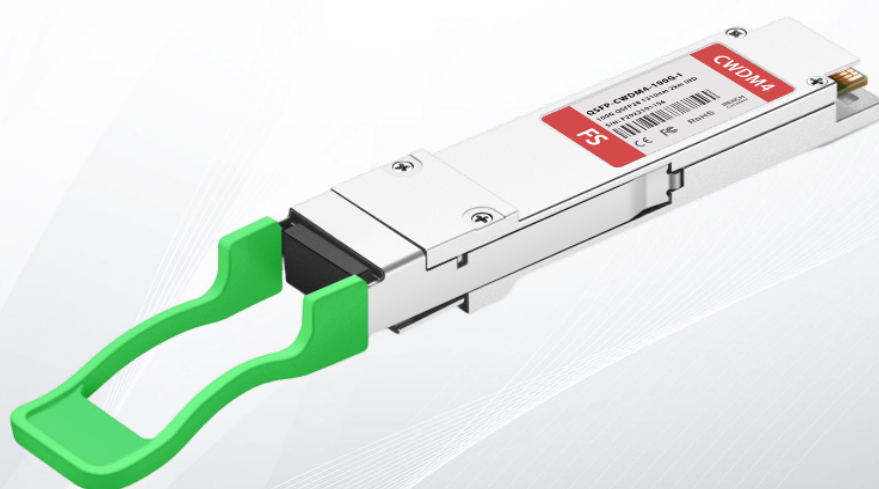


100GBASE-CWDM4 QSFP28 1310nm 2km Industrial Transceiver

QSFP-CWDM4-100G-I



Application

- Data Center 100GE 2km Links

Features

- CWDM4 MSA Compliant
- 25G Single Rate Operation
- 100G Dual Mode Operation
- Built-in Digital Diagnostic Functions
- Cooled CWDM (1271nm, 1291nm, 1311nm, 1331nm) DFB LD
- Maximum Power Consumption 4.5W
- -20 to 85 °C Case Operating Temperature (Cold Start -40 °C)
- SFF-8636 Management Interface

Product Specifications

I. Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings will cause permanent damage and/or adversely affect device reliability.

Parameter	Symbol	Min.	Max.	Unit	Notes
Supply Voltage	V _{CC}	0	+3.6	V	
Storage Temperature		-40	85	°C	
Relative Humidity	RH	15	85	%	

II. Recommended Operating Conditions

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Rate	DR		103.1		Gb/s	
Operating Case Temperature	Top	-40		85	°C	
Bit Error Rate	BER			5E-5		
Fiber Length on SMF Per G.652	L			2000	m	1
Loss Budget over SMF Per G.652				5	dB	2
Supply Voltage	V _{CC}	3.135		3.465	V	
Module Total Power	P			4.5	W	

Notes:

1. Tested with PRBS31, 5dB loss budget with FEC on the host.
2. The channel insertion loss budget may include up to 1dB MPI loss penalty with worst case transmitter and worst case connector MPI.

III. Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	
Differential Input Impedance	Z _{in}		100		Ohm	
Differential Input Voltage Amplitude Per Lane	V _{in}	100		1600	mVp-p	
Differential Termination				10	%	
Receiver						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	
Differential Output Impedance	Z _{out}		100		Ohm	
Differential Output Voltage Amplitude Per Lane	V _{out}	100		400	mVp-p	1
		300		600		
		400		800		
		600		1200		
Eye Width		0.57			UI	
Vertical Eye Closure				5.5	dB	
Differential Termination				10	%	

Notes:

1. Differential output voltage amplitude is adjustable through I2C bus. Default value of the differential output voltage amplitude per lane is 400 – 800 mV.

