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Cisco 40GBASE QSFP Modules

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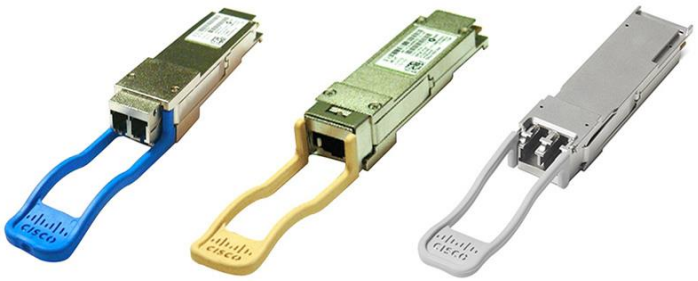
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Product overview

The Cisco® 40GBASE QSFP (Quad Small Form-Factor Pluggable) portfolio offers customers a wide variety of high-density and low-power 40 Gigabit Ethernet connectivity options for data center, high-performance computing 00networks, enterprise core and distribution layers, and service provider applications.



Features and benefits of Cisco QSFP modules

- Hot-swappable input/output device that plugs into a 40 Gigabit Ethernet Cisco QSFP port
- Interoperable with other IEEE-compliant 40GBASE interfaces where applicable
- Certified and tested on Cisco QSFP 40G ports for superior performance, quality, and reliability
- High-speed electrical interface compliant to the IEEE 802.3ba standard
- QSFP Form factor, 2-wire I2C communication interface and other low-speed electrical interface compliant to SFF 8436 and QSFP Multisource Agreement (MSA)

Table 1. Cisco QSFP40G portfolio

Product	Type	Connector Type
QSFP-40G-SR4-S	40GBASE-SR4, 4 lanes, 850 nm MMF	MPO-12
QSFP-40G-SR4	40GBASE-SR4, 4 lanes, 850 nm MMF	MPO-12
QSFP-40G-SR-BD	40GBASE-SR-BiDi, duplex MMF	LC
QSFP-40G-BD-RX	40GBASE-SR-BiDi, duplex MMF, Monitor	LC
FET-40G	Fabric Extender, 4 lanes, 850 nm MMF	MPO-12
QSFP-40G-CSR-S	40GBASE-SR-, duplex MMF	LC
QSFP-40G-CSR4	40GBASE-CSR4, 4 lanes, 850 nm MMF	MPO-12
WSP-Q40GLR4L	40GBASE-LR4-Lite, 1310 nm, SMF	LC
QSFP-40G-LR4-S	40GBASE-LR4, 1310 nm, SMF	LC
QSFP-40G-LR4	40GBASE-LR4, 1310 nm, SMF with OTU3 data-rate support	LC
QSFP-4X10G-LR-S	4x10GBASE-LR	MPO-12
QSFP-40G-ER4	40GBASE-ER4, 1310 nm, SMF with OTU3 data-rate support	LC

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Product	Type	Connector Type
QSFP-H40G-CU (0.5M,1M,2M, 3M,4M, 5M)	QSFP to QSFP copper direct-attach cables	-
QSFP-H40G-ACU (7M, 10M)	QSFP to QSFP copper direct-attach active cables	-
QSFP-4SFP10G-CU (.5M, 1M,2M, 3M,4M, 5M)	QSFP to 4 SFP+ copper break-out cables	-
QSFP-4X10G-AC (7M, 10M)	QSFP to 4 SFP+ copper break-out active cables	-
QSFP-H40G-AOC (1M, 2M, 3M, 5M, 7M, 10M, 15M, 20M, 25M, 30M)	QSFP to QSFP active optical cables	-
QSFP-4X10G-AOC (1M, 2M, 3M, 5M, 7M, 10M)	QSFP to four SFP+ active optical breakout cables	-
CVR-QSFP-SFP10G	QSFP 40G to SFP+ 10G adapter	-

Cisco QSFP-40G-SR4-S (S-Class)

The S-Class Cisco 40GBASE-SR4-S QSFP module supports link lengths of 100 and 150 meters, respectively, on laser-optimized OM3, and OM4/OM5 multimode fibers. QSFP-40G-SR4-S is aligned to IEEE 40GBASE-SR4 optical specifications which support high-bandwidth 40G optical links over 12-fiber parallel fiber terminated with MPO/MTP multifiber female connectors. Because the QSFP-40G-SR4-S does not support 4x10G breakout connectivity, see QSFP-40G-SR4 or QSFP-40G-CSR4 for such applications. QSFP-40G-SR4-S does not support FCoE.

