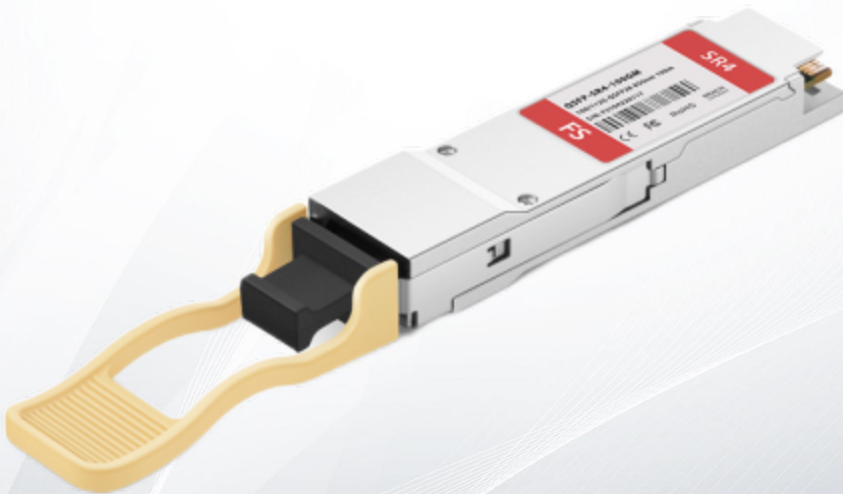


100/112GBASE-OTU4 QSFP28 Dual Rate 850nm 100m DOM Transceiver

QSFP-SR4-100GM



Application

- 100G Ethernet over MPO-12
- 112G Ethernet over MPO-12

Features

- 100Gigabit Ethernet (100GbE) 100GBASE-SR4, 4 x 28Gbit/s OTN and 128G Fibre Channel Multi Rate
- Supports Operations at 100GE (103.1Gbit/s), OTU4 (111.8Gbit/s) and 128G Fibre Channel (112.2Gbit/s)
- Compliant to IEEE 802.3 100GBASE-SR4 and 112G Fibre Channel
- 25.78125 Gbit/s x 4 Channel, 27.95 Gbit/s x 4 Channel and 28.05 Gbit/s x 4 Channel Electrical Interface (CAUI-4)
- Transmission Length up to 70m on OM3(MMF), 100m on OM4 (MMF)
- Compliant to QSFP+ 28Gb/s 4X Pluggable Transceiver Solutions
- Hot Z-Pluggable to 38-pin Electrical Connector
- Operating Temperature Range: 0°C to 70°C
- RoHS6 Compliant

Description

The QSFP28 Optical Transceiver Module is designed for use in 100GBASE Ethernet and 4x 28G OTN client interfaces throughput up to 70m over OM3 multimode fiber (MMF) or 100m over OM4 multimode fiber (MMF) using a wavelength of 850nm via MPO12 connectors. This transceiver is compliant to IEEE 802.3 100GBASE-SR4 and 112G Fibre Channel. Digital diagnostics functions are also available via the I2C interface, as specified by the QSFP28 MSA, to allow access to real-time operating parameters. With these features, this easy to install, hot swappable transceiver is suitable to be used in various applications, such as 100G Ethernet, telecom, service provider applications and 5G wireless network.

Specification

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature Range	T _s	-40	85	°C
Supply Voltage	V _{CC}	-0.3	3.6	V
Relative Humidity	RH	15	85	%

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Data Rate	DR		103.1		Gb/s	1
Bit Error Rate	BER			5E-5		2
Operating Case Temperature	Tcase	0		70	°C	
Fiber Length on MMF(OM3)	L			70	M	3
Fiber Length on MMF(OM4)	L			100	M	3

- Notes:**
- 1. Supports 100GBASE-SR4 per IEEE 802.3-2018. The module supports 4 x 28Gbit/s OTN and 128G Fibre Channel by coding data rate select registers of Lower Page 00h (bytes 87 and 88) to FF FF.
 - 2. Tested with a 231 – 1 PRBS.
 - 3. Requires FEC on the host to support maximum distance, per 100GBASE-SR4.

