Cisco 100GBASE QSFP-100G Modules

Product Overview

The Cisco® 100GBASE Quad Small Form-Factor Pluggable (QSFP) portfolio offers customers a wide variety of high-density and low-power 100 Gigabit Ethernet connectivity options for data center, high-performance computing networks, enterprise core and distribution layers, and service provider applications. The QSFP-100G modules are our new generation of 100G transceiver modules solution based on a QSFP form factor. (See Figure 1.)

Figure 1. QSFP-100G Optical Modules

Features and Benefits of Cisco QSFP Modules

- Hot-swappable input/output device that plugs into a 100G Gigabit Ethernet Cisco QSFP port
- Interoperable with other IEEE-compliant 100GBASE interfaces where applicable
- Certified and tested on Cisco QSFP-100G ports for superior performance, quality, and reliability
- High-speed electrical interface compliant to IEEE 802.3bm

Table 1 describes the Cisco QSFP-100G portfolio.

Table 1. Cisco QSFP-100G Portfolio

Product	Description	Connector Type
QSFP-100G-SR4-S	100GBASE SR4 QSFP Transceiver, MPO, 100m over OM4 MMF	MPO-12 (12 fibers)
QSFP-40/100-SRBD	100G and 40GBASE SR-BiDi QSFP Transceiver, LC, 100m OM4 MMF	LC
QSFP-100G-LR4-S	100GBASE LR4 QSFP Transceiver, LC, 10km over SMF	LC
QSFP-100G-ER4L-S	100GBASE QSFP Transceiver, 25-40KM reach over SMF, Duplex LC	LC
QSFP-100G-CWDM4-S	100GBASE CWDM4 QSFP Transceiver, LC, 2km over SMF	LC
QSFP-100G-PSM4-S	100GBASE PSM4 QSFP Transceiver, MPO, 500m over SMF	MPO-12 (12 fibers)
QSFP-100G-SM-SR	100GBASE CWDM4 Lite QSFP Transceiver, 2km over SMF, 10-60C	LC
QSFP-100G-CU (1M, 2M, 3M, 5M)	100GBASE-CR4 Passive Copper Cable	
QSFP-4SFP25G-CU (1M, 2M, 3M, 5M)	100GBASE QSFP to 4xSFP25G Passive Copper Splitter Cables	
QSFP-100G-AOC (1M, 2M, 3M, 5M, 7M, 10M, 15M, 20M, 25M, 30M)	100GBASE QSFP Active Optical Cables	

Cisco QSFP-100G-SR4-S

The Cisco 100GBASE-SR4-S QSFP Module supports link lengths of up to 70m (100m) over OM3 (OM4) Multimode Fiber with MPO connectors. It primarily enables high-bandwidth 100G optical links over 12-fiber parallel fiber terminated with MPO multifiber connectors. QSFP-100G-SR4-S supports 100GBase Ethernet rate.

Cisco QSFP-40/100G-SRBD

The Cisco QSFP 40/100 Gb dual-rate bi-directional (BiDi) transceiver is a pluggable optical transceiver with a duplex LC connector interface for short-reach data communication and interconnect applications using Multi-Mode Fiber (MMF). It offers customers a compelling solution that enables reuse of their existing 10 Gb duplex MMF infrastructure for migration to either 40 or 100 Gigabit Ethernet connectivity.

In 40-Gbps mode, the Cisco QSFP 40/100-Gbps BiDi transceiver supports link lengths of 100 and 150 meters on laser-optimized OM3 and OM4 multimode fibers, respectively. In 100-Gbps mode, it supports 70 and 100 meters on OM3 and OM4, respectively.

Each Cisco QSFP 40/100-Gbps BiDi transceiver consists of two transmit and receive channels in the 832-918 nanometer wavelength range, enabling an aggregated 40 or 100-Gbps link over a two-strand multimode fiber connection.

