

4G Fiber Channel CWDM SFP 40km DOM LC SMF Transceiver

CWDM-SFP4G-EX



Applications

- Tri-Rate 1.0625 / 2.125 / 4.25Gb/s Fiber Channel

Features

- Up to 4.25Gb/s Data Links
- Hot-Pluggable
- CWDM DFB Laser Transmitter
- Duplex LC Connector
- RoHS Compliant and Lead Free
- Up to 40KM on 9/125 μ m SMF
- Single +3.3V Power Supply
- Digital Diagnostic Monitor Interface Compatible with SFF-8472
- Low Power Dissipation <600mW Typically
- Industrial /Extended/ Commercial Operating Temperature Range: -40°C to 85°C /-5°C to 85°C /-0°C to 70°C Version Available

Description

CWDM- SFP4G -EX transceiver is a high performance, cost effective module which has a Duplex LC optics interface. Standard AC coupled CML for high speed signal and LVTTTL controls and monitors signals. The receiver section uses a PIN receiver and the transmitter uses CWDM DFB laser, and up to 16dB link budget ensures this module STM-16/OC-48 40km application.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	85	°C
Supply Voltage	$V_{CC,T,R}$	-0.5	4	V
Relative Humidity	RH	0	85	%
Case Operating Temperature	Industrial	-40	85	°C
	Extended	-5	85	
	Commercial	0	70	

II. Recommended Operating Environment

Parameter	Symbol	Min.	Max.	Unit
Commercial Temperature	T_C	0	70	°C
Supply Voltage	$V_{CC,T,R}$	3.0	3.6	V
Power Supply Rejection		100		mV _{P-P}

III. Electrical Characteristics (TOP = 0 to 70 °C, $V_{CC} = 3.0$ to 3.60 Volts)

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Supply Voltage	V_{CC}	3.0		3.6	V	
Supply Current	I_{CC}		200	300	mA	

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter Section						
Input Differential impedance	R_{in}		100		Ω	1
Single Ended Data Input Swing	$V_{in,PP}$	250		1200	mV	
Transmit Disable Voltage	V_D	2		V_{CC}	V	2
Transmit Enable Voltage	V_{EN}	V _{ee}		$V_{ee}+0.8$	V	
Receiver Section						
Single Ended Data Output Swing	$V_{out,pp}$	250	400	800	mV	3
Data Output Rise /fall time \leq 2.125 Gb/s	$t_{r/f}$			175	ps	4
Data Output rise/fall time =4.25 Gb/s	$t_{r/f}$			120	ps	4
LOS Fault	$V_{losfault}$	$V_{CC}-0.5$		V_{CC_host}	V	5
LOS Normal	$V_{losnorm}$	V _{ee}		$V_{ee}+0.5$	V	5
Power Supply Rejection	PSR	100			mVpp	6
Deterministic Jitter Contribution \leq 2.125 Gb/s	J_{RXp-p}			0.07	UI	
Deterministic Jitter Contribution =4.25 Gb/s	J_{RXrms}			0.007	UI	
Total Jitter Contribution \leq 2.125 Gb/s	$RX\Delta TJ$			122.4	ps	8
Total Jitter Contribution =4.25 Gb/s	$RX\Delta TJ$			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 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.

8. As measured at 0.022 mW OMA.

9. As measured at 0.048 mW OMA.

IV. Optical Parameters(TOP = 0 to 70 °C, V_{CC} = 3.00 to 3.60 Volts)

Parameter	Symbol	Min.	Max.	Unit	Ref.
Transmitter Section					
Output Opt. Power	POUT	0	+5	dBm	1
Optical Wavelength	λ	$\lambda-5.5$	$\lambda+7.5$	nm	2
Spectral Width	σ		1	nm	2
Optical Modulation Amplitude =4.25Gb/s	OMA	190		μ W	2,3
Optical Modulation Amplitude\leq2.125Gb/s	OMA	174		μ W	2,3
Optical Rise/Fall Time=4.25Gb/s	tr/tf		105	ps	4
Optical Rise/Fall Time\leq2.125Gb/s	tr/tf		160	ps	5
Relative Intensity Noise	RIN		-118	dB/Hz	
Deterministic Jitter Contribution\leq2.125Gb/s	TX Δ DJ		59.8	ps	6
Deterministic Jitter Contribution=4.25Gb/s	TX Δ DJ		28.2	ps	6
Total Jitter Contribution\leq2.125Gb/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
Receiver Section					
Receiver Sensitivity=1.0625Gb/s	RxSENS		0.015	mW	8