Cisco QSFP-40G-SR4

The Cisco 40GBASE-SR4 QSFP Modules support link lengths of 100 meters and 150 meters, respectively, on laser-optimized OM3, and OM4/OM5 multimode fibers. It primarily enables high-bandwidth 40G optical links over 12-fiber parallel fiber terminated with MPO/MTP multifiber female connectors. It can also be used in a 4x10G breakout mode for interoperability with 10GBASE-SR and SFP-10/25G-CSR-S (in 10G mode) interfaces up to 100 and 150 meters on OM3, and OM4/OM5 fibers, respectively. The worry-free 4x10G mode operation is enabled by the optimization of the transmit and receive optical characteristics of the Cisco QSFP-40G-SR4 to prevent receiver overload or unnecessary triggering of alarm thresholds on the 10GBASE-SR and SFP-10/25G-CSR-S (in 10G mode) receiver, and at the same time is completely interoperable with all standard 40GBASE-SR4 interfaces.

The 4x10G connectivity is achieved using an external 12-fiber parallel to 2-fiber duplex breakout cable, which connects the 40GBASE-SR4 module to four 10GBASE-SR optical interfaces. Cisco QSFP-40G-SR4 is optimized to guarantee interoperability with any IEEE 40GBASE-SR4 and in 4x10G mode with the 10GBASE-SR and SFP-10/25G-CSR (in10G mode).

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Cisco QSFP-40G-SR-BD (40G BiDi)

The Cisco QSFP 40-Gbps BiDirectional (BiDi) transceiver (Figure 1) is a pluggable optical transceiver with a duplex LC connector interface for short-reach data communication and interconnect applications using MultiMode Fiber (MMF). The Cisco QSFP 40-Gbps BiDi transceiver offers customers a compelling solution that enables reuse of their existing 10 gigabit duplex MMF infrastructure for migration to 40 Gigabit Ethernet connectivity.

The Cisco QSFP 40-Gbps BiDi transceiver supports link lengths of 100 and 150 meters on laser-optimized OM3, and OM4/OM5 multimode fibers, respectively.

The Cisco BiDi transceiver complies with the QSFP MSA specification, enabling customers to use it on all QSFP 40-Gbps platforms to achieve high-density 40 Gigabit Ethernet networks.

Each Cisco QSFP 40-Gbps BiDi transceiver consists of two 20-Gbps transmit and receive channels in the 832-918 nanometer wavelength range, enabling an aggregated 40-Gbps link over a two-strand multimode fiber connection.

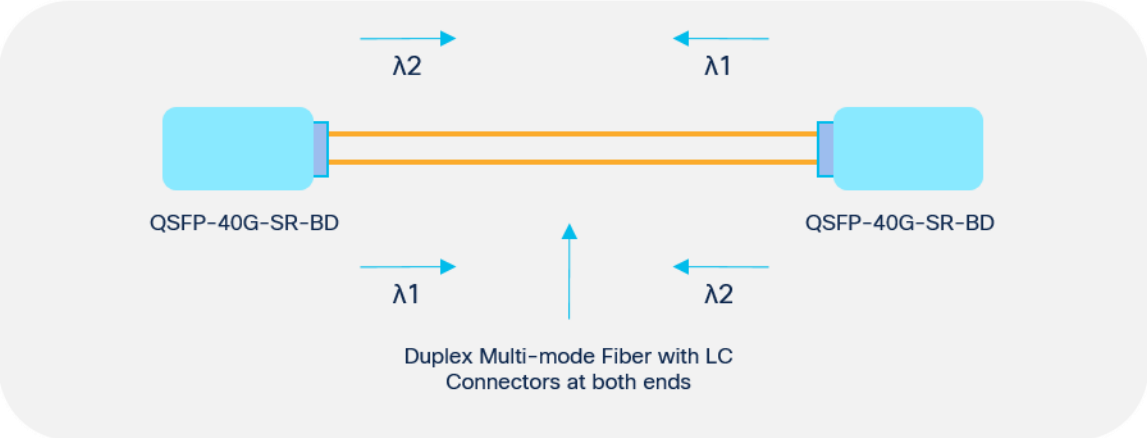


Figure 1.
Cisco QSFP BiDi 40Gbps transceiver: Duplex MMF with LC connectors at both ends

Cisco QSFP-40G-BD-RX

The Cisco QSFP 40-Gbps BiDi monitor is a pluggable optical module for use with link monitor hardware, such as the Cisco Nexus® Data Broker. Like the QSFP BiDi transceiver, it has a duplex MMF LC connector interface. The QSFP BiDi monitor is used only in the monitoring path of a link containing a passive optical tap splitter. The Cisco QSFP monitor offers the same specifications as the QSFP BiDi Transceiver, except that it does not transmit any signal, and thus eliminates the risk of interfering with the live BiDi link path.