IV. Reference Test Points

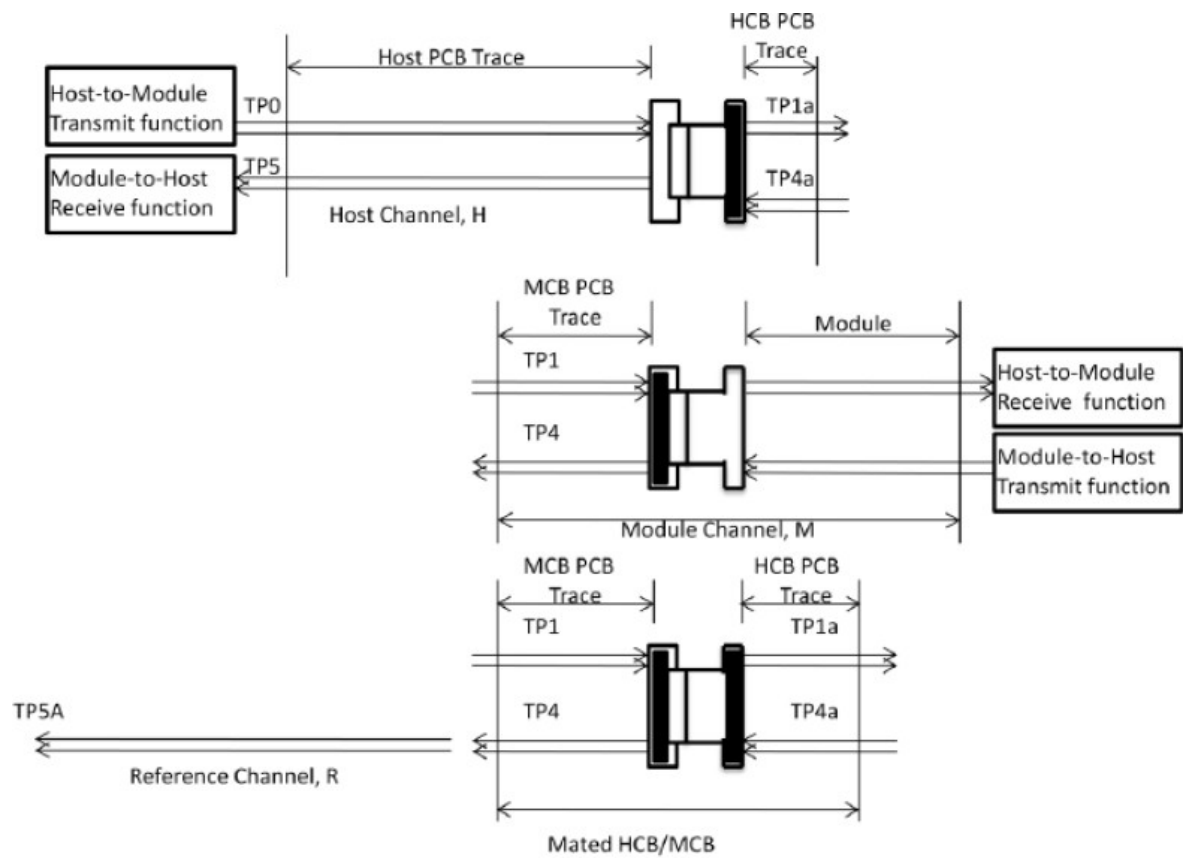


Figure 1. Reference Test Points

V. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Signaling Rate ,Each Lane		25.78125±100ppm			Gb/s	
Line Wavelengths (Range)	λ	1264.5 – 1277.5			nm	
		1284.5 – 1297.5				
		1304.5 – 1317.5				
		1324.5 – 1337.5				
Side-mode Suppression Ratio	SMSR	30			dB	
Total Average Launch Power				8.5	dBm	
Average Launch Power, Each Lane		-6.5		2.5	dBm	
Transmit OMA, Each Lane	TXOMA1	-4		2.5	dBm	
Launch Power (OMA-TDP), Each Lane	OMA-TDP	-5			dBm	
Optical Extinction Ratio	ER	3.5			dB	
Transmitter and Dispersion Penalty, Each Lane	TDP			3	dB	1
Average Launch Power of OFF Transmitter, Each Lane				-30	dBm	
Transmitter Reflectance	RL			-12	dB	
Transmitter Eye Mask Definition {X1,X2,X3,Y1,Y2,Y3}		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}			dB	2
Receiver						
Signaling Rate ,Each Lane		25.78125±100ppm			Gb/s	

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Line Wavelengths (Range)	λ	1264.5 – 1277.5			nm	
		1284.5 – 1297.5				
		1304.5 – 1317.5				
		1324.5 – 1337.5				
Damage threshold, Each Lane		3.5			dBm	
Average Receive Power, Each Lane		-11.5		2.5	dBm	
Unstressed Receiver Sensitivity (OMA), Each Lane	RXsens			-10	dBm	3
Stressed Receiver OMA Sensitivity	SRS			-7.3	dBm	4
Conditions of Stressed Receiver Sensitivity Test						
Vertical Eye Closure Penalty	VECP	1.9			dB	
Stressed J2 Jitter, Each Lane	J2	0.33			UI	
Stressed J4 Jitter, Each Lane	J4	0.48			UI	
SRS Eye Mask Definition {X1,X2,X3,Y1,Y2,Y3}		{0.39, 0.5, 0.5, 0.39, 0.39, 0.4}			dB	
LOS De-Assert	LOSD			-12	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis	LOSH	0.5		5	dB	

Note:

1. TDP does not include a penalty for multi-path interference (MPI).
2. Hit ratio of 5E-5, per IEEE.
3. Sensitivity is specified at the BER of 5E-5.
4. Measured with CWDM4 MSA conformance test signal at TP3 for the BER of 5E-5.