III. Optical Characteristics @100GBASE-SR4

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Signaling Rate, Each Lane		25.78125 ± 100ppm			Gb/s	1
Center Wavelength	λ	840	850	860	dBm	
RMS Spectral Width	SW	0.6			nm	
Transmit OMA Per Lane	TXP	-6.4		3	dBm	
Transmit Average Power Per Lane	Pout	-8.4	2.4		dBm	
Launch Power in OMA Minus TDEC (Min)	P-TDEC	-7.3			dBm	
Transmitter and Dispersion Eye Closure (TDEC), Each Lane (Max)	TDEC	4.3			dB	
Optical Extinction Ratio	ER	2			dB	
Average Launch Power of OFF Transmitter, Per Lane		-30			dBm	
Optical Return Loss Tolerance	RL			12	dB	
Transmitter Eye Mask Definition {X1,X2,X3,Y1,Y2, Y3}	{0.3,0.38,0.45,0.35,0.41,0.5}				dB	Hit ratio 1.5 × 10–3 hits per sample
Receiver						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	1
Damage Threshold	DT	3.4			dBm	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Average Receive Power Per Lane	RXP	-10.3		2.4	dBm	
Receive Power (OMA) Per Lane	RxOMA			3	dBm	
Receiver Reflectance	Rfl			-12	dB	
Stressed Receiver Sensitivity (OMA), Each Lane (Max)	SEN			-5.2	dBm	2
LOS De-Assert	LOSD			-13	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis	LOSh	0.5			dB	

IV. Optical Characteristics @OTU4 and 128G Fibre Channel

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Signaling Rate, Each Lane		27.95		28.05	Gb/s	
Center Wavelength	λ	840	850	860		
RMS Spectral Width	SW			0.6	nm	
Transmit OMA Per Lane	TXP	-6.6		3	dBm	
Transmit Average Power Per Lane	Pout	-8.5		2.4	dBm	
Launch Power in OMA Minus TDEC (Min)	P-TDEC	-7.5			dBm	
Transmitter and Dispersion Eye Closure (TDEC), Each Lane (Max)	TDEC			4.5	dB	
Optical Extinction Ratio	ER	3			dB	

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Average Launch Power of OFF Transmitter, Per Lane						
Optical Return Loss Tolerance	RL			12	dB	
Transmitter Eye Mask Definition {X1,X2,X3,Y1,Y2, Y3}					32G Fiber Channel Mask	
Receiver						
Signaling Rate Per Lane		27.95		28.05	Gb/s	3
Damage Threshold	DT	3.4				
Average Receive Power Per Lane	RXP	-10.4		2.4	dBm	
Receive Power (OMA) Per Lane	RxOMA			3	dBm	
Stressed Receiver Sensitivity (OMA), Each Lane (Max)	SEN			-4.7	dB	4
Receiver Reflectance	Rfl			-12	dBm	
LOS De-Assert	LSAD			-13	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis	LOSh	0.5			dB	

- Notes:**
- 1. Transmitter and Receiver consists of 4 lasers and photodiode operating at 25.78Gb/s each.
 - 2. Measured with conformance test signal at TP3 (see 95.8.8) for the BER specified in 95.1.1 of IEEE Std 802.3-2018.
 - 3. Transmitter and Receiver consists of 4 lasers and photodiode operating at 27.95Gb/s to 28.05Gb/s each.
 - 4. BER:5E-5 Measured with RPBS2^31 test pattern at 28.05Gbps.

V. Electrical Characteristics

Parameter	Smbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			0.75	A	
Module Total Power	P			2.5	W	1
Transmitter						
Signaling Rate Per Lane (Range)		25.78125 ± 100ppm			GBd	
Differential Output Impedance	Zin		100		Ohm	
Differential Output Voltage Amplitude	Vin			900	mVp-p	
Receiver						
Signaling Rate Per Lane (Range)		25.78125 ± 100ppm			GBd	
Differential Output Impedance	Zout		100		Ohm	
Differential Output Voltage Amplitude	Vout	400		900	mVp-p	
Eye Width		0.57			UI	
Vertical Eye Closure		5.5			dB	
Transition Time, 20% to 80%	Tr/Tf	12			ps	

Notes:
1. Maximum total power value is specified across the full temperature and voltage range.