Cisco FET-40G

Cisco FET-40G QSFP Modules are fabric-extender transceiver modules used to connect to fabric links (links between the fabric extender switch and the parent switch). The interconnect works over parallel multimode fiber across distances of up to 100 and 150 meters, respectively, on laser-optimized OM3, and OM4/OM5 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 parallel-to-duplex fiber breakout cables for connectivity to four FET-10G interfaces.

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Cisco QSFP-40G-CSR-S (S-Class)

The QSFP-40G-CSR-S is a pluggable optical transceiver with a duplex LC connector interface used for connectivity using MultiMode Fiber (MMF). The Cisco 40GBASE-CSR Modules support link lengths of 300, 400 meters, and 440m respectively, on laser-optimized OM3, OM4 and OM5* multimode fibers. Customers benefit through the reuse of their existing 10 gigabit duplex MMF infrastructure as they migrate to 40 Gigabit Ethernet, while maintaining the same supported link distances as 10G Ethernet on OM3 and OM4. Additionally customers can benefit from improved reach on OM5. Each QSFP-40G-CSR-S operates at four different wavelengths. Each of the four wavelengths operates at 10G over existing duplex multimode fiber using standard LC connectors. The Cisco QSFP-40G-CSR-S transceiver does not support FCoE.

*Depends on fiber quality.

Cisco QSFP-40G-CSR4

Cisco 40GBASE-CSR4 QSFP Modules extend the reach of the IEEE 40GBASE-SR4 interface to 300 and 400 meters on laser-optimized OM3, and OM4/OM5 multimode parallel fiber, respectively. 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 parallel cables with MPO/MTP female connectors or in a 4x10G breakout mode with parallel to duplex fiber breakout cables for connectivity to four 10GBASE-SR interfaces. Cisco QSFP-40G-CSR4 is optimized to guarantee interoperability over the complete specification range of 10GBASE-SR.

Cisco WSP-Q40GLR4L (QSFP-LR4-Lite)

The Cisco WSP-Q40GLR4L 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 40 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device. It is interoperable with 40GBASE-LR4 for distances up to 2 kilometers. The operating temperature range is from +10 to +60°C with an optical link budget of 4 decibels. This 4-decibel link budget offers the ability to support the loss from patch panels in the link in a data center environment.

Cisco QSFP-40G-LR4-S (S-Class)

The Cisco 40GBASE-LR4 QSFP module supports link lengths of up to 10 kilometer over a standard pair of G.652 single-mode fiber with duplex LC connectors. The QSFP-40G-LR4-S module supports 40GBASE Ethernet rate only. The 40 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed in the device. QSFP-40G-LR4-S does not support FCoE.

Cisco QSFP-40G-LR4

The Cisco 40GBASE-LR4 QSFP module supports link lengths of up to 10 kilometers 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.

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Cisco QSFP-4X10G-LR-S (S-Class)

The Cisco QSFP-4X10G-LR-S QSFP module supports link lengths of up to 10km on G.652 Single-Mode Fiber (SMF). It enables high-bandwidth 40G optical links over 12-fiber parallel fiber terminated with MPO/MTP multifiber female connectors. It can also be used in a 4x10G mode for interoperability with 10GBASE-LR interfaces up to 10km.

The 4x10G connectivity is achieved using an external 12-fiber parallel to 2-fiber duplex breakout cable, which connects the 4x10G LR module to four 10GBASE-LR optical interfaces. Cisco's QSFP-4X10G-LR-S is optimized to guarantee interoperability in 4x10G mode over the full specification range of 10GBASE-LR and the SFP-10/25G-LR-S (in 10G mode). QSFP-4X10G-LR-S does not support FCoE.

Cisco QSFP-40G-ER4

The Cisco 40GBASE-ER4 QSFP Module supports link lengths up to 40km over G.652 single-mode fiber with duplex LC connectors. The 40GE or OTU3 signal is carried over four wavelengths in the 1310nm range. Multiplexing and demultiplexing of the four wavelengths are managed within the device.

