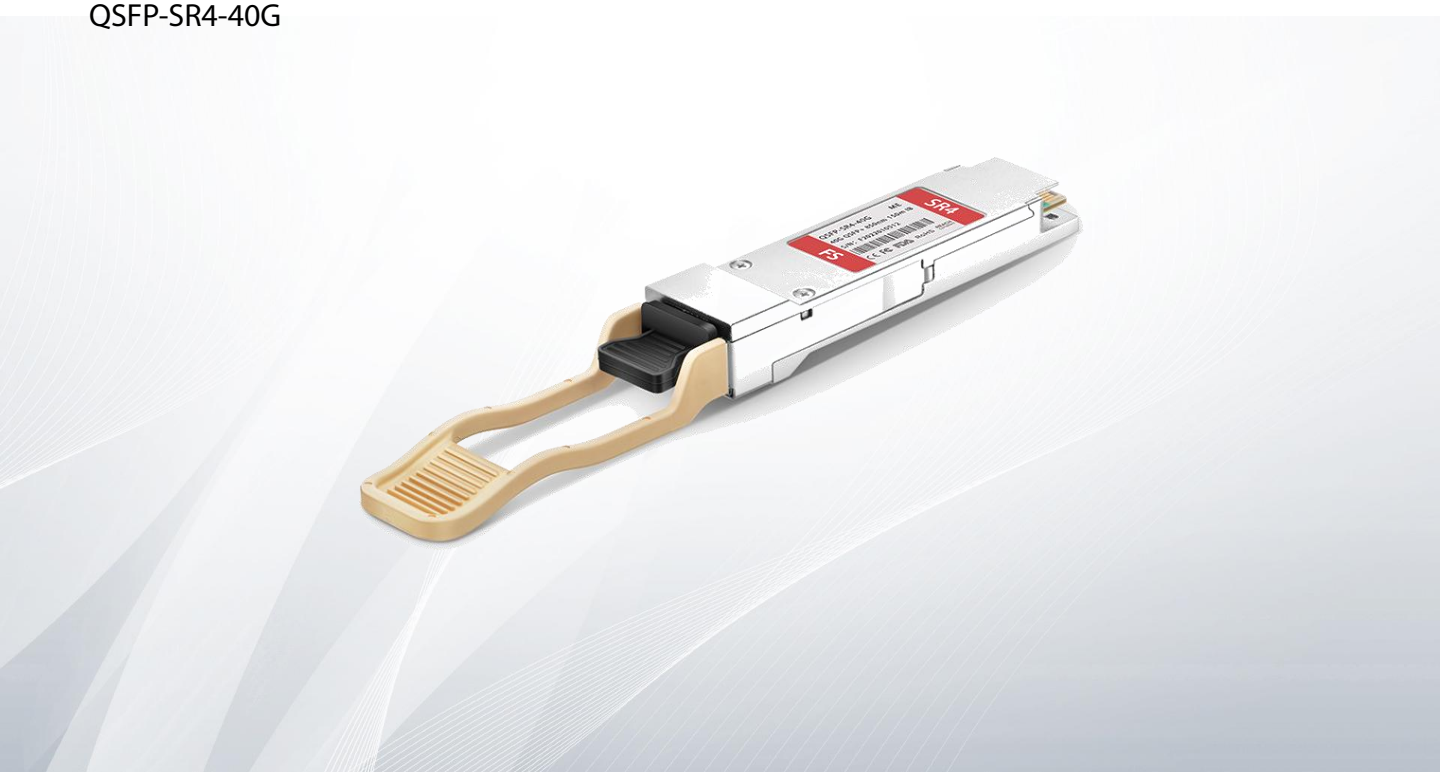
40GBASE-SR4 QSFP+ 850nm 150m DOM Transceiver for InfiniBand FDR10

QSFP-SR4-40G



Application

- InfiniBand FDR10

Standards

- IEEE 802.3 40GBASE-SR4
- QSFP+ MSA
- SFF-8436
- SFF-8472

Features

- Maximum Data Rate per Lane: 10.3125Gb/s
- Max. Power Consumption 1.5W
- Maximum Link Length of 100m on OM3 MMF or 150m on OM4 MMF
- 3.3V Supply Voltage
- 0~70 ºC Case Operating Temperature
- 850nm 4 VCSEL Lasers and 4 Channels PIN Photo Detectors
- MTP/MPO-12 Receptacle
- 2-Wire Interface for Management and Digital Diagnostic Monitoring
- Class 1 Laser Safety

Description

The QSFP+ Optical Transceiver Module is designed for use in 40Gb/s FDR10 InfiniBand systems throughput up to 150m over OM4 or 100m over OM3 multimode fiber (MMF) using a wavelength of 850nm via a MTP/MPO-12 connector. This transceiver is compliant with QSFP+ MSA, SFF-8436, SFF-8472 and IEEE 802.3ba standards. Digital diagnostics functions are also available via the I2C interface, as specified by the QSFP+ 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 InfiniBand, data centers, high-performance computing networks, enterprise core and distribution layer applications.