Table 2. Link loss budget for QSFP-40/100-SRBD

Mode	MMF Type	Reach (meters)	Total Loss Budget (dB)	BER
40G	OM3	100	1.9*	1e-15***
	OM4	150	1.5**	1e-12
100G	OM3	70	1.9*	1e-12
	OM4	100	1.9*	1e-12

* Includes 1.5dB connector loss

** Includes 1.0dB connector loss

*** In 40G mode, QSFP-40/100-SRBD has 0.7 decibel incremental margin (in addition to 1.9 decibel total loss budget shown in the table), which can be allocated to connector losses in the link for OM3 fiber for applications when a link BER of 1E-12 is sufficient. Cisco recommends that this margin be allocated to connector losses. Care should be taken to not exceed 120 meters in fiber link distance with the OM3 fiber

Cisco QSFP-100G-ER4L-S

The Cisco QSFP100 ER4-Lite supports link lengths of up to 40km over a standard pair of G.652 single-mode fiber with duplex LC connectors. The 100 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device. Full 40km reach requires the use of FEC on the host platform. Without FEC, the reach is 30km. The QSFP100 ER4-Lite provides backward compatibility with Cisco's CPAK ER4-Lite, whose reach is up to 25km, and with IEEE 100GBASE-ER4 standardized transceivers, such as Cisco's CFP 100G ER4, up to 30km. It also interoperates with Cisco's QSFP100 and CPAK IEEE 100GBASE-LR4 modules up to 10km.

Table 3. Interoperability matrix for QSFP-100G-ER4L-S

Interoperability matrix	QSFP-100G-ER4L-S with host FEC	CFP-100G-ER4 CFP2-100G-ER4 (IEEE 100GBASE-ER4)	QSFP-100G-ER4L-S (no FEC)	CPAK-100G-ER4L	CPAK-100G-LR4 QSFP-100G-LR4-S
QSFP-100G-ER4L-S with host FEC	40km				
CFP-100G-ER4 CFP2-100G-ER4 (IEEE 100GBASE-ER4)	x	40km			
QSFP-100G-ER4L-S (no FEC)	x	30km	30km		
CPAK-100G-ER4L**	x	25km	25km*	25km	
CPAK-100G-LR4 QSFP-100G-LR4-S	x	10km	10km	10km	10km

* Maximum connector insertion loss 1.5dB

** QSFP-100G-ER4L-S interoperating with CPAK-100G-ER4L is considered an engineered link

Cisco QSFP-100G-CWDM4-S

The Cisco QSFP-100G-CWDM4-S Module supports link lengths of up to 2 km over a standard pair of G.652 Single-Mode Fiber (SMF) with duplex LC connectors. The 100 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device.

Cisco QSFP-100G-PSM4-S

The Cisco QSFP-100G-PSM4-S Module supports link lengths of up to 500 meters over SMF with MPO connectors. The 100 Gigabit Ethernet signal is carried over 12-fiber parallel fiber terminated with MPO multifiber connectors.

Cisco QSFP-100G-SM-SR

The Cisco QSFP-100G-SM-SR QSFP module supports link lengths of up to 2 kilometers over a standard pair of G.652 Single-Mode Fiber (SMF) with duplex LC connectors. The 100 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device. The operating temperature range is from +10 to +60°C with an optical link budget of 4.2 decibels. This 4.2-decibel link budget offers the ability to support the loss from patch panels in the link in a data center environment. QSFP-100G-SM-SR is interoperable with QSFP-100G-CWDM4-S.

Cisco QSFP-4SFP25G-CUxM

Cisco QSFP-100G to four SFP-25G copper direct-attach breakout cables (Figure 2) are suitable for very short links and offer a cost-effective way to connect within racks and across adjacent racks. These breakout cables connect to a 100G QSFP port of a Cisco switch on one end and to four 25G SFP ports of a Cisco switch/server on the other end. Cisco currently offers passive cables in lengths of x=1, 2, 3 and 5 meters.