VI. OpticalOutputEyeDiagram

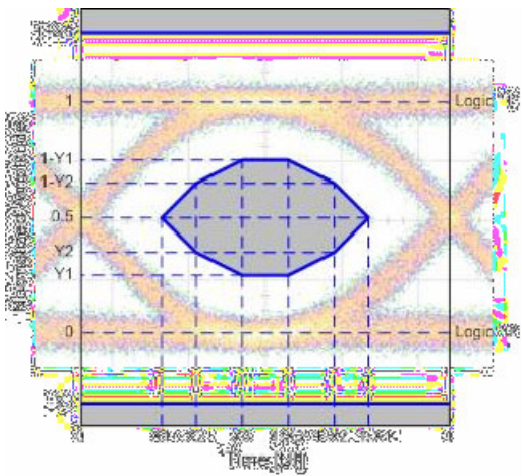


Figure 2. Optical Output Eye Diagram

VII. PIN Assignment

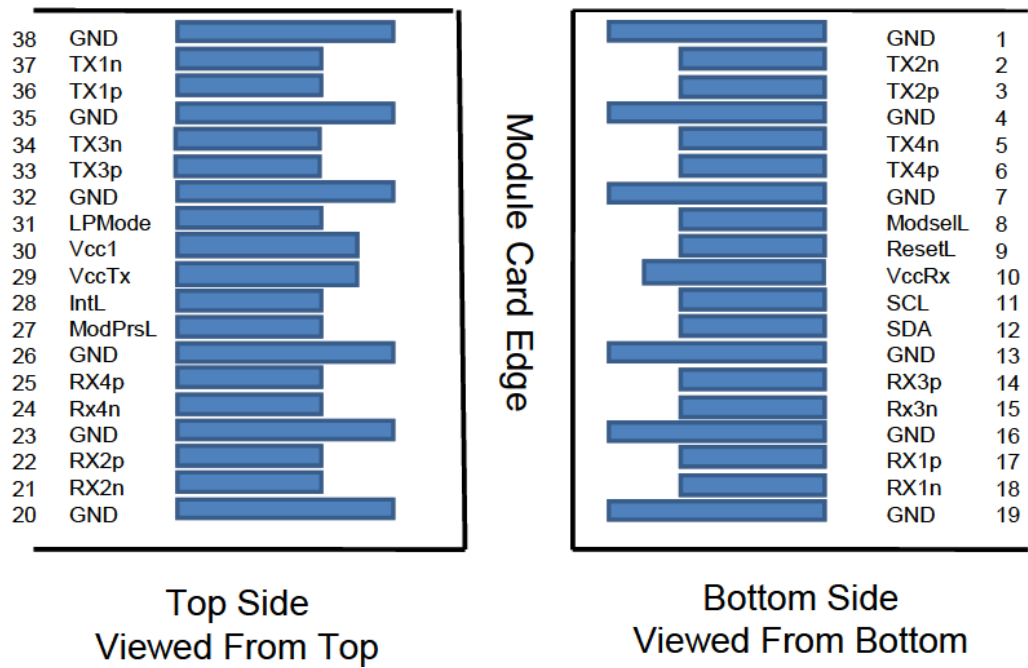


Figure 3. Module Pads

VIII. Module Pin Definitions

Pin No.	Logic	Symbol	Description	Plug Sequence	Note
1		GND	Ground	1	1
2	CML-I	Tx2n	Transmitter Inverted Data Input	3	
3	CML-I	Tx2p	Transmitter Non-Inverted Data Input	3	
4		GND	Ground	1	1
5	CML-I	Tx4n	Transmitter Inverted Data Input	3	
6	CML-I	Tx4p	Transmitter Non-Inverted Data Input	3	
7		GND	Ground	1	1
8	LVTTL-I	ModselL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		Vcc Rx	+3.3V Power Supply Receiver	2	2
11	LVC MOS-I/O	SCL	2-wire Serial Interface Clock	3	
12	LVC MOS-I/O	SDA	2-wire Serial Interface Data	3	
13		GND	Ground	1	1
14	CML-O	Rx3p	Receiver Non-Inverted Data Output	3	
15	CML-O	Rx3n	Receiver Inverted Data Output	3	
16		GND	Ground	1	1
17	CML-O	Rx1p	Receiver Non-Inverted Data Output	3	
18	CML-O	Rx1n	Receiver Inverted Data Output	3	
19		GND	Ground	1	1
20		GND	Ground	1	1