VI. Digital Diagnostic Functions

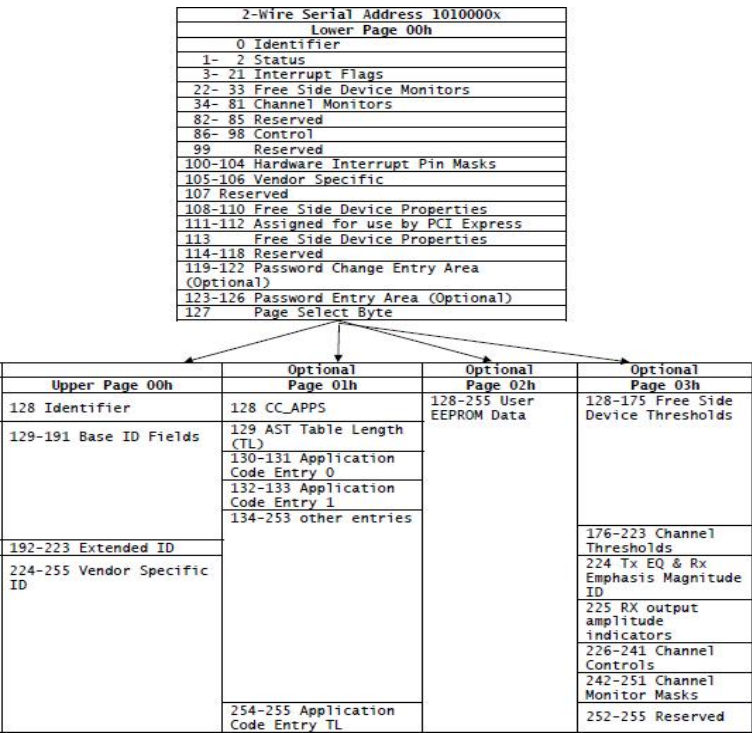


Figure 1: Two-wire interface Ffields

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. The 2-wire serial interface shall consist of a master and slave. The fixed side shall be the master and the free side shall be the slave. Control and data are transferred serially. The master shall initiate all data transfers. Data can be transferred from the master to the slave and from the slave to the master. The 2-wire interface shall consist of clock (SCL) and data (SDA) signals. The master utilizes SCL to clock data and control information on the 2-wire bus. The master and slave shall latch the state of SDA on the positive transitioning edge of SCL. The SDA signal is bi-directional. During data transfer, the SDA signal shall transition when SCL is low. A transition on the SDA signal while SCL is high shall indicate a stop or start condition. For more information, please see the QSFP28 MSA documentation.

VII. Digital Diagnostic Specifications

Parameter	Symbol	Accuracy	Units	Notes
Transceiver Case Temperature	DMI_TEMP	± 3	°C	Over Operating Temp
Supply voltage	DMI_VCC	± 3%	V	Full Operating Range
Channel Bias current	DMI_IBIAS	± 10%	mA	Per Channel
Channel RX power	DMI_RX	± 3	dB	Per Channel
Channel TX power	DMI_TX	± 3	dB	Per Channel

