

4G Fiber Channel CWDM SFP 80km DOM LC SMF Transceiver

CWDM-SFP4G-ZX



Applications

- Multi-rate 1 × FC/2 × FC/4 × FCSONET OC-48

Features

- Up to 4.25Gb/s bit rates
- Hot-Pluggable
- Duplex LC connector
- 1470~1610nm CWDM DFB transmitter, APD photo-detector
- SMF links up to 80km
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface
- Power Supply :+3.3V
- Power consumption<1.5W
- Temperature Range: 0~70° C
- RoHS compliant

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	V
Relative Humidity	RH	0		85	%

II. Electrical Characteristics(T_{OP} = 0 to 70 ° C, VCC = 3.0 to 3.60 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Supply Voltage	V _{CC}	3.0		3.6	V	

Supply Current	I _{CC}			450	mA	
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Transmitter

Input differential impedance	R _{in}		100		Ω	1
Single ended data input swing	V _{in,pp}	250		1200	mV	
Transmit Disable Voltage	VD	2		V _{CC}	V	
Transmit Enable Voltage	VEN	V _{EE}		V _{EE} +0.8	V	2

Receiver

Single ended data output swing	V _{out,pp}	250	400	800	mV	3
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Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Data output rise/fall time ≤ 2.125 Gb/s	Tr/f			175	ps	4
Data output rise/falltime = 4.25Gb/s	Tr/f			120	ps	4
LOS Fault	VLOS fault	Vcc-0.5		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6
Deterministic Jitter Contribution≤2.125Gb/s	RX Δ DJ			51.7	ps	7,8
Determinstic Jitter Contribution=4.25Gb/s	RX Δ DJ			25.9	ps	8,9
Total Jitter Contribution≤2.125Gb/s	RX Δ TJ			122.4	ps	8
Total Jitter Contribution=4.25Gb/s	RX Δ TJ			61.2	ps	9

Note:

1.AC coupled.

2.Or open circuit.

3.Into 100 ohm differential termination.

4.20 – 80 %

5.LOS is LVTTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.

6.All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor 1 Pluggable (SFP) Transceiver MultiSource Agreement (MSA) , September 14, 2000. The Power Supply Rejection applies for a supply voltage range of 3.1 to 3.6 V.

7.Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and DJ. Δ

8.As measured at 0.022 mW OMA.

9.As measured at 0.048 mW OMA.

III. Optical Parameters(T_{OP} = 0 to 70 ° C, VCC = 3.0 to 3.60 Volts)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Transmitter						
Output Opt.Power	POUT	0		+5	dBm	1
Optical Wavelength	λ	λ-5.5		λ+7.5	nm	2
Spectral Width	σ			1	nm	2
Optical Modulation Amplitude =4.25Gb/s	OMA	190			μW	2,3
Optical Modulation Amplitude≤2.125Gb/s	OMA	174			μW	2,3
Optical Rise/FallTime=4.25Gb/s	tr/tf			105	ps	4
Optical Rise/FallTime≤2.125Gb/s	tr/tf			160	ps	5
Relative Intensity Noise	RIN			-118	dB/Hz	
Deterministic Jitter Contribution≤2.125Gb/s	TX Δ DJ			59.8	ps	6
Deterministic Jitter Contribution=4.25Gb/s	TX Δ DJ			28.2	ps	6
Total Jitter Contribution≤2.125Gb/s	TX Δ TJ			119	ps	
Total Jitter Contribution=4.25Gb/s	TX Δ TJ			59.8	ps	
Extinction Ratio= 1.25Gb/s	ER	9			dB	7

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
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Receiver

Receiver Sensitivity = 1.0625 Gb/s	RxSENS			-28	dBm	8
Receiver Sensitivity=2.125Gb/s	RxSENS			-26	dBm	8
Receiver Sensitivity=4.25Gb/s	RxSENS			-24	dBm	8
Average Receiver Power	RxMAX			-7	dBm	
Receiver Elec.3 dB cutoff frequency				1500	MHz	9
ReceiverElec.3 dB cutoff frequency				2500	MHz	10
Optical Center Wavelength	λ_C	1260		1620	nm	
Optical Return Loss		12			dB	
LOS De-Assert	LOSD			-25	dBm	
LOS Assert	LOSA	-35			dBm	
LOS Hysteresis		0.5			dB	

General Specifications

Data Rate	BR	1062		4250	Mb/s	11
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Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Bit Error Rate	BER			10 ⁻¹²		12
Max. Supported Link Length on 9/125µm SMF@ 4X Fibre Channel	LMAX1			80	km	13
Max. Supported Link Length on 9/125µm SMF@ 1X and 2X Fibre Channel	LMAX2			90	km	13

Note:

1.Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.