Cisco QSFP to QSFP copper direct-attach cables

Cisco QSFP to QSFP copper direct-attach 40GBASE-CR4 cables (Figure 3) are suitable for very short distances and offer a very 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 0.5, 1, 2, 3, 4 and 5 meters and active cables in lengths of 7 and 10 meters.



Figure 2.
Cisco 40GBASE-CR4 QSFP direct-attach copper cables

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Cisco QSFP to Four SFP+ copper breakout cables

Cisco QSFP to four SFP+ copper direct-attach breakout cables (Figure 2) are suitable for very short distances and offer a very 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 .5, 1, 2, 3, 4 and 5 meters and active cables in lengths of 7 and 10 meters.

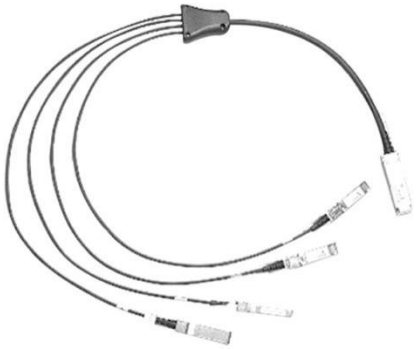


Figure 3.
Cisco QSFP to Four SFP+ copper breakout cables

Cisco QSFP to QSFP active optical cables

Cisco QSFP to QSFP copper direct-attach 40GBASE-CR4 cables (Figure 5) are suitable for very short distances and offer a flexible way to connect within racks and across adjacent racks. Active optical cables are much thinner and lighter than copper cables, which makes cabling easier. Active optical cables enable efficient system airflow and have no EMI issues, which is critical in high-density racks. Cisco currently offers active optical cables in lengths of 1, 2, 3, 5, 7, 10, 15, 20, 25 and 30 meters.

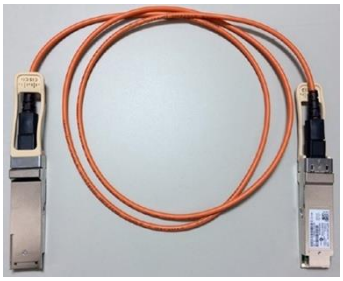


Figure 4.
Cisco 40G QSFP active optics cables

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Cisco QSFP to Four SFP+ active optical breakout cables

Cisco QSFP to four SFP+ active optical breakout cables (Figure 4) are suitable for very short distances and offer a flexible way to connect within racks and across adjacent racks. Active optical cables are much thinner and lighter than copper cables, which makes cabling easier. Active optical cables enable efficient system airflow and have no Electro Magnetic Interference (EMI) issues, which is critical in high-density 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.

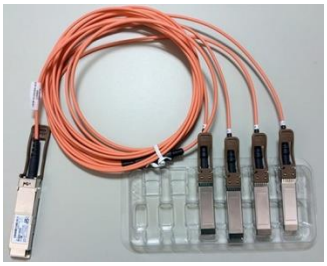


Figure 5.
Cisco 40G QSFP to Four SFP+ breakout active optics cables

Cisco QSFP-40G to SFP and SFP+ Adapter Module

The Cisco QSFP-40G to SFP or SFP+ Adapter (QSA) Module offers 10 Gigabit Ethernet and 1 Gigabit Ethernet connectivity for QSFP 40G ports. It allows smooth and cost-effective migration to 40 Gigabit Ethernet by providing an option to use lower-speed SFP or Enhanced Small Form-Factor Pluggable SFP or SFP+ modules in QSFP+ ports when the other end of the network is running at lower speeds.

The Cisco QSA Module (Figure 6 and Figure 7) converts a QSFP+ port to an SFP or SFP+ port. With this adapter, customers have the flexibility to use a SFP or SFP+ module, or cable to connect to a lower-speed port on the other end of the network. This flexibility allows a cost-effective transition to 40 Gigabit Ethernet by maximizing the use of high-density 40 Gigabit Ethernet QSFP platforms.



Figure 6.
Cisco QSA module



Figure 7.
Cisco QSA Module with SFP or SFP+ Plugged In

Compatible switch models and SFP or SFP+ modules

The list of switch models supporting the Cisco QSA Module is available in the “Cisco Optics-to-Device Compatibility Matrix” at https://tmgmatrix.cisco.com/

A list of Cisco SFP or SFP+ transceiver modules that can be plugged in to the QSA module is provided in the “Cisco Optic-to-Optics Interoperability Matrix” at https://tmgmatrix.cisco.com/iop?tpid=255

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Technical specifications

Following are technical specifications for platform support, and connectors and cabling.