VIII. Pin Function Definitions

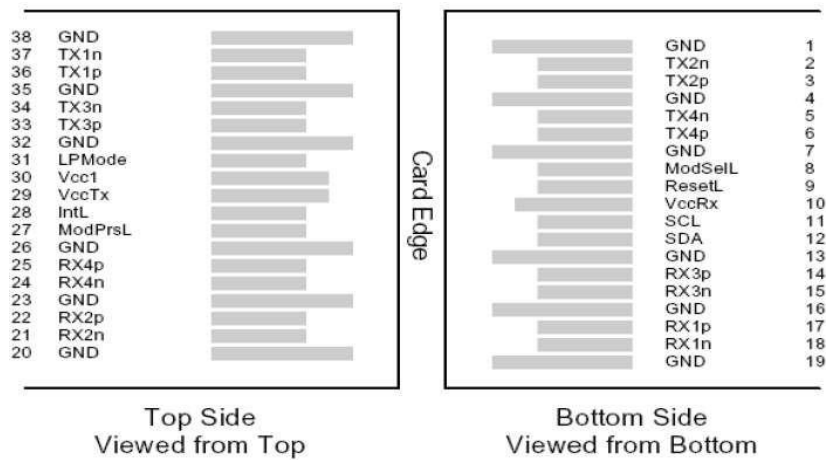


Figure 2: QSFP28-compliant 38-pin connector

IX. Transceiver Pin Descriptions

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

Pin No.	Symbol	Description	Ref.
12	SDA	2-wire Serial Interface Data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted DataOutput	
15	Rx3n	Receiver Inverted Data Output	
16	GND	Ground	1
17	Rx1p	Receiver Non-Inverted Data Output	
18	Rx1n	Receiver Inverted Data Output	
19	GND	Ground	1
20	GND	Ground	1
21	Rx2n	Receiver Inverted Data Output	
22	Rx2p	Receiver Non-Inverted Data Output	
23	GND	Ground	1
24	Rx4n	Receiver Inverted Data Output	
25	Rx4p	Receiver Non-Inverted Data Output	
26	GND	Ground	1
27	ModPrsL	Module Present	
28	IntL	Interrupt	2
29	VccTx	+3.3V Power Supply Transmitter	
30	Vcc1	+3.3V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1

Pin No.	Symbol	Description	Ref.
33	Tx3n	Transmitter Inverted Data Input	
34	GND	Ground	
35	Tx1p	Transmitter Non-Inverted Data Input	1
36	Tx1n	Transmitter Inverted Data Input	
37	GND	Ground	
38	Tx3n	Transmitter Inverted Data Input	1

- Notes:**
- 1. Circuit ground is internally isolated from chassis ground.
 - 2. IntL is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board. The INTL pin is deasserted"High" after completion of reset, when byte 2 bit 0 (Data Not Ready) is read with a value of '0' and the flag field is read (see SFF-8636).