Parameter	Symbol	Min.	Max.	Unit	Ref.
Receiver Sensitivity=1.0625Gb/s	RxSENS		-22	dBm	9
Receiver Sensitivity = 2.125 Gb/s	RxSENS		0.015	mW	8
			-21	dBm	9
Receiver Sensitivity = 4.25 Gb/s	RxSENS		0.029	mW	8
			-18	dBm	9
Average Receiver Power	RxMAX		0	dBm	
Receiver Elec.3dB Cut Off Frequency			1500	MHz	11
Receiver Elec.3dB Cut Off Frequency			2500	MHz	12
Optical Center Wavelength	λ_C	1260	1600	nm	
Optical Return Loss		12		dB	
LOS De-Assert	LOSD		-20	dBm	
LOS Assert	LOSA	-30		dBm	
LOS Hysteresis		0.5		dB	
General Specifications					
DataRate	BR	1062	4250	Mb/s	13
BitErrorRate	BER		10^{-12}		14
Max. Supported Link Length on 9/125μm SMF@4X Fibre Channel	LMAX1		40	km	15
Max. Supported Link Length on 9/125μm SMF@1X and 2X Fibre Channel	LMAX2		50	km	15

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

V. Digital Diagnostic Monitor Characteristics

Parameter	Symbol	Min.	Max.	Unit
Temperature Monitor Absolute Error	DMI_Temp	-3	3	degC
Laserpower Monitor Absolute Error	DMI_TX	-3	3	dB
RX Power Monitor Absolute Error	DMI_RX	-3	3	dB
Supply Voltage Monitor Absolute Error	DMI_V _{CC}	-0.1	0.1	V
Bias Current Monitor	DMI_I _{bias}	-10%	10%	mA

