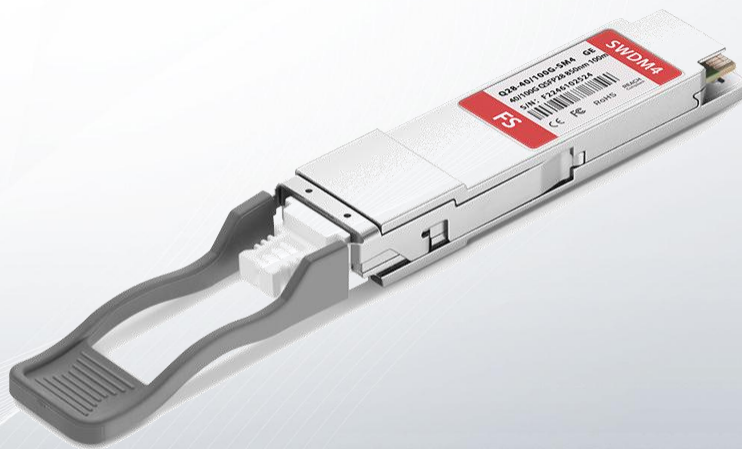


40/100GBASE-SM4 QSFP28 SWDM4 Dual Rate 850nm 100m DOM Transceiver

QSFP-MBIDI-100G



Application

- 40G Ethernet over Duplex MMF
- 100G Ethernet over Duplex MMF

Features

- 4x25Gb/s 850nm VCSEL-based Transmitter
- Hot-pluggable QSFP28 Form Factor
- Supports 40G/100G Dual-Rate Operation
- Power Dissipation<3.5W
- Duplex LC Connector
- Compliant with QSFP28 MSA, SWDM MSA and IEEE802.3bm CAUI-4
- Maximum Link Length of 150m on OM5 Multimode Fiber
- Operating Temperature Range: 0°C to 70°C
- RoHS Compliant

Description

The 40G/100G QSFP28 SWDM4 transceiver modules are designed for use in 40G/100G Ethernet links over duplex multimode fiber. Four channels/lanes in the 850-940nm region @ 10.3125Gb/s / @ 25.78Gbps to transport the Ethernet signal. Digital diagnostics functions are available via an I2C interface, as specified by the QSFP28 MSA.

Specification

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	T _S	-40	85	°C
Supply Voltage	V _{CC}	-0.5	3.6	V
Relative Humidity	RH	15%	85%	

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Max.	Unit
Case Temp-Operating	T _{case}	0	70	°C
Supply Voltage	V _{CC}	3.14	3.46	V
Power Consumption	P		3.5	W
Link Distance on OM3 Fiber(100G)			75	M
Link Distance on OM4 Fiber(100G)			100	M
Link Distance on OM5 Fiber(100G)			150	M

Parameter	Symbol	Min.	Max.	Unit
Link Distance on OM3 Fiber(40G)			240	M
Link Distance on OM4 Fiber(40G)			350	M
Link Distance on OM5 Fiber(40G)			440	M