Pin No.	Logic	Symbol	Description	Plug Sequence	Note
21	CML-O	Rx2n	Receiver Inverted Data Output	3	
22	CML-O	Rx2p	Receiver Non-Inverted Data Output	3	
23		GND	Ground	1	1
24	CML-O	Rx4n	Receiver Inverted Data Output	3	
25	CML-O	Rx4p	Receiver Non-Inverted Data Output	3	
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL	Interrupt	3	
29		Vcc Tx	+3.3V Power Supply Transmitter	2	2
30		Vcc1	+3.3V Power Supply	2	2
31	LVTTL-I	LPMode	Low Power Mode	3	
32		GND	Ground	1	1
33	CML-I	Tx3p	Transmitter Non-Inverted Data Input	3	
34	CML-I	Tx3n	Transmitter Inverted Data Input	3	
35		GND	Ground	1	
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	

Notes:

1. GND is the symbol for signal and supply (power) common for the module. All are common within the module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the host board signal-common ground plane.
2. VccRx, Vcc1 and VccTx are applied concurrently and may be internally connected within the module in any combination. Vcc contacts in SFF-8662 and SFF-8672 each have a steady state current rating of 1 A.

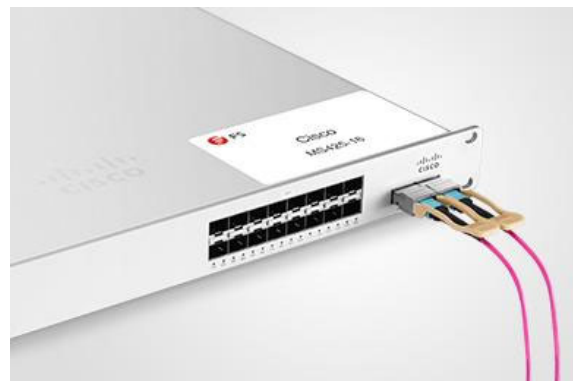
Test Center

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

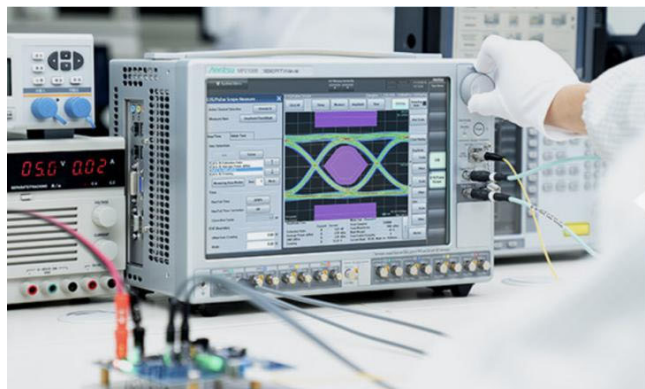


HUAWEI S6720-30L-HI-24S

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.

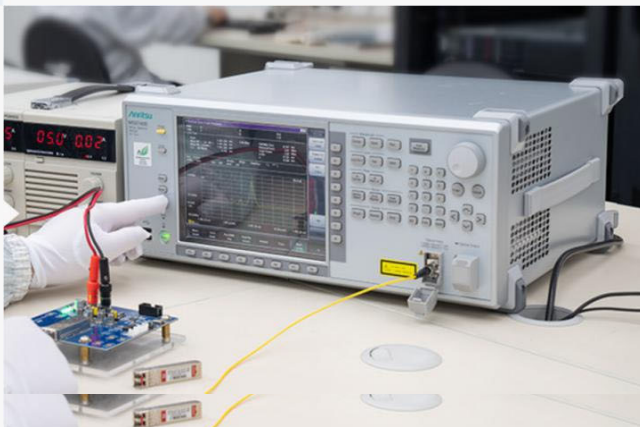
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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
Q28-IR4-100G-I	100GBASE-CWDM4 QSFP28 1310nm 2km Industrial Module
QSFP-ZR4-100G-I	100GBASE-ZR4 QSFP28 1310nm 80km Industrial Module
QSFP-4W20-100G-I	100GBASE-4WDM-20 QSFP28 1310nm 20km Industrial Module
QSFP-4W40-100G-I	100GBASE-4WDM-40 QSFP28 1310nm 40km Industrial Module
QSFP-LR4-100G-I	100GBASE-LR4 QSFP28 1310nm 10km Industrial Module
QSFP-SR4-100G-I	100GBASE-SR4 QSFP28 850nm 100m Industrial Module
QSFP-4W40-100G-E	100GBASE-ER4L QSFP28 1310nm 40km Extended Module