2.Also specified to meet curves in FC-PI-2 10.0 Figures 18, 19, and 21, which allow trade-off between wavelength, spectral width and OMA. Rate selectable part is specified to meet IEEE Draft P802.3ah /D2.0 Figure 59-3.

3.Equivalent extinction ratio specification for Fibre Channel. Allows smaller ER at higher average power.

4.Unfiltered, 20-80%.

5.Unfiltered, 20-80%.

6.Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and DJ. Δ

7.Applicable for Rate Selectable version only in low bandwidth mode.

8.Measured with conformance signals defined in FC-PI-2 10.0 specifications. Value in OMA. Measured with PRBS 2⁷ -1 at 10⁻¹²BER

9.Measured with conformance signals defined in FC-PI-2 10.0 specifications. Represents sensitivity based on OMA spec, as corrected to incoming Extinction Ratio of 13 dB (for example, at 5.75dB incoming extinction ratio, an OMA of 0.029 mW corresponds to -16 dBm sensitivity). Measured with PRBS 2⁷ -1 at 10⁻¹²BER

10.Measured with PRBS 2⁷ -1 at 10⁻¹²BER

11.Rate Selectable version in low bandwidth mode.

12.Rate Selectable version in high bandwidth mode.

13.1x/2x/4x Fibre Channel compliant.

14.Tested with a PRBS 2⁷ -1 test pattern.

15 Distances are indicative only. Please refer to the Optical Specifications in Section IV to calculate a more accurate link budget based on specific conditions in your application.

IV. Pin Assignment

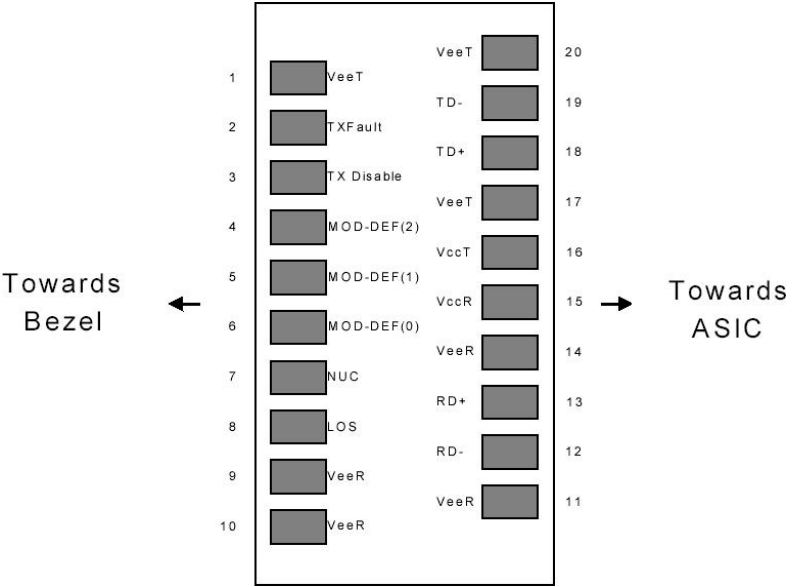


Diagram of Host Board Connector Block Pin Numbers and Names

Pin Description

Pin	Name	Function	Plug Seq	Note
1	VeeT	Transmitter Ground	1	1
2	TX Fault	Transmitter Fault Indication	3	
3	TX Disable	Transmitter Disable	3	2
4	MOD-DEF2	Module Definition	2	3
5	MOD-DEF1	Module Definition 1	3	3
6	MOD-DEF0	Module Definition 0	3	3
7	Rate Select	Not Connected	3	4
8	LOS	Loss of Signal	3	5
9	VeeR	Receiver Ground	1	1