Product Specifications

I. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T_S	-40		85	℃
Supply Voltage	V_{CC}	-0.5		3.6	V
Relative Humidity (Non-condensing)	RH	5		95	%
Input Voltage	V_{in}	-0.5		V_{CC}+0.5	V

II. Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T_{OPR}	0		70	ºC
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V
Power Supply Current	I_{CC}			475	mA
Maximum Power Dissipation	P_D			1.5	W
Data Rate per Lane	DR		10.3125		Gb/s

Parameter	Symbol	Min.	Typical	Max.	Units	Notes
Operating Distance (MMF OM3)		0.5		100	m	
Operating Distance (MMF OM4)		0.5		150	m	

III. Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Units
Transmitter					
Mean Wavelength, each Lane	λ	840	850	860	nm
Data Rate per Lane	DR		10.3125		Gbps
Spectral Width (RMS)	Δλ			0.65	nm
Optical Powerr, each Lane	P_{OUT}	-7.6		2.4	dBm
OMA per Lane	P_{oma}	-5.6		3	dBm
Peak Power, each Lane	P_peak			4	dBm
Extinction Ratio	ER	3			dB
TDP, each Lane	TDP			3.5	dB
Optical Return Loss Tolerance				12	dB
Average Launch Power Tx_Off, each Lane				-30	dBm
Receiver					
Wavelength, each Lane	λ	840	850	860	nm

Parameter	Symbol	Min.	Typical	Max.	Units
Data Rate per Lane	DR		10.3125		Gbps
Average Power at Receiver, each Lane		-9.5		2.4	dBm
Rx OMA per Lane	OMA			3	dBm
Stressed Receiver Sensitivity OMA, each Lane	SRS			-5.4	dBm
Peak Power, each Lane				4	dBm
Receiver Reflectance	RX_R			-12	dB
LOS Assert	LOS_A	-30			dBm
LOS De-assert	LOS_D			-10	dBm
LOS Hysteresis		0.5			dB

Note:

1. Measured with a PRBS2^{31}-1 test pattern @10.3125Gbps, BER≤10^{-12}.

IV. Electrical Characteristics

1. High Speed Electrical Specifications

Parameter	Symbol	Min.	Typical	Max.	Units
Supply Voltage	V_{cc}	3.135		3.465	V
Supply Current	I_{cc}			450	mA
Input Differential Impedance		90	100	110	Ω
Differential Data Input Swing	$V_{IN, P-P}$	300		1100	mVpp
Differential Data Output Swing	$V_{OUT, P-P}$	300		850	mVpp
Input Logic Level High		2		V_{cc}	
Input Logic Level Low		0		0.8	
Output Logic Level High		V_{cc}-0.5		V_{cc}	
Output Logic Level Low		0		0.4	

2. 2-Wire Electrical Specifications

Parameter	Symbol	Min.	Max.	Units
Host 2-Wire V_{cc} Voltage	V_{cc}_Host_2w	3.14	3.46	V
SCL and SDA Voltage	V_OL	0	0.4	V
	V_OH	V_{cc}_Host_2w-0.5	V_{cc}_Host_2w+0.3	V
	V_IL	-0.3	V_{cc}T*0.3	V
	V_IH	V_{cc}T*0.7	V_{cc}T+0.5	V
Input Current on the SCL and SDA Contacts	Ii	-10	10	mA

V. Timing

Parameter	Symbol	Min.	Max.	Unit	Notes
Clock Frequency	f_scl	100	400	kHZ	1
Clock Pulse Width Low	t_low	1.3		μs	
Clock Pulse Width High	t_high	0.6		μs	
Time Bus Free Before New Transmission Can Start	t_buf	20		μs	2
START Hold Time	t_HD, STA	0.6	0	μs	
START Set-up Time	t_SU, STA	0.6		μs	
Data In Hold Time	t_HD, DAT	0		μs	
Data In Set-up Time	t_SU, DAT	0.1		μs	
Input Rise Time (100kHz)	tr, 100		1000	ns	3
Input Rise Time (400kHz)	tr, 100		300	ns	3
Input Fall Time (100kHz)	tf, 100		300	ns	4
Input Fall Time (400kHz)	tf, 400		300	ns	4
STOP Set-up Time	t_SU, STO	0.6		us	

Notes:

1. Module shall operate with fSCL up to 100 kHz without requiring clock stretching. The module may clock stretch with fSCL greater than 100 kHz and up to 400 kHz.
2. Between STOP and START and between ACK and ReSTART.
3. From (VIL, MAX-0.15) to (VIH, MIN+0.15).
4. From (VIH, MIN+0.15) to (VIL, MAX-0.15).

