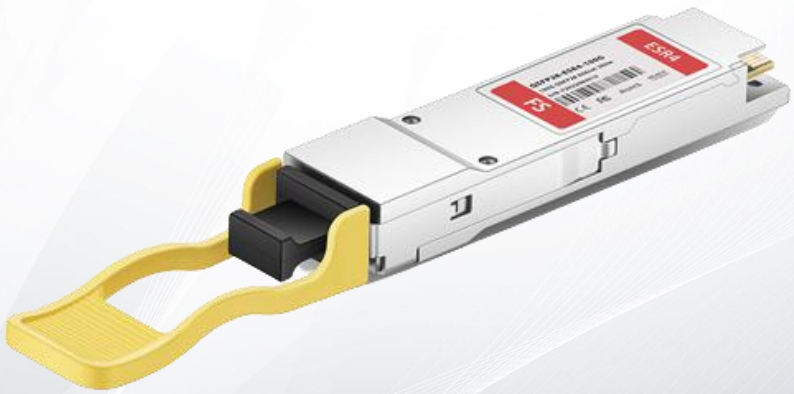
100GBASE-ESR4 QSFP28 850nm 300m DOM Transceiver

QSFP28-ESR4-100G



Application

- 100G BASE-ESR4

Standards

- SFF-8665
- SFF-8636
- SFF-8679
- IEEE 802.3cd

Features

- 100Gigabit Ethernet (100GbE) 100GBASE-SR4
- Supports Operations at 100GE (103.1Gbit/s)
- Compliant to IEEE 802.3 100GBASE-SR4
- 25.78125 Gbit/s x 4 Channel, Electrical Interface (CAUI-4)
- RoHS6 Compliant
- Low Power Consumption≤1.5W
- Compliant to "QSFP+ 28Gb/s 4X Pluggable Transceiver Solutions" (SFF-8665)
- Optical Light Source: 4 x 850NM (VCSEL)
- Transmission Length up to 200M on OM3(MMF), 300M on OM4 (MMF)
- 12 MM Fiber MPO Connector
- Operating Temperature Range: 0℃ to 70℃
- Hot Z-Pluggable to 38-Pin Electrical Connector
- Latching Mechanism: Pull Tab
- Two-Wire Common Management Interface (SFF-8636)

Description

The 100GBASE-ESR4 QSFP28 Optical Transceiver Module is designed for use in 100GBASE Ethernet throughput up to 200m over OM3 MMF or 300m over OM4 MMF using a wavelength of 850nm via a MTP/MPO-12 connector. This transceiver is compliant with IEEE 802.3bm 100GBASE-SR4 and CAUI-4 standard. 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 at key locations optical networks like 100GBASE Ethernet.

Product Specifications

I. Absolute Maximum Ratings (T_C=25℃, Unless Otherwise Noted)

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.	Typical	Max.	Unit	Notes
Storage Temperature	T_s	-40	-	+85	℃	
Maximum Supply Voltage	V_{CC}	-0.3	-	3.6	V	
Operating Relative Humidity	RH	15	-	+85	%	

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Data Rate	DR		103.1		Gb/s	1
Bit Error Rate	BER			5E-5		2
Operating Case Temperature	Tcase	0		70	℃	
Fiber Length on MMF(OM4)	L			300	m	3

Notes:

1. Supports 100GBASE-SR4 per IEEE 802.3-2018.

2. Tested with a 231 – 1 PRBS.

3. Requires FEC on the host to support maximum distance, per 100GBASE-SR4.

III. Electric Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Supply Voltage	V_{CC}	3.135		3.465	V	
Supply Current	Icc			0.75	A	
Module Total Power	P			2.5	W	1
Transmitter						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	
Differential Input Impedance	Zin	100			Ohm	
Differential Input Voltage Amplitude	Vin			900	mVp-p	
Receiver						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	
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.

IV. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Transmitter						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	1
Center Wavelength	λ	840	850	860		
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 Ratio1.5×10^{-3} Hits Per Sample
Receiver						
Signaling Rate Per Lane		25.78125 ± 100ppm			Gb/s	1
Damage Threshold	DT	3.4			dBm	
Average Receive Power Per Lane	RXP	-10.3		2.4	dBm	
Receive Power(OMA) Per Lane	RxOMA			3	dBm	

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Receiver Reflectance	Rfl			-12	dB	
Stressed Receiver Sensitivity(OMA), Each Lane(Max.)	SEN			-5.2	dBm	2
LOS De-Assert	LOS_D			-13	dBm	
LOS Assert	LOS_A	-30			dBm	
LOS Hysteresis	LOS_H	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.