III. Optical Characteristics @10.3125Gb/s

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Transmitter						
Signaling Rate, Each Lane		10.3125,9.953±100ppm			Gb/s	
Lane Wavelength Range	Lane0 Lane1 Lane2 Lane3	844 874 904 934		858 888 918 948	nm	
Difference in Launch Power Between Any Two Lanes				4.5	dBm	
RMS Spectral Width @850nm @880nm,910nm,940nm	Lane0 Lane1,2,3			0.53 0.59	nm	
Optical Modulation Amplitude (OMA), Each Lane		-5.5		3	dBm	
Average Launch Power Per Lane		-7.5		3	dBm	
Launch Power Tx OMA-TDP	Lane0 Lane1 Lane2 Lane3	-6.4 -6.0 -6.5 -7.0			dBm	
Transmitter and Dispersion Eye Closure	Lane0 Lane1 Lane2 Lane3			3.7 4.0 4.5 5.0	dB	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Extinction Ratio		2			dB	
Optical Return Loss Tolerance		12			dB	
Average Launch Power Per Lane @ TX Off State				-30	dBm	
Encircled Flux		>=86% at 19um <=30% at 4.5um				
Transmitter Eye Mask Definition {X1, x2, X3, Y1, Y2, Y3} Hit Ratio 5x10-5 Hits Per Sample		{0.23,0.34,0.43,0.27,0.35,0.4}				
Receiver						
Signaling Rate, Each Lane		10.3125,9.953±100ppm			Gb/s	
Lane Wavelength Range	Lane0 Lane1 Lane2 Lane3	844 874 904 934		858 888 918 948	nm	
Damage Threshold, Each Lane		3.8			dBm	
Average Receive Power, Each Lane		-12.9 -12.5 -12.2 -11.9		2.4	dBm	
Receiver Power, each lane (OMA)				3	dBm	
Receiver sensitivity OMA, per lane				-9.1	dB	
Difference in Receive Power Between Any Two Lanes(OMA)				5	dB	
RX__Los__Assert		-30			dBm	
RX__Los_ De-ASSERT				-13	dBm	
RX__Los_ Hysteresis		0.5			dBm	
Return Reflectance				-12	dB	

IV. Optical Characteristics @25.78125Gb/s

Parameter	Symbol	Min.	Typ.	Max.	Unit	Ref.
Transmitter						
Signaling Rate, Each Lane		25.78125±100ppm			Gb/s	
Lane Wavelength Range	Lane0 Lane1 Lane2 Lane3	844 874 904 934		858 888 918 948	nm	
Modulation Format	NRZ					
Difference in Launch Power Between Any Two Lanes				4.5	dBm	
RMS Spectral Width				0.59	nm	1
Optical Modulation Amplitude (OMA), Each Lane		-5.5		3	dBm	2
Average Launch Power Per Lane @ TX Off State				-30	dBm	
Launch Power in OMA Minus TDEC	Lane0 Lane1 Lane2 Lane3	-7 -7 -7.4 -7.7			dBm	
Transmitter and Dispersion Eye Closure	Lane0 Lane1 Lane2 Lane3			4 4 4.4 4.8	dB	3
Extinction Ratio		2			dB	
Optical Return Loss Tolerance				12	dB	
Encircled Flux		>86% at 19 um s30% at 4.5 um				4

Parameter	Smbol	Min.	Typ.	Max.	Unit	Ref.
Transmitter						
Transmitter Eye Mask Definition {X1,X2, X3, Y1, Y2. Y3} Hit Ratio 1.5x10-3 Hits Per Sample		{0.3,0.38,0.45,0.35,0.41,0.5}				
Receiver						
Signaling Rate, Each Lane		25.78125±100ppm			Gb/s	
Lane Wavelength Range	Lane0	844		858	nm	
	Lane1	874		888		
	Lane2	904		918		
	Lane3	934		948		
Modulation Format		NRZ				
Damage Threshold		4.4			dBm	
Average Receive Power, Each Lane	Lane0	-9.5		3.4	dBm	
	Lane1	-9.4				
	Lane2	-9.4				
	Lane3	-9.4				
Receiver Power, Each Lane (OMA)				3	dBm	
Receiver Reflectance				-12	dB	
unStressed Receiver Sensitivity(OMA)	Lane0			-8.2	dBm	5
	Lane1			-8.4		
	Lane2			-8.6		
	Lane3			-8.8		
RX_ Los_ Assert		-30			dBm	
RX_ Los_ De-ASSERT				-12	dBm	
RX_ Los_ Hysteresis		0.5			dBm	

- Notes:
1. RMS spectral width is the standard deviation of the spectrum.
 2. The normative lowest value of OMA for a compliant transmitter is 'Launch power in OMA minus TDEC, each lane (min)' plus the actual value of 'TDEC', but with a value of at least 'OMA, each lane miny.
 - 3.'TDEC is calculated from the measured TDECm using the methods in 3.6. TDECm is measured flwing the method in IEE 802.3 clause 95.8.5 using a 12.6 GHz bandwidth reference receiver for all lanes.
 4. If measured into type A1a.2 or tpe A1a.3 50 um fiber in accordance with IEC 61280-1-4.
 - 5.unstressed sensitivity at BER of 5E-5(pre FEC)

V. Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit
Transmitter				
Signaling Rate Per Lane (Range)	25.78125±100 ppm			GBd
Differential Input Return Loss	Equation (83E-5)			dB
Differential to Common Mode Input Return Loss	Equation (83E-6)			dB
Differential Termination Mismatch	10			%
Module Stressed Input Test	See 83E3.4.1			
Differential Pk-pk Input Voltage Tolerance	900			mV
DC Common Mode Voltage	-350		2850	mV
Single Ended Voltage Tolerance Range	-0.4		3.3	V
Receiver				
Signaling Rate Per Lane (Range)	25.78125±100 ppm			GBd
AC Common-mode Output Voltage (RMS)			17.5	mV
Differential Output Voltage	900			mV
Eye Width	0.57			UI
Eye Height, Differential	228			mV
Vertical Eye Closure			5.5	dB
Dfferential Output Return Loss	Equation (83E-2)			dB

Parameter	Min.	Typ.	Max.	Unit
Receiver				
Common to Differential Mode Conversion Return Loss	Equation (83E-3)			dB
Dfferential Termination Mismatch			10	%
Transition Time (20% to 80%)	12			ps
DC Common Mode Voltage	-350		2850	mV

VI. Digital Diagnostic Monitor Characteristics

Parameter	Unit	Specification
Temperature Monitor	°C	± 3
Voltage Monitor	V	± 5 %
I_bias Monitor	mA	± 10 %
Received Power (Rx) Monitor	dB	± 3.0
Transmit Power (Tx) Monitor	dB	± 3.0

VII. Pin Function Definitions

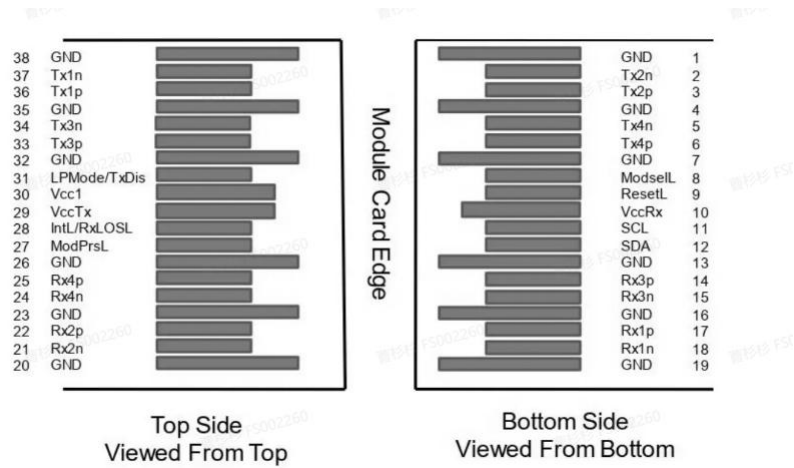


Figure 1: QSFP28-compliant 38-pin connector

VIII. Transceiver Pin Descriptions

Pin No.	Symbol	Description	Ref.
1	GND	Transmitter Ground (Common with Receiver Ground)	1
2	Tx2n	Transmitter Inverted Data Input	
3	Tx2p	Transmitter Non-Inverted Data output	
4	GND	Transmitter Ground (Common with Receiver Ground)	
5	Tx4n	Transmitter Inverted Data Input	
6	Tx4p	Transmitter Non-Inverted Data output	
7	GND	Transmitter Ground (Common with Receiver Ground)	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	VccRx	3.3V Power Supply Receiver	2
11	SCL	2-Wire serial Interface Clock	

