. MOD_ABS pulls line low to indicate module is plugged in.
- 5. LOS is open collector output. Should be pulled up with 4.7kΩ~10kΩ on host board to a typical 3.3V voltage. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

VI. Typical Application Circuit



VIII. Diagram Mechanical Drawing

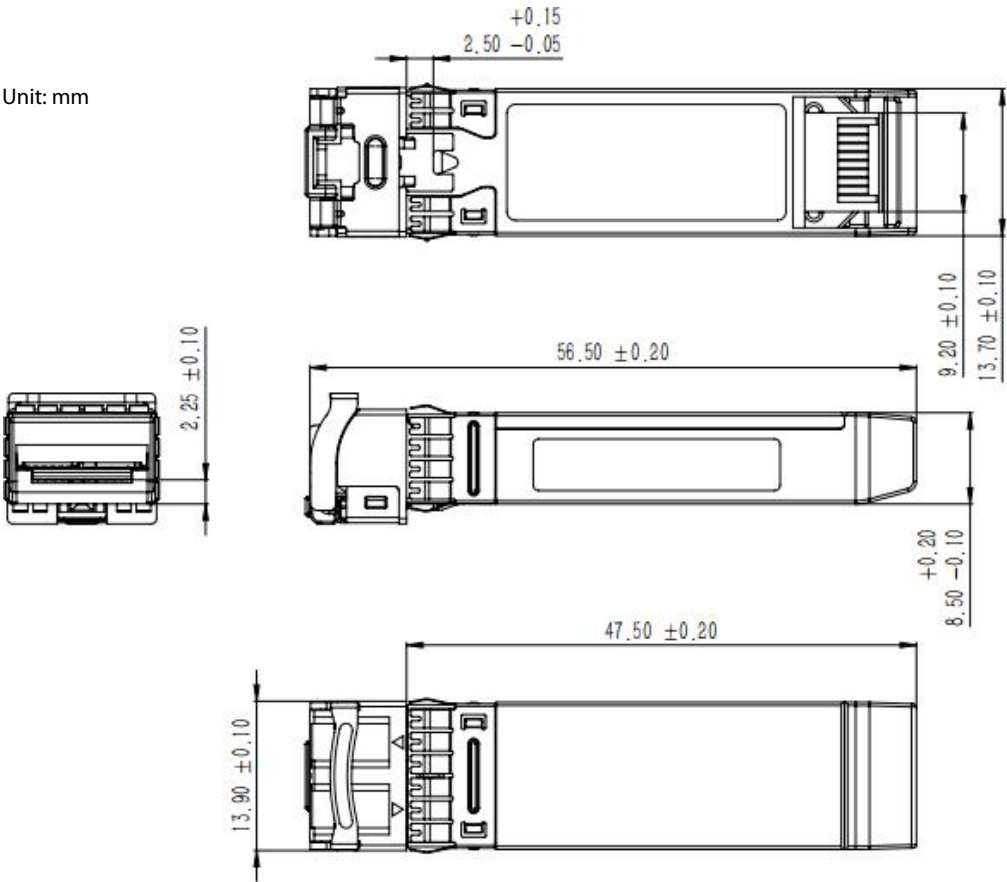
FS's 10G CWDM 80KM-I serial transceivers support the 2-wire serial communication protocol as defined in the SFP+ MSA. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, FS SFP+ transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a factory set normal range.

The SFP MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8-bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8-bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged.

The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the EEPROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

IX. Diagram Mechanical Drawing



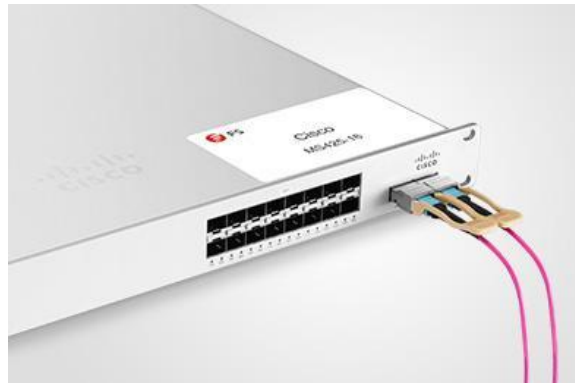
Test Center

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



Force10 S60-44T

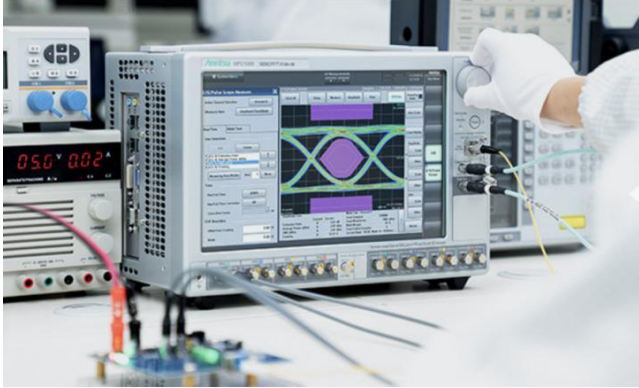


HUAWEI S6720-30L-HI-24S

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

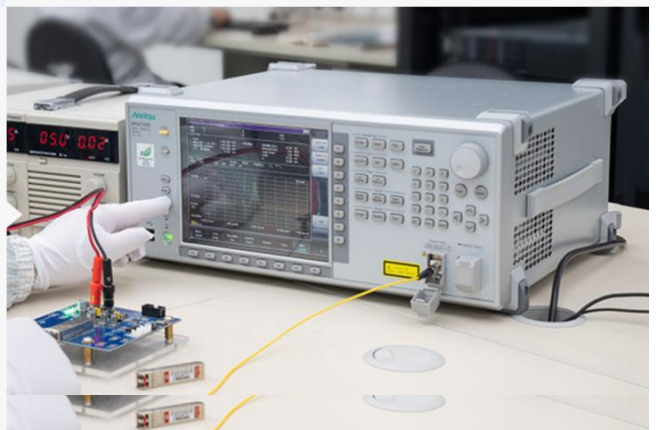
Test the actual transfer data rate and the transmission ability under different protocols with Network Master Pro.

- 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
CWDM-SFP10G-20SP	SFP+, 10GBase-LR, CWDM 1270nm-1330nm, SMF, 20km, Duplex LC, DOM
CWDM-SFP10G-20L	SFP+, 10GBase-LR, CWDM 1350nm-1610nm, SMF, 20km, Duplex LC, DOM
CWDM-SFP10G-40S	SFP+, 10GBase-ER, CWDM 1270nm-1450nm, SMF, 40km, Duplex LC, DOM
CWDM-SFP10G-40L	SFP+, 10GBase-ER, CWDM 1470nm-1610nm, SMF, 40km, Duplex LC, DOM
CWDM-SFP10G-80L	SFP+, 10GBase-ZR, CWDM 1470nm-1610nm, SMF, 80km, Duplex LC, DOM
CWDM-SFP10G-80-I	SFP+, 10GBase-ZR, CWDM 1470nm-1610nm, SMF, 80km, Duplex LC, Industrial, DOM