VI. Pin Definitions

Pin	Logic	Symbol	Name/Description	Plug Sequence	Notes
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

Pin	Logic	Symbol	Name/Description	Plug Sequence	Notes
8	LVTTL-I	ModselL	Module Select	3	
9	LVTTL-I	ResetL	Module Reset	3	
10		V_{CC}Rx	3.3V Power Supply Receiver	2	2
11	LVCMOS-I/O	SCL	2-Wire Serial Interface Clock	3	
12	LVCMOS-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
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	

Pin	Logic	Symbol	Name/Description	Plug Sequence	Notes
26		GND	Ground	1	1
27	LVTTL-O	ModPrsL	Module Present	3	
28	LVTTL-O	IntL	Interrupt	3	
29		V_{CC}Tx	3.3V Power Supply Transmitter	2	2
30		V_{CC}1	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	1
36	CML-I	Tx1p	Transmitter Non-Inverted Data Input	3	
37	CML-I	Tx1n	Transmitter Inverted Data Input	3	
38		GND	Ground	1	1

Notes:

1. GND is the symbol for signal and supply (power) common for the QSFP+ module. All are common within the QSFP+ 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. V_{CC}Rx, V_{CC}1 and V_{CC}Tx are the receiver and transmitter power supplies and shall be applied concurrently. V_{CC}Rx, V_{CC}1 and V_{CC}Tx may be internally connected within the QSFP+ transceiver module in any combination. The connector pins are each rated for a maximum current of 500 mA.

VII. Memory Specifications

Parameter	Symbol	Min.	Max.	Unit	Notes
Serial Interface Clock Holdoff "Clock Stretching"	T_clock_hold		500	μs	1
Complete Single or Sequential Write Up to 4 Byte	tWR		40	ms	
Complete Sequential Write of 5~8 Byte	tWR		80	ms	
Endurance (Write Cycles)		10K		ms	

Note:

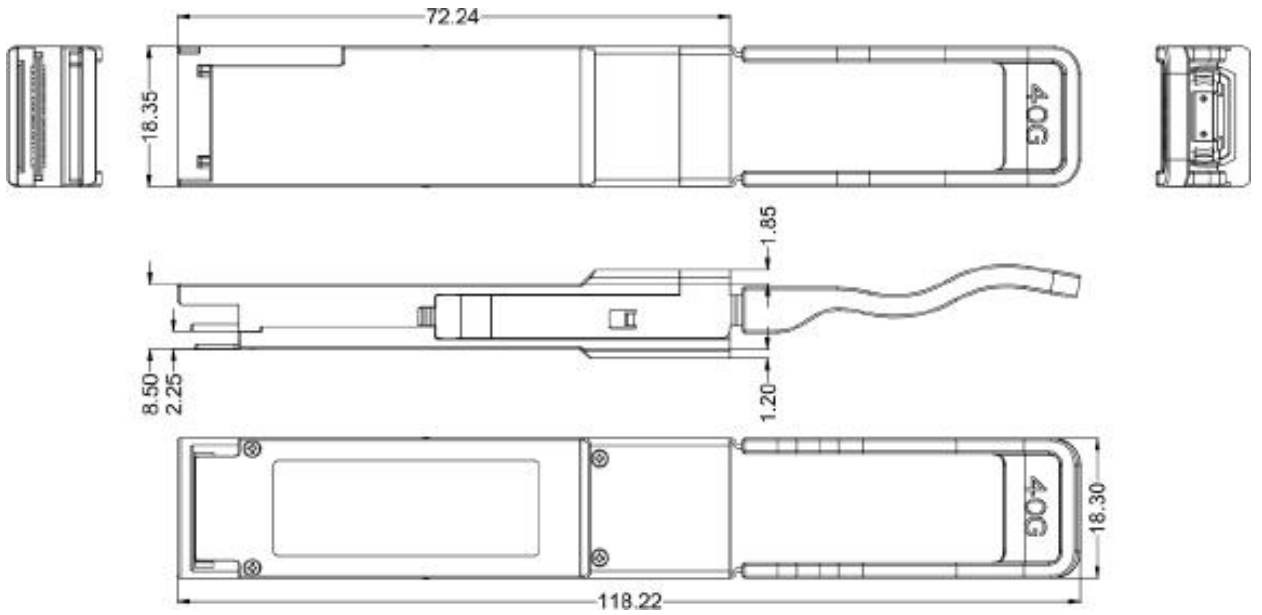
1. Maximum time the QSFP+ module may hold the SCL line low before continuing with a read or write operation.