VI. Block Diagram of Transceiver

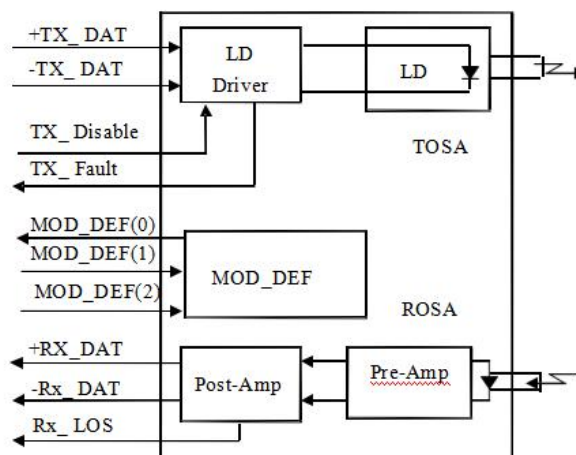


Figure 1. SFP Host Recommended Circuit

VII. Pin Assignment

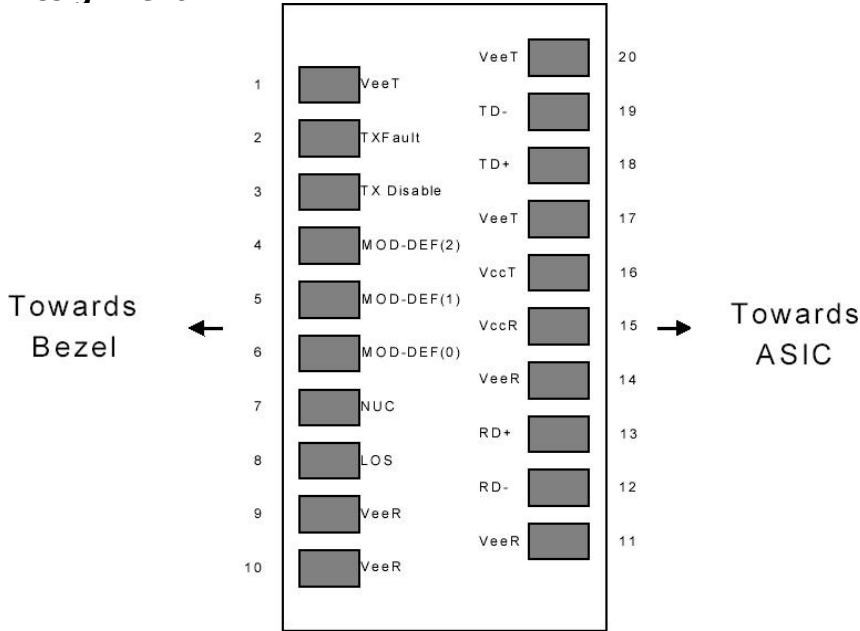


Figure 2. Diagram of Host Board Connector Block Pin Numbers and Names

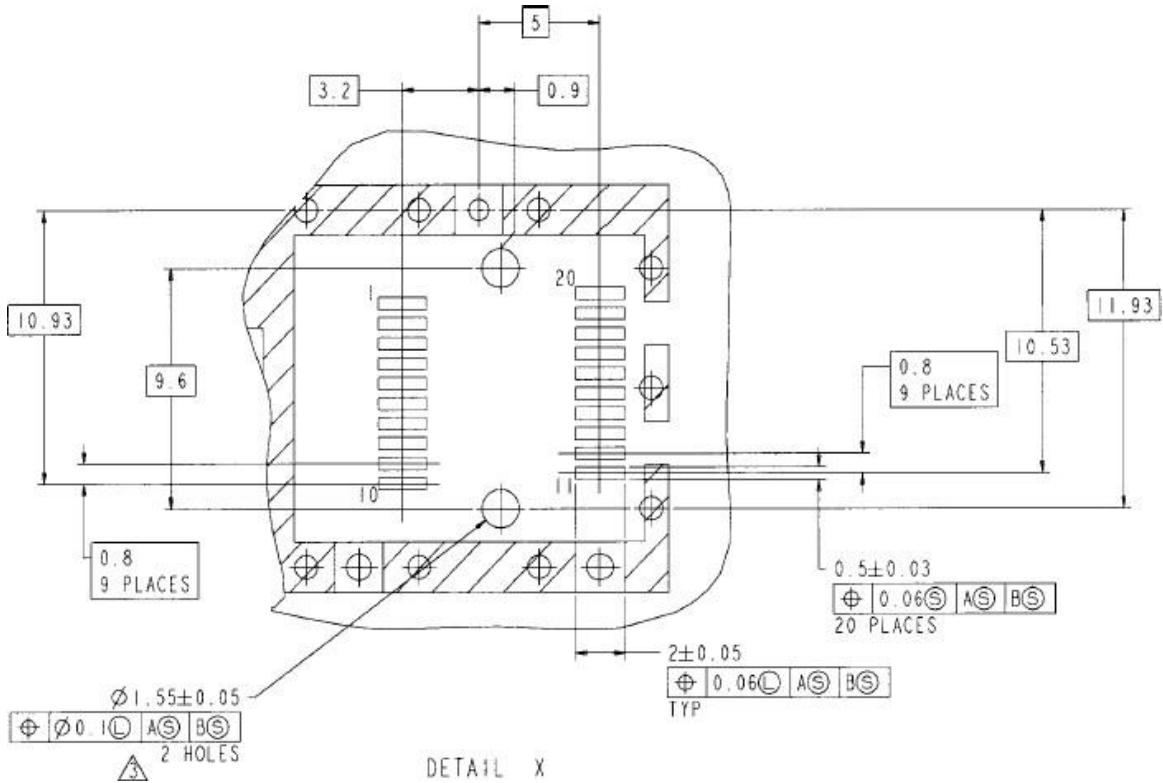


Figure 3. SFP Host Board Mechanical Layout

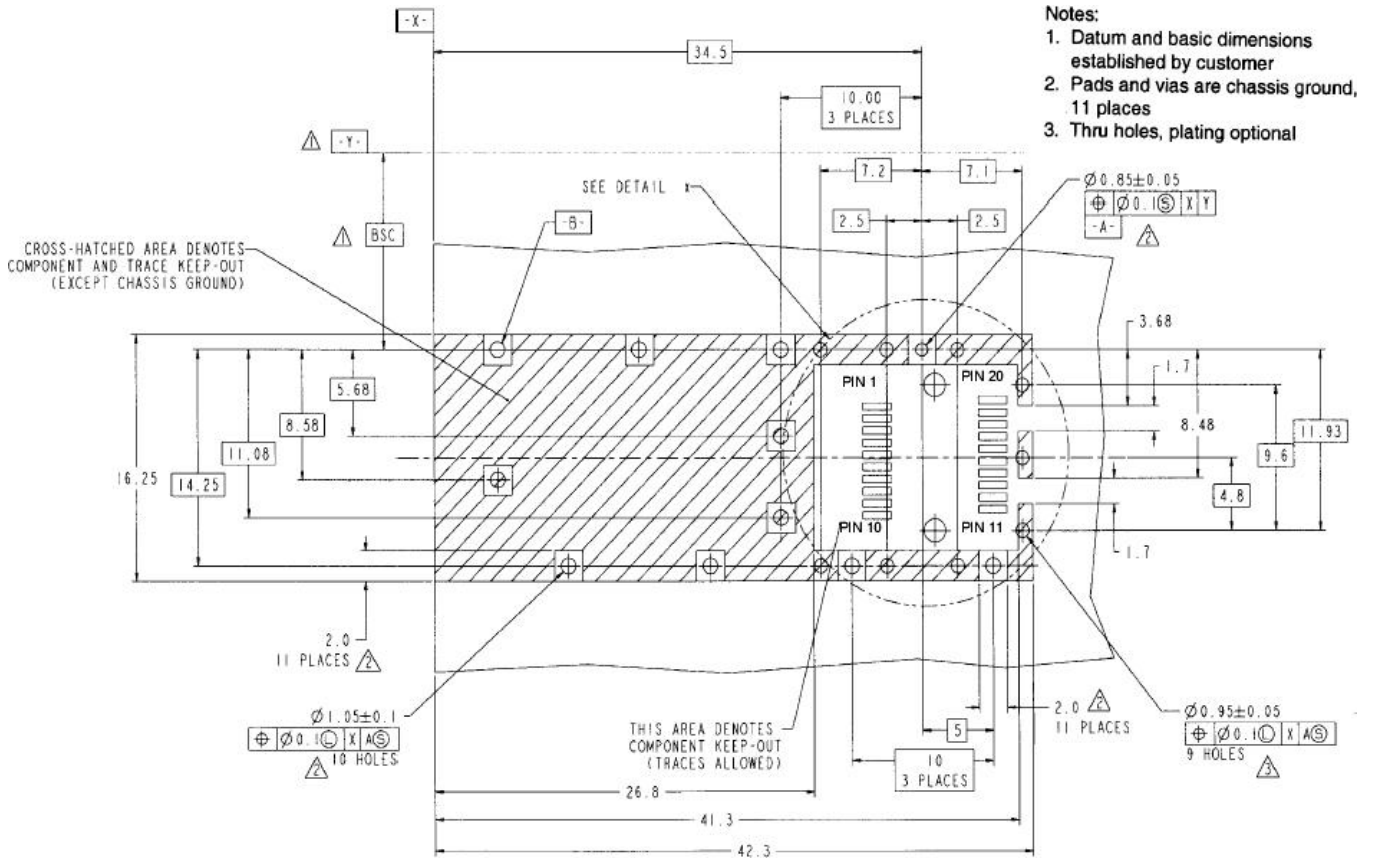


Figure 4. SFP Host Board Mechanical Layout(Cont)

VIII. Pin Description

Pin	Name	Function	Plug Seq	Notes
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
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	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	6

Pin	Name	Function	Plug Seq	Notes
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