Figure 2. QSFP-4SFP25G-CUxM Cables

Cisco QSFP-100G-CUxM

Cisco QSFP to QSFP copper direct-attach 100GBASE-CR4 cables (Figure 3) are suitable for very short links and offer a cost-effective way to establish a 100-Gigabit link between QSFP-100G ports of Cisco switches within racks and across adjacent racks. Cisco currently offers passive copper cables in lengths of x=1, 2, 3 and 5 meters.

Figure 3. QSFP-100G-CU1M Cables

Cisco QSFP-100G-AOCxM

Cisco QSFP-100G to QSFP-100G AOC cables (Figure 4) are suitable for short distances and offer a flexible way to connect within racks and across racks. Active optical cables are much thinner and lighter than copper cables, which makes cable management easier. AOCs enable efficient system airflow, which is critical in high-density racks. Cisco currently offers active optical cables in lengths of x=1, 2, 3, 5, 7, 10, 15, 20, 25, and 30 meters.

Figure 4. QSFP-100G-AOC3M Cables

Technical Specifications

Platform Support

Cisco QSFP modules are supported on Cisco switches and routers. For more details, refer to the Cisco 100 Gigabit Ethernet Transceiver Modules Compatibility Matrix.

Connectors and Cabling

Refer to Table 4 for connector type information and cabling specifications for each QSFP product.

Table 4. QSFP Port Cabling Specifications

Cisco QSFP	Nominal Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km)*1	Cable Distance	Power Consumption (W)	Pull Tab Color
QSFP-100G-SR4-S	850	MMF	50.0 50.0	2000 (OM3) 4700 (OM4)	70m 100m	3.5	Beige
QSFP-40/100-SRBD	855, 908	MMF	50.0 50.0	2000 (OM3) 4700 (OM4)	70m 100m	3.5	Gray

Cisco QSFP	Nominal Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km)[*1]	Cable Distance	Power Consumption (W)	Pull Tab Color
QSFP-100G-LR4-S	1295, 1300, 1304, 1309	SMF	G.652	-	10km	4.0	Blue
QSFP-100G-ER4L-S	1295, 1300, 1304, 1309	SMF	G.652	-	40km (with host FEC) 30km (without host FEC)	4.5	Red
QSFP-100G-CWDM4-S	1271, 1291, 1311, 1331	SMF	G.652	-	2km	3.5	Green
QSFP-100G-PSM4-S	1310	SMF	G.652	-	500m	3.5	Orange
QSFP-100G-SM-SR	1271, 1291, 1311, 1331	SMF	G.652	-	2km	3.5	Green
QSFP-100G-CU1M	-	Direct-attach copper cable assembly	-	-	1m	1.5	Beige
QSFP-100G-CU2M	-		-	-	2m		Brown
QSFP-100G-CU3M	-		-	-	3m		Orange
QSFP-100G-CU5M	-		-	-	5m		Gray
QSFP-4SFP25G-CU1M	-		-	-	1m		Beige
QSFP-4SFP25G-CU2M	-		-	-	2m		Brown
QSFP-4SFP25G-CU3M	-		-	-	3m		Orange
QSFP-4SFP25G-CU5M	-		-	-	5m		Gray
QSFP-100G-AOC1M	-	Active optical cable assembly	-	-	1m	3.5	Beige
QSFP-100G-AOC2M	-		-	-	2m		Brown
QSFP-100G-AOC3M	-		-	-	3m		Orange
QSFP-100G-AOC5M	-		-	-	5m		Gray
QSFP-100G-AOC7M	-		-	-	7m		Blue
QSFP-100G-AOC10M	-		-	-	10m		Red
QSFP-100G-AOC15M	-		-	-	15m		Black
QSFP-100G-AOC20M	-		-	-	20m		Green
QSFP-100G-AOC25M	-		-	-	25m		Green
QSFP-100G-AOC30M	-		-	-	30m		Green

[*1] Specified at transmission wavelength. For QSFP-40/100-SRBD, Modal Bandwidth is specified at 850nm

Table 5 shows the key optical characteristics for the Cisco QSFP modules.