Pin	Definition	Description	Plug Seq	Note
10	VeeR	Receiver Ground	1	1
11	VeeR	Receiver Ground		1
12	RD-	Inv. Received Data Out	3	6
13	RD+	Received Data Out	3	6
14	VeeR	Receiver Ground	3	1
15	VccR	Receiver Power	2	1
16	VccT	Transmitter Power	2	
17	VccT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	6
19	TD-	Inv. Transmit In	3	6
20	VeeT	Transmitter Ground	1	

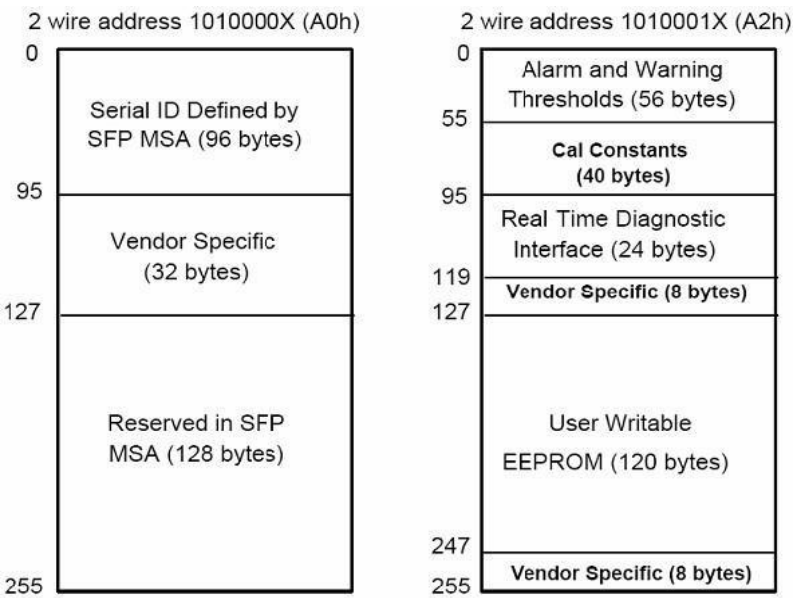
Note:

- 1.Circuit ground is internally isolated from chassis ground.
- 2.Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3.Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V.MOD_DEF(0) pulls line low to indicate module is plugged in.
- 4.Rate select is not used
- 5.LOS is open collector output. Should be pulled up with 4.7k – 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 6.AC Coupled

V. 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)



VI. Serial ID Memory Contents

Data Address	Length (Byte)	Name of Length	Description and Contents
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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	Codeof optical connectortype(07=LC)

Data Address	Length (Byte)	Name of Length	Description and Contents
3-10	8	Transceiver	Fiber Channel
11	1	Encoding	8B10B (01h)
12	1	BR,Nominal	Nominal baudrate, unit of 100Mbps
13	1	Reserved	(0000h)
14	1	Length(9um,km)	Link length supported for 9/125 um fiber, units of km
15	1	Length(9um)	Link length supported for 9/125 um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125 um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125 um fiber, units of 10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	Link length supported for 50/125 um fiber, units of 10m
20-35	16	VendorName	SFP vendor name:
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID

Data Address	Length (Byte)	Name of Length	Description and Contents
40-55	16	VendorPN	Part Number:""(ASCII)
56-59	4	Vendor rev	Revision level for part number
60-61	2	Wavelength	Laser wavelength
62	1	Reserved	Least significant byte of sum of data in address 0-62
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	Manufacturing date code
92	1	Diagnostic Type	Diagnostics
93	1	Enhanced Options	Diagnostics

Data Address	Length (Byte)	Name of Length	Description and Contents
94	1	SFF-8472	Diagnostics
95	1	CCEX	Check code for the extended ID Fields (addresses64 to94)
Vendor Specific ID Fields			

96-127	32	Readable	Vendor specific date, read only
128-255	128	Reserved	ReservedforSFF-8079

