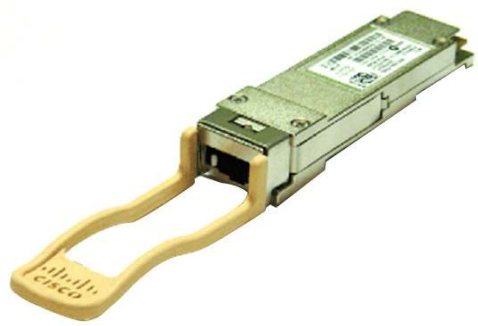
Cisco 40GBASE QSFP Modules

Product Overview

The Cisco® 40GBASE QSFP (Quad Small Form-Factor Pluggable Plus) modules offer customers a wide variety of high-density 40 Gigabit Ethernet connectivity options for data center, high-performance computing networks, enterprise core and distribution layers, and service provider transport applications.

Figure 1 shows a 40GBASE-SR4 QSFP module.

Figure 1. Cisco 40GBASE-SR4 QSFP Module



Features and Benefits

Main features of Cisco 40GBASE QSFP modules include:

- Support for 40GBASE Ethernet
- Hot-swappable input/output device that plugs into a 40-Gigabit Ethernet QSFP Cisco switch port
- Flexibility of interface choice
- Interoperable with other IEEE-compliant 40GBASE interfaces available in various form factors
- Support for “pay-as-you-populate” model
- Support for the Cisco quality identification (ID) feature, which enables a Cisco switch to identify whether the module is certified and tested by Cisco

Cisco QSFP-40G-SR4

The Cisco 40GBASE-SR4 QSFP Module supports link lengths of 100m and 150m respectively on laser-optimized OM3 and OM4 multimode fiber cables. It primarily enables high-bandwidth 40G optical links over 12-fiber ribbon cables terminated with MPO/MTP multifiber connectors. It can also be used in 4x10G mode along with ribbon to duplex fiber breakout cables for connectivity to four 10GBASE-SR optical interfaces. Maximum channel insertion loss allowed is respectively 1.9dB over 100m of OM3 cable or 1.5dB over 150m of OM4 cable.

Cisco FET-40G

The Cisco FET-40G QSFP Module is a fabric extender module used to connect to fabric links (links between the fabric extender switch and patent switch). The interconnect will work over multimode fiber across distances of up to 100m and 150m respectively on laser-optimized OM3 and OM4 multimode fiber cables. This module can be used for native 40G optical links over 12-fiber ribbon cables with MPO/MTP connectors, or in 4x10G mode with ribbon to duplex fiber breakout cables for connectivity to four FET-10G interfaces.

Cisco QSFP-40G-CSR4

The Cisco 40GBASE-CSR4 QSFP Module is similar to the 40GBASE-SR4 interface but it extends supported link lengths to 300m and 400m respectively on laser-optimized OM3 and OM4 multimode fiber cables. Each 10-gigabit lane of this module is compliant to IEEE 10GBASE-SR specifications. This module can be used for native 40G optical links over 12-fiber ribbon cables with MPO/MTP connectors, or in 4x10G mode with ribbon to duplex fiber breakout cables for connectivity to four 10GBASE-SR interfaces. Maximum channel insertion loss allowed is respectively 2.6dB over 300m of OM3 cable or 2.9dB over 400m of OM4 cable.

Cisco QSFP-40GE-LR4

The Cisco 40GBASE-LR4 QSFP Module (Figure 2) supports link lengths of up to 10km over a standard pair of G.652 single-mode fiber with duplex LC connectors. The 40 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device.

Figure 2. Cisco 40GBASE-LR4 QSFP Module

Cisco QSFP to Four SFP+ Copper Breakout Cables

Cisco QSFP to four SFP+ copper direct-attach breakout cables (Figure 3) are suitable for very short distances and offer a highly cost-effective way to connect within racks and across adjacent racks. These breakout cables connect to a 40G QSFP port of a Cisco switch on one end and to four 10G SFP+ ports of a Cisco switch on the other end. Cisco currently offers passive cables in lengths of 1, 3, and 5 meters, and active cables in lengths of 7 and 10 meters.