Table 5. Optical Characteristics

Product	Descriptions	Transmit Power (dBm) per lane[*2]		Receive Power (dBm) per lane[*2*3]		Transmit and Receive Wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
QSFP-100G-SR4-S	100GBASE SR4 QSFP Transceiver, MPO, 100m over OM4 MMF	+2.4	-8.4	+2.4	-10.3	840 to 860
QSFP-40/100G-SRBD	100G and 40GBASE SR-BiDi QSFP Transceiver, LC, 100m OM4 MMF	+4 (100G) +5 (40G)	-6 (100G) -4 (40G)	4 (100G) 5 (40G)	-7.9 (100G) -6 (40G)	855, 908
QSFP-100G-LR4-S	100GBASE LR4 QSFP Transceiver, LC, 10km over SMF	+4.5	-4.3	4.5	-10.6	Four lanes: 1295, 1300, 1304, 1309
QSFP-100G-ER4L-S[*4]	100GBASE QSFP Transceiver, 25-40KM reach over SMF, Duplex LC	+6.5	-2.5	-3.5	-20.5 (with FEC) -17 (without FEC)	Four lanes: 1295, 1300, 1304, 1309

Product	Descriptions	Transmit Power (dBm) per lane[*2]		Receive Power (dBm) per lane[*2*3]		Transmit and Receive Wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
QSFP-100G-CWDM4-S	100GBASE CWDM4 QSFP Transceiver, LC, 2km over SMF	+2.5	-6.5	+2.5	-11.5	Four lanes: 1271, 1291, 1311, 1331
QSFP-100G-PSM4-S	100GBASE PSM4 QSFP Transceiver, MPO, 500m over SMF	+2.0	-9.4	+2	-12.66	1295 to 1325
QSFP-100G-SM-SR	100GBASE CWDM4 Lite QSFP Transceiver, 2km over SMF, 10-60C	+2.5	-6.9	+2.5	-11.1	Four lanes: 1271, 1291, 1311, 1331

[*2] Transmitter and receiver power is average optical power, unless specified

[*3] Optical power at RX is informative only. A received power within this range is required but does not ensure operation

[*4] Minimum channel insertion loss is 6.4dB for QSFP-100G-ER4L-S

Dimensions

Maximum outer dimensions for the QSFP connector module are (H x W x D) 13.5 x 18.4 x 72.4 mm.

Cisco QSFP connector modules typically weigh 100 grams or less.

Environmental Conditions

Operating temperature range:

- Commercial temperature range: 0 to 70°C (32 to 158°F). Exceptions are
  - QSFP-100G-SM-SR: +10 to 60°C (50 to 140°F)
  - QSFP-40/100-SRBD:
    - 100G: +10C to +60C
    - 40G: +10C to +70C
- Storage temperature range: -40 to 85°C (-40 to 185°F)

Warranty

- Standard warranty: 90 days

Ordering Information

Table 6 provides the ordering information for Cisco QSFP 100G modules and related cables.

Table 6. Ordering Information

Description	Product Number
QSFP Optics Modules	
Cisco 100GBASE-SR4 QSFP Transceiver, MPO-12, 100m over OM4 MMF	QSFP-100G-SR4-S
Cisco 100G and 40GBASE SR-BiDi QSFP Transceiver, LC, 100m OM4 MMF	QSFP-40/100-SRBD
Cisco 100GBASE-LR4 QSFP Transceiver, LC, 10km over SMF	QSFP-100G-LR4-S
Cisco 100GBASE QSFP Transceiver, 40KM reach over SMF, Duplex LC	QSFP-100G-ER4L-S
Cisco 100GBASE CWDM4 QSFP Transceiver, LC, 2km over SMF	QSFP-100G-CWDM4-S
Cisco 100GBASE PSM4 QSFP Transceiver, MPO-12, 500m over SMF	QSFP-100G-PSM4-S
Cisco 100GBASE CWDM4 Lite QSFP Transceiver, 2km over SMF, 10-60C	QSFP-100G-SM-SR