Pin No.	Symbol	Description	Ref.
12	SDA	2-Wire serial Interfacc Data	
13	GND	Transmitter Ground (Common with Receiver Ground)	
14	Rx3p	Receiver Non-Inverted Data Output	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Transmitter Ground (Common with Receiver Ground)	
17	Rxlp	Recciver Non-Inverted Data Output	
18	Rxln	Recciver Inverted Data Output	
19	GND	Transmitter Ground (Common with Receiver Ground)	
20	GND	Transmitter Ground (Common with Receiver Ground)	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Transmitter Ground (Common with Receiver Ground)	
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	_Receiver Non-Inverted Data Output	
26	GND	Transmitter Ground (Common with Recciver Ground)	
27	ModPrsl	] Module Present	
28	IntL	[Interrupt	
29	VccTx	3.3V power supply transmitter	2
30	Vccl	3.3V power supply	2
31	LPMODE	Low Power Mode,not connect	
32	GND	Transmitter Ground (Common with Recciver Ground)	

Pin No.	Symbol	Description	Ref.
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Output	
35	GND	Transmitter Ground (Common with Receiver Ground)	
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Output	
38	GND	Transmitter Ground (Common with Receiver Ground)	

Notes:

1. GND is the symbol for signal and supply (power) common for QSFP28modules. All are common within the QSFP28 module and all module voltages are referenced to this potential unless otherwise noted. Connect these directly to the hostboard signal common ground plane.

2. VccRx, Vcc1 and VccTx Tx are the receiving and transmission power suppliers and shall be applied concurrently. Recommended host board power supply filtering is shown below. Vcc Rx, Vcc1 and Vcc Tx Tx may be internally connected within the QSFP28transceiver module in any combination. The connector pins are each rated for a maximum current of 1000mA.