Figure 3. Cisco QSFP to Four SFP+ Copper Breakout Cables

Cisco QSFP to QSFP Copper Direct-Attach Cables

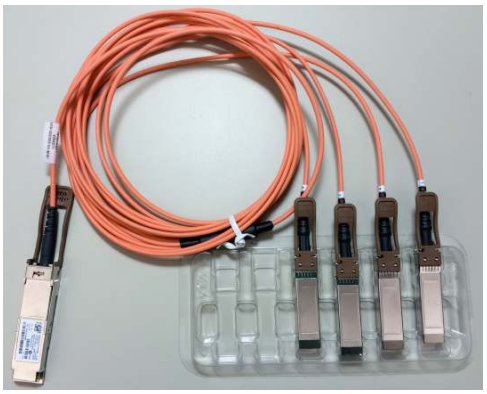
Cisco QSFP to QSFP copper direct-attach 40GBASE-CR4 cables (Figure 4) are suitable for very short distances and offer a highly cost-effective way to establish a 40-Gigabit link between QSFP ports of Cisco switches within racks and across adjacent racks. Cisco currently offers passive cables in lengths of 1, 3, and 5 meters, and active cables in lengths of 7 and 10 meters.

Figure 4. Cisco 40GBASE-CR4 QSFP Direct-Attach Copper Cables

Cisco QSFP to Four SFP+ Active Optical Breakout Cables

Cisco QSFP to four SFP+ active optical breakout cables (Figure 5) are suitable for very short distances and offer a highly cost-effective and flexible way to connect within racks and across adjacent racks. These breakout cables connect to a 40G QSFP port of a Cisco switch on one end and to four 10G SFP+ ports of a Cisco switch on the other end. Cisco currently offers active optical breakout cables in lengths of 1, 2, 3, 5, 7, and 10 meters.

Figure 5. Cisco 40G QSFP to Four SFP+ Breakout Active Optics Cables



Cisco QSFP to QSFP Active Optical Cables

Cisco QSFP to QSFP copper direct-attach 40GBASE-CR4 cables (Figure 6) are suitable for very short distances and offer a highly cost-effective and flexible way to connect within racks and across adjacent racks. Cisco currently offers active optical cables in lengths of 1, 2, 3, 5, 7, 10, and 15 meters.

Figure 6. Cisco 40G QSFP Active Optics Cables

Technical Specifications

Platform Support

Cisco QSFP modules are supported on Cisco switches and routers. For more details, refer to the document "Cisco 40 Gigabit Ethernet Transceiver Modules Compatibility Matrix."

Connectors and Cabling

Connectors: MPO/MTP ribbon connector (-SR4, -CSR4), Duplex LC connector (-LR4).

Note: Only connections with patch cords with PC or UPC connectors are supported. Patch cords with APC connectors are not supported. All cables and cable assemblies used must be compliant with the standards specified in the standards section.

Table 1 provides cabling specifications for the Cisco QSFP modules.

Table 1. QSFP Port Cabling Specifications

Cisco QSFP	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km)***	Cable Distance*
Cisco QSFP-40G-SR4	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	30m 100m 150m**
Cisco FET-40G	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	30m 100m 150m**
Cisco QSFP-40G-CSR4	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	82m 300m 400m
Cisco QSFP-40GE-LR4	1310	SMF	G.652	-	10km
Cisco QSFP-4SFP10G-CU1M	-	Direct-attach copper	-	-	1m
Cisco QSFP-4SFP10G-CU3M	-	Direct-attach copper	-	-	3m
Cisco QSFP-4SFP10G-CU5M	-	Direct-attach copper	-	-	5m
Cisco QSFP-4X10G-AC7M	-	Direct-attach copper	-	-	7m
Cisco QSFP-4X10G-AC10M	-	Direct-attach copper	-	-	10m
Cisco QSFP-H40G-CU1M	-	Direct-attach copper	-	-	1m
Cisco QSFP-H40G-CU3M	-	Direct-attach copper	-	-	3m
Cisco QSFP-H40G-CU5M	-	Direct-attach copper	-	-	5m
Cisco QSFP-H10G-ACU7M	-	Direct-attach copper	-	-	7m
Cisco QSFP-H10G-ACU10M	-	Direct-attach copper	-	-	10m
QSFP-4X10G-AOC1M	-	Active optical cable assembly	-	-	1m
QSFP-4X10G-AOC2M	-	Active optical cable assembly	-	-	2m
QSFP-4X10G-AOC3M	-	Active optical cable assembly	-	-	3m
QSFP-4X10G-AOC5M	-	Active optical cable assembly	-	-	5m
QSFP-4X10G-AOC7M	-	Active optical cable assembly	-	-	7m
QSFP-4X10G-AOC10M	-	Active optical cable assembly	-	-	10m
QSFP-H40G-AOC1M	-	Active optical cable assembly	-	-	1m
QSFP-H40G-AOC2M	-	Active optical cable assembly	-	-	2m
QSFP-H40G-AOC3M	-	Active optical cable assembly	-	-	3m
QSFP-H40G-AOC5M	-	Active optical cable assembly	-	-	5m
QSFP-H40G-AOC7M	-	Active optical cable assembly	-	-	7m
QSFP-H40G-AOC10M	-	Active optical cable assembly	-	-	10m
QSFP-H40G-AOC15M	-	Active optical cable assembly	-	-	15m