Description	Product Number
QSFP Direct-Attach Copper Modules	
Cisco 100GBASE-CR4 QSFP Passive Copper Cable, 1-meter	QSFP-100G-CU1M
Cisco 100GBASE-CR4 QSFP Passive Copper Cable, 2-meter	QSFP-100G-CU2M
Cisco 100GBASE-CR4 QSFP Passive Copper Cable, 3-meter	QSFP-100G-CU3M
Cisco 100GBASE-CR4 QSFP Passive Copper Cable, 5-meter	QSFP-100G-CU5M
Cisco 100GBase QSFP to 4xSFP25G Passive Copper Splitter Cable, 1-meter	QSFP-4SFP25G-CU1M
Cisco 100GBase QSFP to 4xSFP25G Passive Copper Splitter Cable, 2-meter	QSFP-4SFP25G-CU2M
Cisco 100GBase QSFP to 4xSFP25G Passive Copper Splitter Cable, 3-meter	QSFP-4SFP25G-CU3M
Cisco 100GBase QSFP to 4xSFP25G Passive Copper Splitter Cable, 5-meter	QSFP-4SFP25G-CU5M
Cisco 100GBase QSFP Active Optical Cable, 1-meter	QSFP-100G-AOC1M
Cisco 100GBase QSFP Active Optical Cable, 2-meter	QSFP-100G-AOC2M
Cisco 100GBase QSFP Active Optical Cable, 3-meter	QSFP-100G-AOC3M
Cisco 100GBase QSFP Active Optical Cable, 5-meter	QSFP-100G-AOC5M
Cisco 100GBase QSFP Active Optical Cable, 7-meter	QSFP-100G-AOC7M
Cisco 100GBase QSFP Active Optical Cable, 10-meter	QSFP-100G-AOC10M
Cisco 100GBase QSFP Active Optical Cable, 15-meter	QSFP-100G-AOC15M
Cisco 100GBase QSFP Active Optical Cable, 20-meter	QSFP-100G-AOC20M
Cisco 100GBase QSFP Active Optical Cable, 25-meter	QSFP-100G-AOC25M
Cisco 100GBase QSFP Active Optical Cable, 30-meter	QSFP-100G-AOC30M

Regulatory and Standards Compliance

Standards:

- SFF-8665: QSFP+ 28 Gb/s 4X Pluggable Transceiver Solution (QSFP28) - Rev 1.8 May 10, 2013
- SFF-8636: Common Management Interface - DRAFT Rev 1.9 May 12, 2014
- 802.3™-2012 IEEE Standard for Ethernet
- IEEE 802.3ba Amendment of IEEE Std 802.3-2012
- IEEE 802.3bm Amendment of IEEE Std 802.3-2012 (D3.1, 1st August 2014)
- GR-20-CORE: Generic Requirements for Optical Fiber and Optical Fiber Cable
- GR-326-CORE: Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies
- GR-468-CORE: Generic Requirements for Optoelectronic Devices Used in Telecommunications Equipment
- GR-1435-CORE: Generic Requirements for Multifiber Optical Connectors
- RoHS 6

Safety:

- Cable jacket of QSFP copper modules is UL E116441 Compliant
- QSFP copper cables are ELV compliant

Table 7. Laser Class for the QSFP-100G Optical Modules

Product	Laser Class
Cisco QSFP-100G-SR4-S	1
Cisco QSFP-40/100-SRBD	1M
Cisco QSFP-100G-LR4-S	1
Cisco QSFP-100G-ER4L-S	1
Cisco QSFP-100G-CWDM4-S	1
Cisco QSFP-100G-PSM4-S	1
Cisco QSFP-100G-SM-SR	1

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Additional Information

For more information about Cisco 100GBASE QSFP optics and copper modules, contact your sales representative or visit https://www.cisco.com/en/US/products/hw/modules/ps5455/prod_module_series_home.html.

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