IX. Mechanical Dimensions

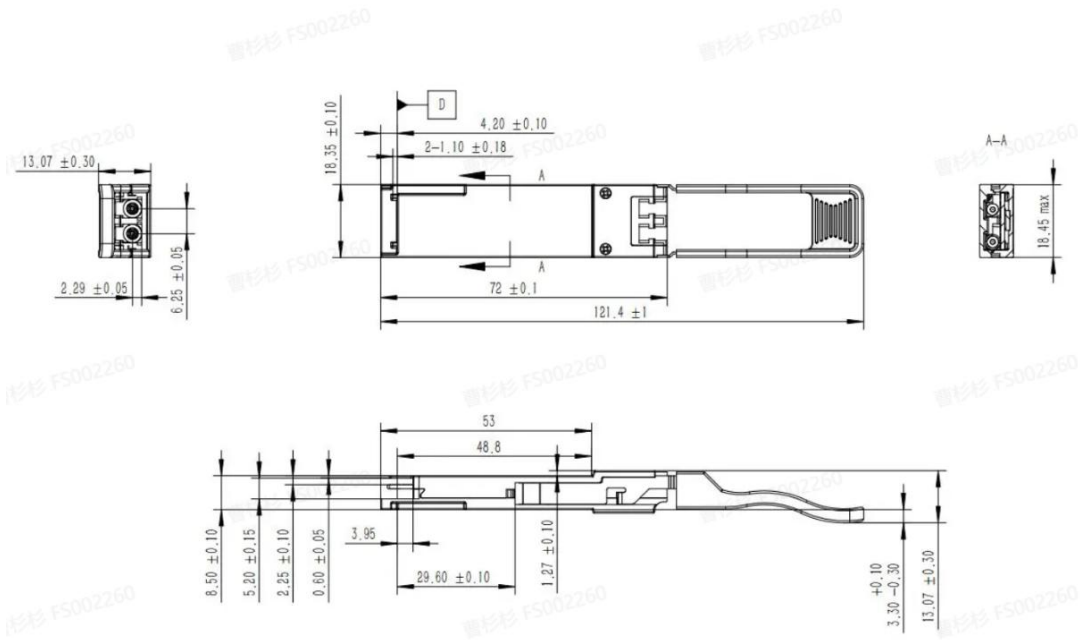


Figure 2: Mechanical dimensions

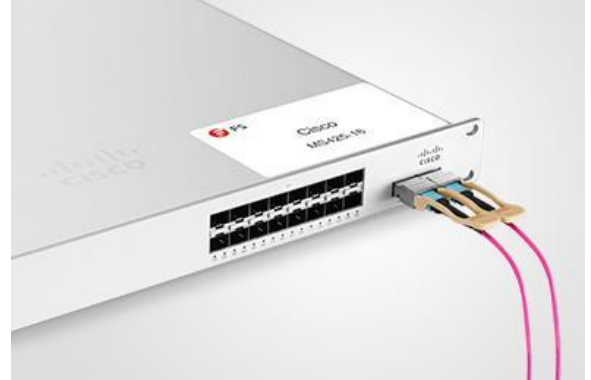
Test Center

I. Compatibility Testing

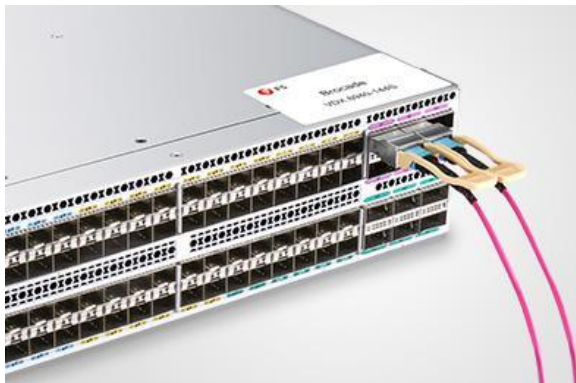
Each fiber optical transceiver has been tested in host device on site in FS Assured Program to ensure full compatibility with over 200 vendors.



Cisco Catalyst C9500-24Y4C



Cisco MS425-16



Brocade VDX 6940-144S



Dell EMC Networking Z9100-ON



Force@tm S60-44T

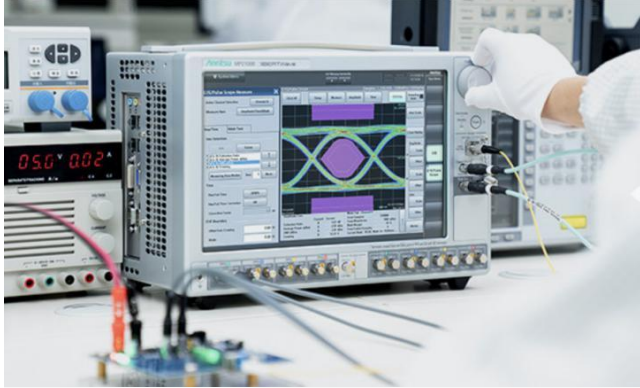


HUAWEI S6720-30L-HI-24S

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.

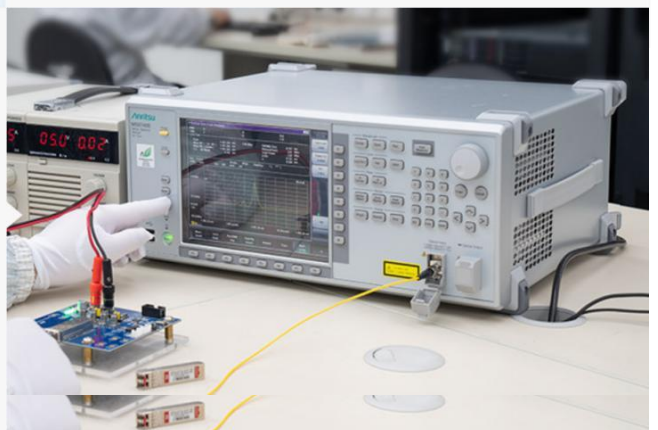
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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



Order Information

Part Number	Description
Q28-40/100G-SM4	40/100GBASE-SM4 QSFP28 SWDM4 Dual Rate 850nm 100m Transceiver
Q28-100/112G-SR4	100GBASE-SR4 and 112GBASE-OTU4 QSFP28 Dual Rate 850nm 100m Transceiver
Q28-100/112G-10	100GBASE-LR4 and 112GBASE-OTU4 QSFP28 Dual Rate 1310nm 10km Transceiver
Q28-100/112G-20	100GBASE-LR4 and 112GBASE-OTU4 QSFP28 Dual Rate 1310nm 20km Transceiver
Q28-100/112G-40	100GBASE-LR4 and 112GBASE-OTU4 QSFP28 Dual Rate 1310nm 40km Transceiver