* Minimum cabling distance is 0.5m for -SR4 and -CSR4 modules, and 2m for -LR4 according to the IEEE 802.3 standard.
** Considered an engineered link with maximum 1dB allocated to connectors and splice loss.

*** Specified at transmission wavelength.

Note: All Cisco QSFP modules and cables except QSFP-40G-CSR4 exceed IEEE specifications guaranteeing a link bit-error rate (BER) better than 1E-15. QSFP-40G-CSR4 meets IEEE specifications guaranteeing a link BER better than 1E-12.

Table 2 shows the main optical characteristics for the Cisco QSFP modules.

Table 2. Optical Transmit and Receive Specifications

Product	Type	Transmit Power (dBm)*		Receive Power (dBm)*		Transmit and Receive Wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
Cisco QSFP-40G-SR4	40GBASE-SR4, 4 lanes, 850 nm MMF	-1, per lane**	-7.6, per lane	2.4, per lane	-9.5, per lane	840 to 860
Cisco FET-40G	Fabric extender, 4 lanes, 850 nm MMF	-1, per lane**	-8.0, per lane	-1.0, per lane	-9.9, per lane	840 to 860
Cisco QSFP-40G-CSR4	40GBASE-CSR4, 4 lanes, 850 nm MMF	0, per lane	-7.3, per lane	0, per lane	-9.9, per lane	840 to 860
Cisco QSFP-40GE-LR4	40GBASE-LR4, 1310 nm, SMF	2.3, per lane	-7, per lane	2.3, per lane	-13.7, per lane	Four lanes 1271, 1291, 1311, 1331

* Transmitter and receiver power is in average, unless specified.
** Version -01 of QSFP-40G-SR4 allows for a maximum transmit power of +1dBm per lane.

Table 3 describes bail latch or pull tab color code for each type of QSFP module.

Table 3. QSFP Modules Color Code

Product	Color Code
Cisco QSFP-40G-SR4	Beige
FET-40G	Brown
Cisco QSFP-40G-CSR4	Orange
Cisco QSFP-40GE-LR4	Blue
Cisco QSFP-4SFP10G-CU1M	Beige
Cisco QSFP-4SFP10G-CU3M	Orange
Cisco QSFP-4SFP10G-CU5M	Gray
Cisco QSFP-4X10G-AC7M	Blue
Cisco QSFP-4X10G-AC10M	Red
Cisco QSFP-H40G-CU1M	Beige
Cisco QSFP-H40G-CU3M	Orange
Cisco QSFP-H40G-CU5M	Gray
Cisco QSFP-H40G-ACU7M	Blue
Cisco QSFP-H40G-ACU10M	Red
Cisco QSFP-4X10G-AOC1M	Beige
Cisco QSFP-4X10G-AOC2M	Brown
Cisco QSFP-4X10G-AOC3M	Orange
Cisco QSFP-4X10G-AOC5M	Gray
Cisco QSFP-4X10G-AOC7M	Blue
Cisco QSFP-4X10G-AOC10M	Red
Cisco QSFP-H40G-AOC1M	Beige

Product	Color Code
Cisco QSFP-H40G-AOC2M	Brown
Cisco QSFP-H40G-AOC3M	Orange
Cisco QSFP-H40G-AOC5M	Gray
Cisco QSFP-H40G-AOC7M	Blue
Cisco QSFP-H40G-AOC10M	Red
Cisco QSFP-H40G-AOC15M	Black

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 module typically weigh 100 grams or less.

Environmental Conditions and Power Requirements

Operating temperature range:

- Commercial temperature range: 0 to 70℃ (32 to 158° F)
- Storage temperature range: -40 to 85℃ (-40 to 185° F)

Table 4 provides the maximum power consumption ratings per Cisco QSFP module.