VIII. Digital Diagnostic Specifications

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0~70	±3	ºC	Internal
Voltage	0~V_{CC}	±3	%	Internal
Tx Bias Current, each Lane	0~15	±10	%	Internal
Tx Output Power	-7.6~2.4	±3	dB	Internal
Rx Power, each Lane	-9.5~2.4	±3	dB	Internal

IX. Mechanical Specifications

Unit: mm

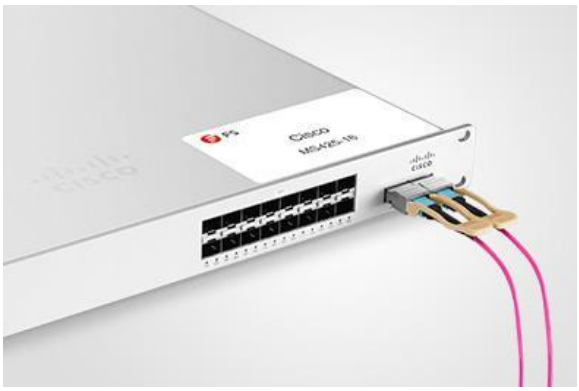


Test Center

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

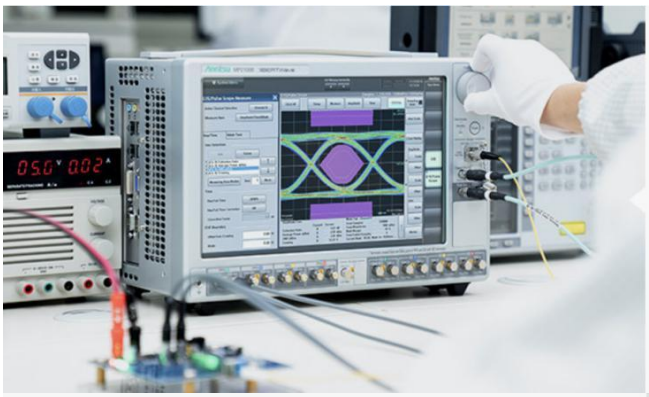
Force⑩tm S60-44T

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
QSFP-SR4-40G	40GBASE-SR4 QSFP+ 850nm 150m MTP/MPO Transceiver for MMF
QSFP-SR4-40G	40GBASE-SR4 QSFP+ 850nm 150m MTP/MPO Transceiver for MMF, InfiniBand FDR10
QSFP-CSR4-40G	40GBASE-CSR4 QSFP+ 850nm 400m MTP/MPO Transceiver for MMF
QSFP-PIR4-40G	40GBASE-PLRL4 QSFP+ 1310nm 1.4km MTP/MPO Transceiver for SMF
QSFP-LX4-40G	40GBASE-UNIV QSFP+ 1310nm 2km LC Transceiver for SMF&MMF
QSFP-IR4-40G	40GBASE-LR4L QSFP+ 1310nm 2km LC Transceiver for SMF
QSFP-LR4-40G	40GBASE-LR4 and OTU3 QSFP+ 1310nm 10km LC Transceiver for SMF
QSFP-LR4-40G	40GBASE-LR4 QSFP+ 1310nm 10km LC Transceiver for SMF, InfiniBand FDR10
QSFP-LR4-40G-20	40GBASE-LR4 QSFP+ 1310nm 20km LC Transceiver for SMF
QSFP-PLR4-40G	40GBASE-PLR4 QSFP+ 1310nm 10km MTP/MPO Transceiver for SMF
QSFP-ER4-40G	40GBASE-ER4 and OTU3 QSFP+ 1310nm 40km LC Transceiver for SMF
QSFP-BD-40G	40GBASE-SR Bi-Directional QSFP LC Duplex Transceiver for MMF
QSFP-BIDI-40G	40GBASE Bi-Directional QSFP+ 850nm 300m DOM LC Transceiver for MMF
QSFP-PLR4-40G-I	40GBASE-PLR4 QSFP+ PSM4 1310nm 10km Industrial MTP/MPO Transceiver for SMF

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