VII. Digital Diagnostic Monitor Characteristicscifications

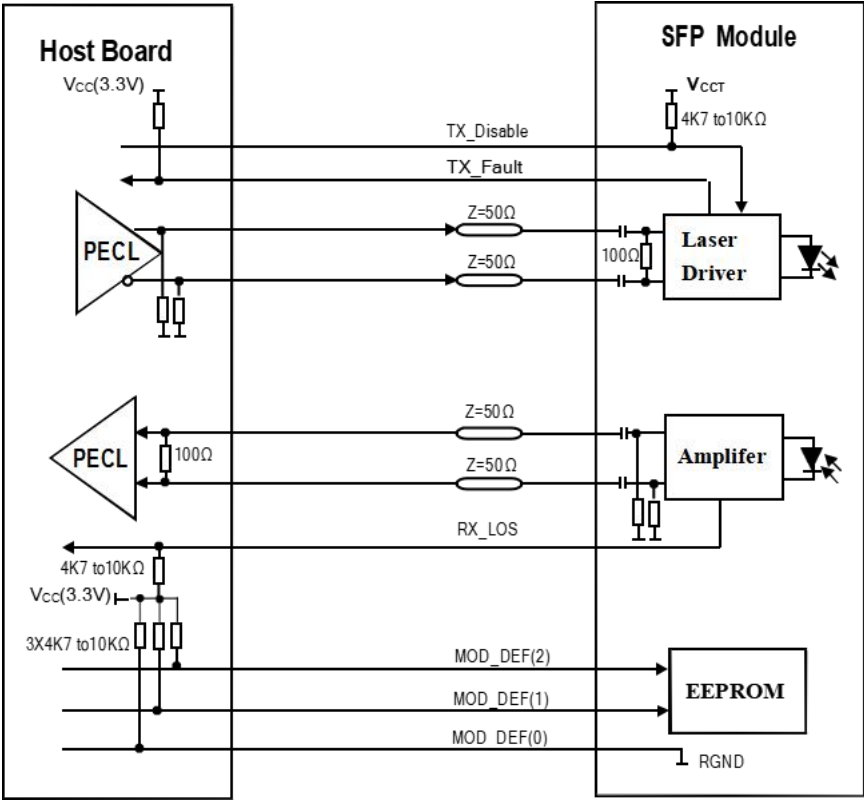
Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	± 3%	° C
98-99	VCC3 Internal Supply Voltage	± 3%	%
100-101	Laser Bias Current	± 10	%
102-103	Tx Output Power	± 3%	dBm
104-105	Rx Input Power	± 3%	dBm

VIII. Regulatory Compliance

The FT3780D-xx complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

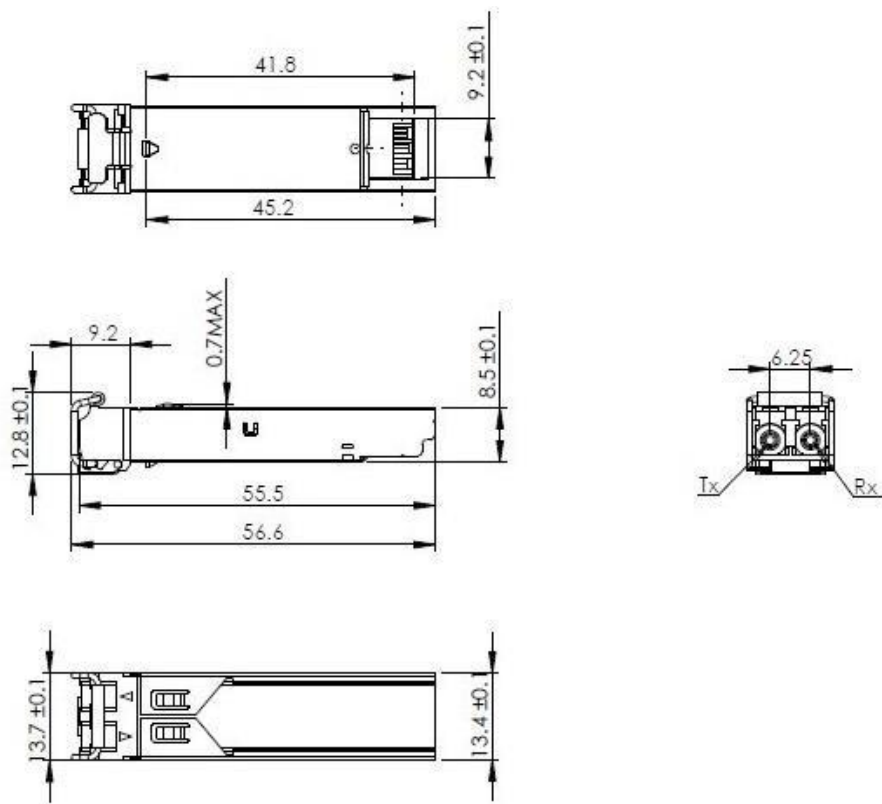
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part15 Class B EN55022 Class B (CISPR22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11EN60950, EN (IEC)60825-1,2	Compatible with Class 1 laserproduct.