V. Pin Definitions

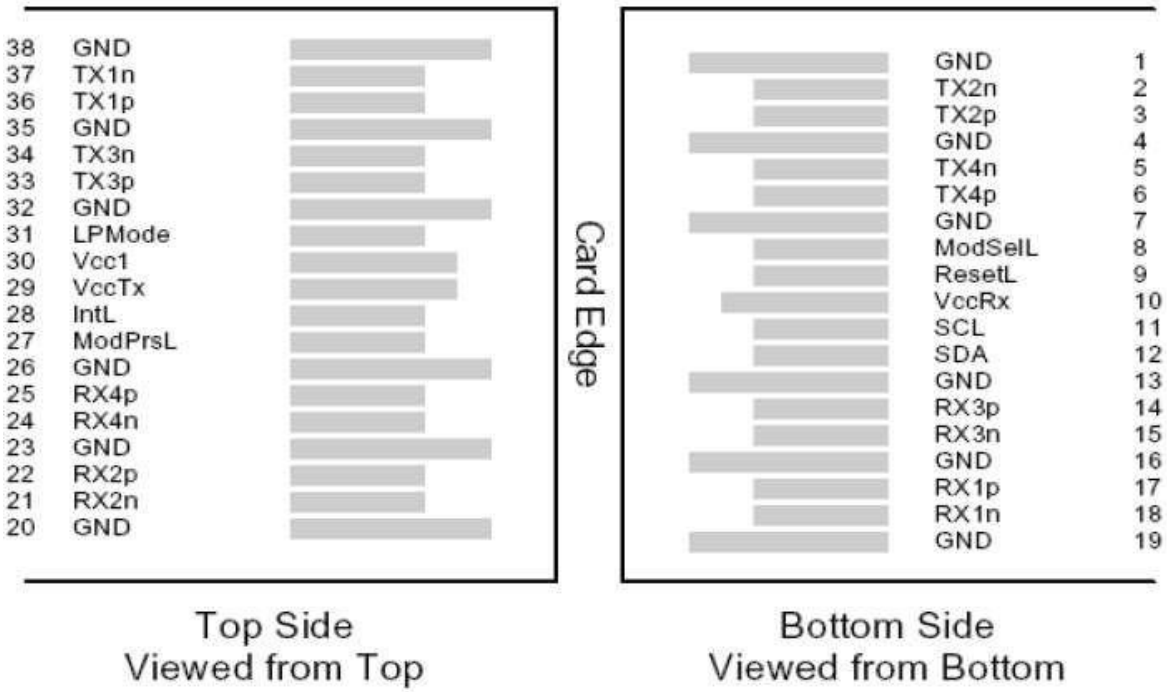


Figure 1 – QSFP28-Compliant 38-Pin Connector (Per SFF-8679)

VI. Pin Descriptions

Pin	Symbol	Name/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	

Pin	Symbol	Name/Description	Ref.
7	GND	Ground	1
8	ModSelL	Module Select	
9	ResetL	Module Reset	
10	V_{CC} Rx	+3.3V Power Supply Receiver	
11	SCL	2-Wire Serial Interface Clock	
12	SDA	2-Wire Serial Interface Data	
13	GND	Ground	1
14	Rx3p	Receiver Non-Inverted Data Output	
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	

Pin	Symbol	Name/Description	Ref.
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	V_{CC}Tx	+3.3V Power Supply Transmitter	
30	V_{CC}1	+3.3V Power Supply	
31	LPMode	Low Power Mode	
32	GND	Ground	1
33	Tx3p	Transmitter Non-Inverted Data Input	
34	Tx3n	Transmitter Inverted Data Input	
35	GND	Ground	1
36	Tx1p	Transmitter Non-Inverted Data Input	
37	Tx1n	Transmitter Inverted Data Input	
38	GND	Ground	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).