Table 4. QSFP Modules Maximum Power Consumption

Product	Power Consumption (W)
Cisco QSFP-40G-SR4	1.5
Cisco FET-40G	1.5
Cisco QSFP-40G-CSR4	1.5
Cisco QSFP-40GE-LR4	3.5
Cisco QSFP-4SFP10G-CU1M	1.5
Cisco QSFP-4SFP10G-CU3M	1.5
Cisco QSFP-4SFP10G-CU5M	1.5
Cisco QSFP-4X10G-AC7M	1.5
Cisco QSFP-4X10G-AC10M	1.5
Cisco QSFP-H40G-CU1M	1.5
Cisco QSFP-H40G-CU3M	1.5
Cisco QSFP-H40G-CU5M	1.5
Cisco QSFP-H40G-ACU7M	1.5
Cisco QSFP-H40G-ACU10M	1.5
Cisco QSFP-4X10G-AOC1M	1.5
Cisco QSFP-4X10G-AOC2M	1.5
Cisco QSFP-4X10G-AOC3M	1.5
Cisco QSFP-4X10G-AOC5M	1.5
Cisco QSFP-4X10G-AOC7M	1.5
Cisco QSFP-4X10G-AOC10M	1.5
Cisco QSFP-H40G-AOC1M	1.5
Cisco QSFP-H40G-AOC2M	1.5
Cisco QSFP-H40G-AOC3M	1.5

Product	Power Consumption (W)
Cisco QSFP-H40G-AOC5M	1.5
Cisco QSFP-H40G-AOC7M	1.5
Cisco QSFP-H40G-AOC10M	1.5
Cisco QSFP-H40G-AOC15M	1.5

Warranty

- Standard warranty: 90 days
- Extended warranty (optional): Cisco QSFP modules can be covered in a Cisco SMARTnet® Service support contract for the Cisco switch or router chassis

Ordering Information

Table 5 provides the ordering information for Cisco SFP+ modules and related cables.

Table 5. Ordering Information

Description	Product Number
QSFP Optics Modules	
Cisco 40GBASE-SR4 QSFP Module for MMF	QSFP-40G-SR4
Cisco Fabric Extender Transceiver	FET-40G
Cisco 40GBASE-CSR4 QSFP Module for MMF	QSFP-40G-CSR4
Cisco 40GBASE-LR4 QSFP Module for SMF	QSFP-40GE-LR4
QSFP Direct-Attach Copper Modules	
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 1-meter, passive	QSFP-4SFP10G-CU1M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 3-meter, passive	QSFP-4SFP10G-CU3M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 5-meter, passive	QSFP-4SFP10G-CU5M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 7-meter, active	QSFP-4X10G-AC7M
Cisco 40GBASE-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 10-meter, active	QSFP-4X10G-AC10M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 1-meter, passive	QSFP-H40G-CU1M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 3-meter, passive	QSFP-H40G-CU3M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 5-meter, passive	QSFP-H40G-CU5M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 7-meter, active	QSFP-H40G-ACU7M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 10-meter, active	QSFP-H40G-ACU10M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 1-meter	QSFP-4X10G-AOC1M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 2-meter	QSFP-4X10G-AOC2M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 3-meter	QSFP-4X10G-AOC3M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 5-meter	QSFP-4X10G-AOC5M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 7-meter	QSFP-4X10G-AOC7M
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 10-meter	QSFP-4X10G-AOC10M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 1-meter	QSFP-H40G-AOC1M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 2-meter	QSFP-H40G-AOC2M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 3-meter	QSFP-H40G-AOC3M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 5-meter	QSFP-H40G-AOC5M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 7-meter	QSFP-H40G-AOC7M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 10-meter	QSFP-H40G-AOC10M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 15-meter	QSFP-H40G-AOC15M

Regulatory and Standards Compliance

Standards:

- 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-1435-CORE: Generic Requirements for Multifiber Optical Connectors
- IEEE 802.3ba (-SR4, -LR4)
- IEEE 802.3ae (-CSR4)
- QSFP+ MSA SFF-8436
- SFP+ MSA SFF-8431 and -8461
- RoHS 6

Safety:

- Laser Class 1M per IEC60825-1 and CFR 21Section 1040
- Cable jacket of QSFP copper modules is UL #E116441 Compliant
- QSFP copper cables are ELV Compliant

Additional Information

For more information about Cisco 40GBASE QSFP optics and copper modules, contact your sales representative or visit http://www.cisco.com/en/US/products/hw/modules/ps5455/prod_module_series_home.html.

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