X. Mechanical Dimensions

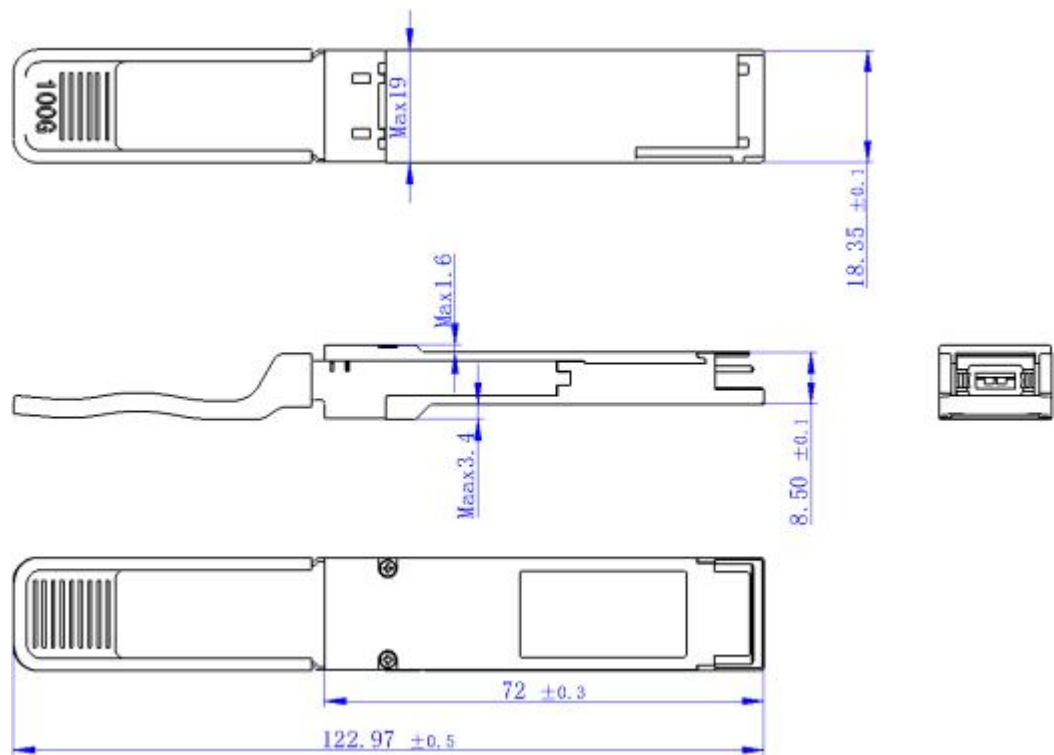


Figure 3: Mechanical dimensions

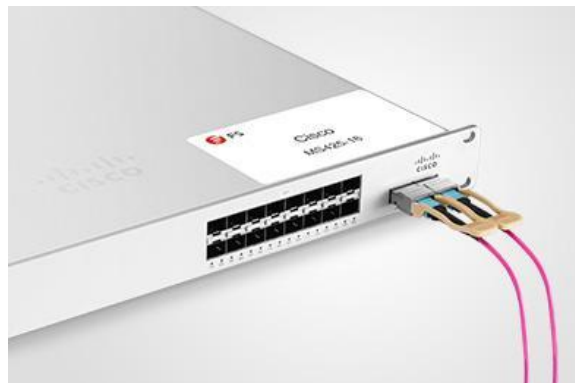
Test Center

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

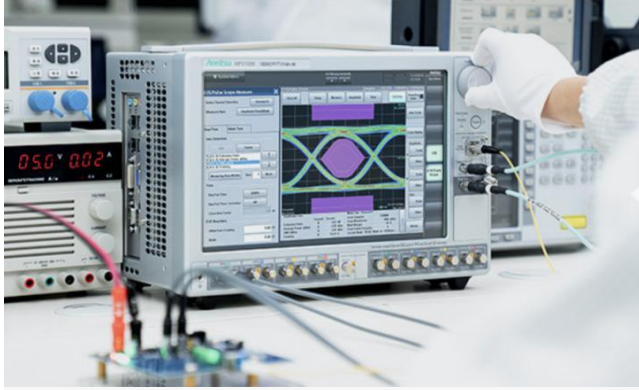


HUAWEI S6720-30L-HI-24S

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.

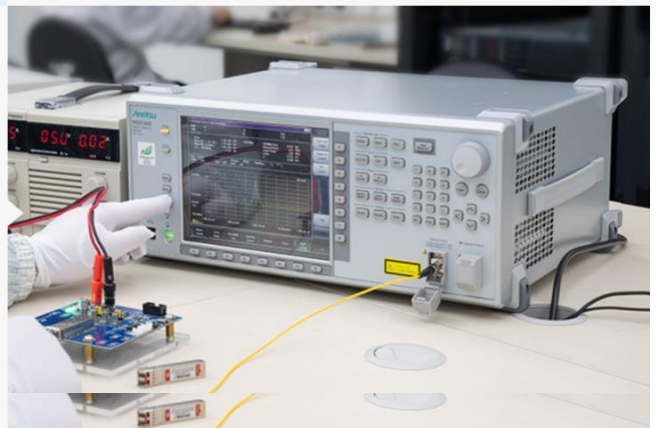
- Ethernet
- Fibre Channel
- SDH/SONET
- CPRI



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
QSFP-SR4-100GM	100GBASE-SR4 and 112GBASE-OTU4 QSFP28 Dual Rate 850nm 100m Transceiver
Q28-40/100G-SM4	40/100GBASE-SM4 QSFP28 SWDM4 Dual Rate 850nm 100m Transceiver
QSFP-LR4-100GM	100GBASE-LR4 and 112GBASE-OTU4 QSFP28 Dual Rate 1310nm 10km Transceiver
QSFP-ELR4-100GM	100GBASE-LR4 and 112GBASE-OTU4 QSFP28 Dual Rate 1310nm 20km Transceiver
QSFP-ER4-100GM	100GBASE-LR4 and 112GBASE-OTU4 QSFP28 Dual Rate 1310nm 40km Transceiver