VII. Digital Diagnostic Functions

2-Wire Serial Address 1010000x
Lower Page 00h
0 Identifier
1- 2 Status
3- 21 Interrupt Flags
22- 33 Free Side Device Monitors
34- 81 Channel Monitors
82- 85 Reserved
86- 98 Control
99 Reserved
100-104 Hardware Interrupt Pin Masks
105-106 Vendor Specific
107 Reserved
108-110 Free Side Device Properties
111-112 Assigned for use by PCI Express
113 Free Side Device Properties
114-118 Reserved
119-122 Password Change Entry Area (Optional)
123-126 Password Entry Area (Optional)
127 Page Select Byte

Upper Page 00h	Optional Page 01h	Optional Page 02h	Optional Page 03h
128 Identifier	128 CC_APPS	128-255 User EEPROM Data	128-175 Free Side Device Thresholds
129-191 Base ID Fields	129 AST Table Length (TL)		
	130-131 Application Code Entry 0		
	132-133 Application Code Entry 1		
	134-253 other entries		
192-223 Extended ID			176-223 Channel Thresholds
224-255 Vendor Specific ID			224 Tx EQ & Rx Emphasis Magnitude ID
			225 RX output amplitude indicators
			226-241 Channel Controls
			242-251 Channel Monitor Masks
	254-255 Application Code Entry TL		252-255 Reserved

Figure 2 – Two-Wire Interface Fields

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.

VIII. Digital Diagnostic Specifications

Parameter	Symbol	Accuracy	Units	Notes
Transceiver Case Temperature	DMI_TEMP	±3	℃	Over Operating Temp.
Supply Voltage	DMI_V_{CC}	±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