IX. Recommended Circuit

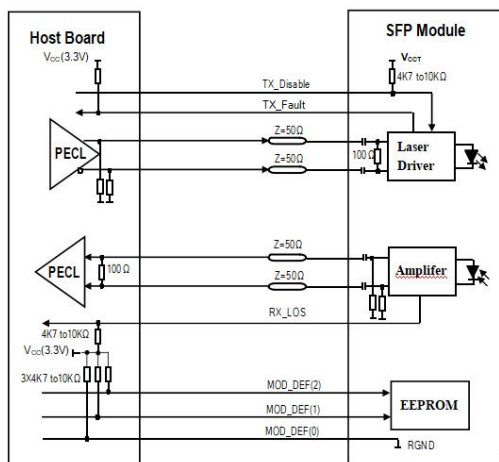


Figure 5. Block Diagram

X. Mechanical Specifications

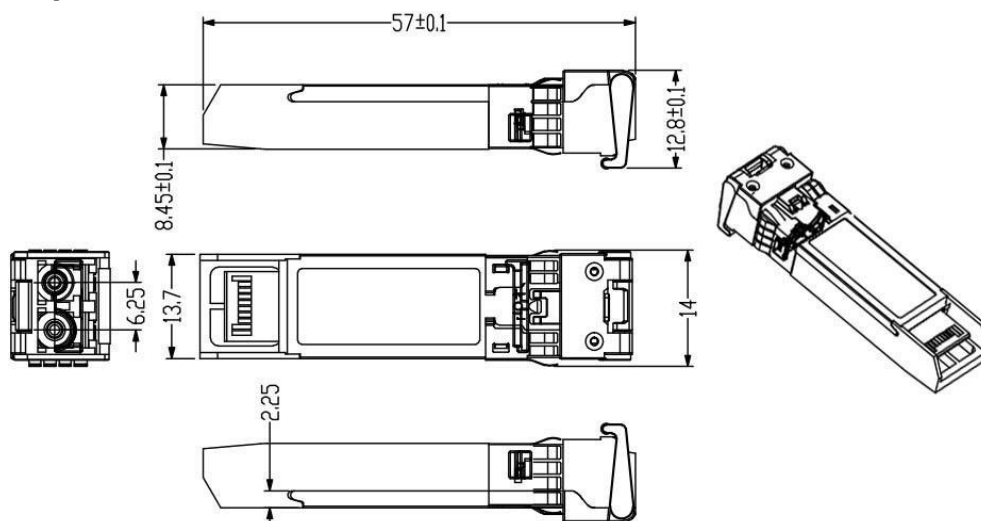


Figure 6. Mechanical Drawing

Note:

In the Part No. of CWDM- SFP4G -EX, 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

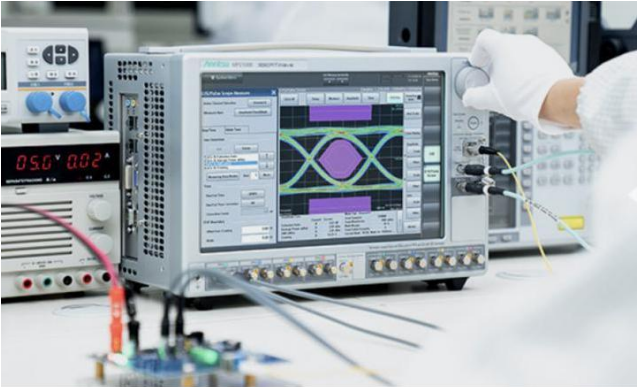


HUAWEI S6720-30L-HI-24S

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.

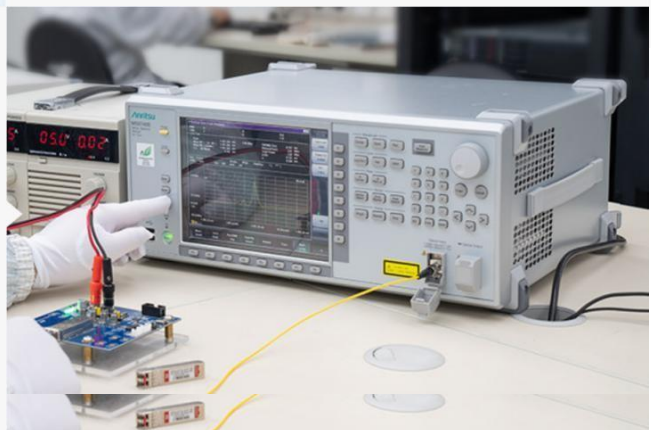
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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



Ordering Information

Part Number	Description
CWDM-SFP4G-ZX	4G Fiber Channel CWDM SFP 80km DOM LC Transceiver for SMF



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