IX. Recommended Circuit



SFP Host Recommended Circuit

X. Mechanical Dimensions



Mechanical Drawing

Note:

In the Part No. of , XX stands for wavelength, such as:

47: for 1470nm, 49: for 1490nm, 51: for 1510nm, 53: for 1530nm, 55: for 1550nm,
57: for 1570nm, 59: for 1590nm, 61: for 1610nm.

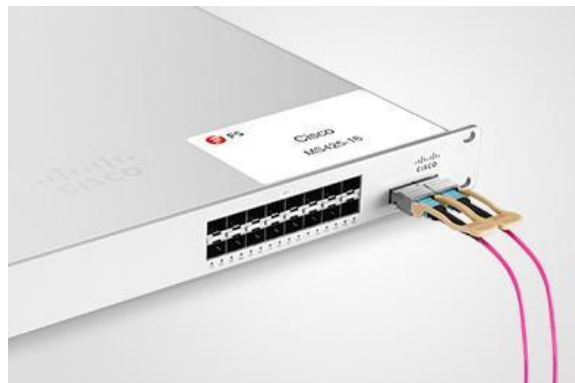
Test Center

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



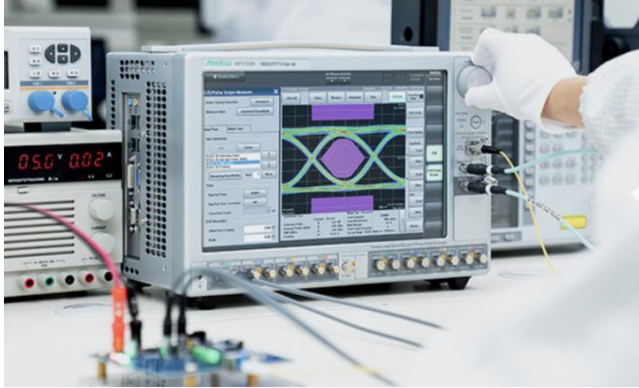
Force@tm S60-44T



HUAWEI S6720-30L-HI-24S

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.

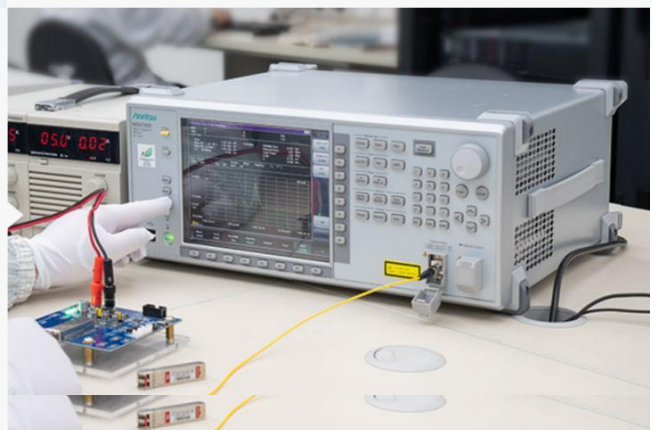
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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-SFP4G-EX	4G Fibre Channel SFP Transceiver, Duplex LC, 40km over SMF
CWDM-SFP4G-ZX	4G Fibre Channel SFP Transceiver, Duplex LC, 80km over SMF