IX. Mechanical Specifications

Unit: mm

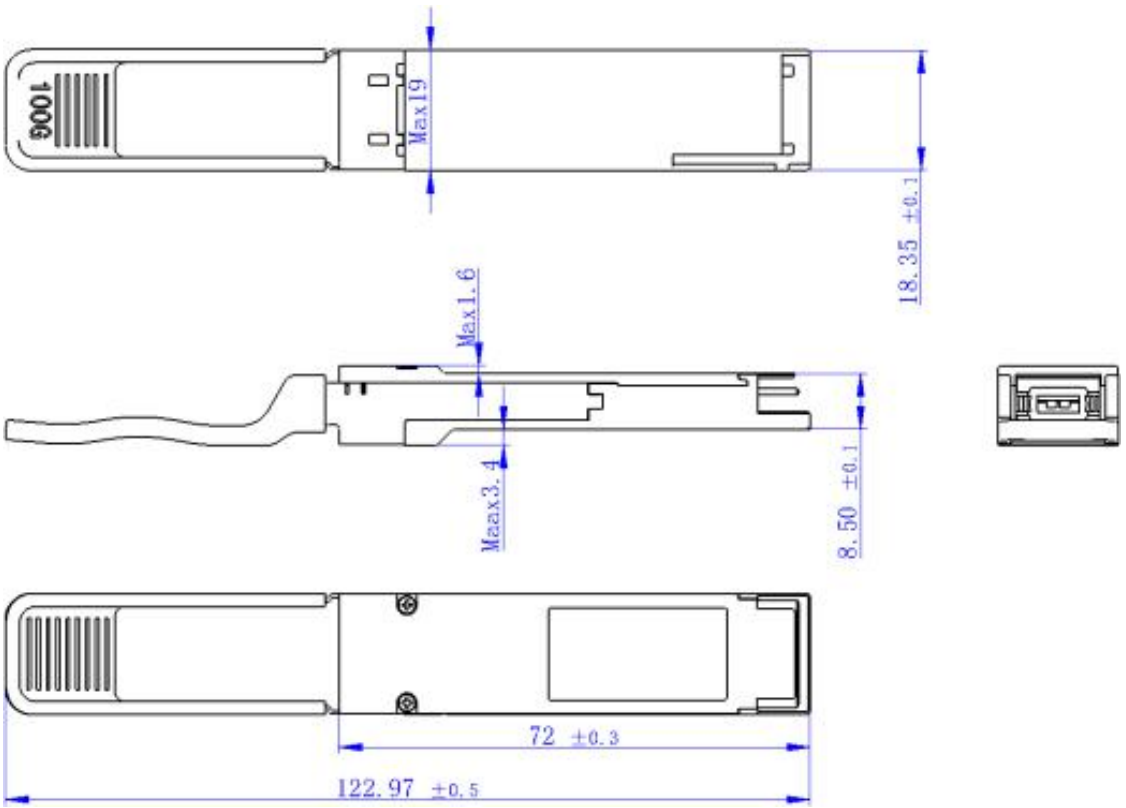


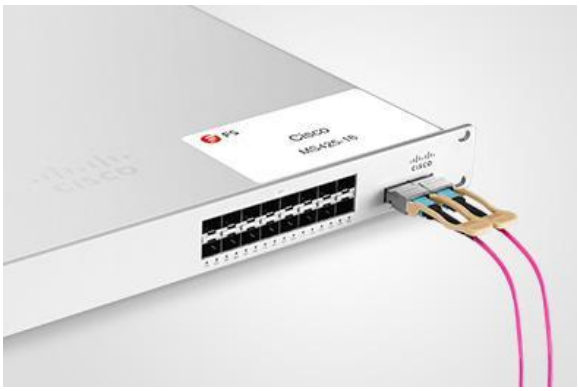
Figure 3 Mechanical Dimensions

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

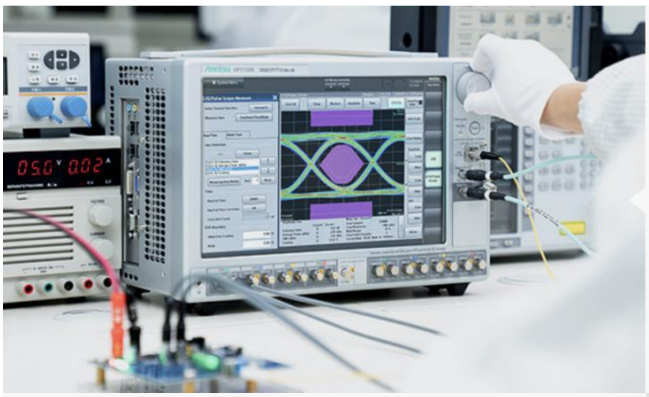
Force⑩tm S60-44T

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
QSFP28-SR4-100G	QSFP28 100GBASE-SR4 850nm 100m Transceiver
QSFP28-BIDI-100G	QSFP28 100GBASE-SR Bi-Directional 850nm 100m Transceiver
QSFP28-ESR4-100G	QSFP28 100GBASE-ESR4 850nm 300m Transceiver
QSFP28-PIR4-100G	QSFP28 100GBASE-PSM4 1310nm 500m Transceiver
QSFP28-IR4-100G	QSFP28 100GBASE-CWDM4 1310nm 2km Transceiver
QSFP28-PSM4-100G	QSFP28 100GBASE-PSM4 1310nm 2km Transceiver
QSFP28-LR4-100G	QSFP28 100GBASE-LR4 1310nm 10km Transceiver
QSFP28-EIR4-100G	QSFP28 100GBASE-eCWDM4 1310nm 10km Transceiver
QSFP28-ER4-100G	QSFP28 100GBASE-ER4 1310nm 40km Transceiver
QSFP28-ZR4-100G	QSFP28 100GBASE-ZR4 1310nm 80km Transceiver
Q28-100/112G-10	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 Dual Rate 1310nm 10km Transceiver
Q28-100/112G-20	QSFP28 100GBASE-LR4 and 112GBASE-OTU4 Dual Rate 1310nm 20km Transceiver
Q28-100/112G-40	QSFP28 100GBASE-ER4 and 112GBASE-OTU4 Dual Rate 1310nm 40km Transceiver
Q28-ER4L-100G-X	QSFP28 100GBASE-ER4L1310nm 40km Extended
QSFP28-ISR4-100G	QSFP28 100GBASE-SR4 850nm 100m Transceiver(Industrial)
QSFP28-ILR4-100G	QSFP28 100GBASE-LR4 1310nm 10km Transceiver(Industrial)
QSFP28-DR-100G	QSFP28 100GBASE-DR 1310nm 500m Transceiver
QSFP28-FR-100G	QSFP28 100GBASE-FR 1310nm 2km Transceiver
QSFP28-LR-100G	QSFP28 100GBASE-LR 1310nm 10km Transceiver

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