Platform support

Cisco QSFP modules are supported on Cisco switches and routers. For more details, refer to the "Cisco Optics-to-Device Compatibility Matrix" at https://tmgmatrix.cisco.com/

Connectors and cabling

Refer to Table 3 for connector type information and cabling specifications for each QSFP product.

Note: Except for QSFP-4X10G-LR-S, only connections with patch cords with PC or Ultra-Physical Contact (UPC) connectors are supported. QSFP-4X10G-LR-S requires patch cords with Angled Physical Contact (APC) MPO connectors. All cables and cable assemblies used must be compliant with the standards specified in the standards section of this data sheet.

Product specifications

Table 2 provides cabling specifications for the Cisco QSFP modules.

Table 2. QSFP Port cabling specifications

Cisco QSFP	Wavelength (nm)	Cable type	Core size (Microns)	Modal bandwidth (MHz*km)*3	Cable distance*1	Power consumption (W)	Pull tab color
Cisco QSFP-40G-SR4-S	850	MMF	50.0 50.0	2000 (OM3) 4700 (OM4/OM5)	100m 150m*2	1.5	Beige
QSFP-40G-SR4	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4/OM5)	30m 100m 150m*2	1.5	Beige
Cisco QSFP-40G-SR-BD	832 - 918	MMF	50.0 50.0 50.0	500 (OM2)*6 2000 (OM3)*6 4700 (OM4/OM5)*6	30m 100m 150m*2	3.5	Gray
Cisco QSFP-40G-BD-RX	832 - 918	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4/OM5)	30m 100m 150m*2	3.5	Beige (or Gray with "Rx" mark)
FET-40G	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4/OM5)	30m 100m 150m*2	1.5	Brown
QSFP-40G-CSR-S	850	MMF	50.0	2000 (OM3)*6	300m*5	3.5	Orange

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Cisco QSFP	Wavelength (nm)	Cable type	Core size (Microns)	Modal bandwidth (MHz*km)*3	Cable distance*1	Power consumption (W)	Pull tab color
				4700 (OM4)*6 4700 (OM5)*6	400m*5 440m*5		
QSFP-40G-CSR4	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4/OM5)	82m 300m 400m	1.5	Orange
WSP-Q40GLR4L	1310	SMF	G.652	-	2km	3.5	Yellow
Cisco QSFP-40G-LR4-S	1310	SMF	G.652	-	10km	3.5	Blue
QSFP-40G-LR4	1310	SMF	G.652	-	10km	3.5	Blue
QSFP-4X10G-LR-S	1310	SMF	G.652	-	10km	3.5	Blue
QSFP-40G-ER4	1310	SMF	G.652	-	40km*4	3.5	Red
QSFP-H40G-CU0-5M	-	Direct-attach copper cable assembly	-	-	0.5m	1/10	Beige
QSFP-H40G-CU1M	-		-	-	1m		Beige
QSFP-H40G-CU2M	-		-	-	2m		Brown
QSFP-H40G-CU3M	-		-	-	3m		Orange
QSFP-H40G-CU4M	-		-	-	4m		Orange
QSFP-H40G-CU5M	-		-	-	5m		Gray
QSFP-H40G-ACU7M	-		-	-	7m	1.5 each end	Blue
QSFP-H40G-ACU10M	-		-	-	10m		Red
QSFP-4SFP10-CU0-5	-		-	-	.5m	1/10	Beige
QSFP-4SFP10G-CU1M	-		-	-	1m		Beige
QSFP-4SFP10G-CU2M	-		-	-	2m		Brown
QSFP-4SFP10G-CU3M	-		-	-	3m		Orange
QSFP-4SFP10G-CU4M	-		-	-	4m		Orange
QSFP-4SFP10G-CU5M	-		-	-	5m		Gray
QSFP-4X10G-AC7M	-		-	-	7m	1.5 each end	Blue
QSFP-4X10G-AC10M	-		-	-	10m		Red
QSFP-H40G-AOC1M	-		-	-	1m		Beige

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Cisco QSFP	Wavelength (nm)	Cable type	Core size (Microns)	Modal bandwidth (MHz*km)*3	Cable distance*1	Power consumption (W)	Pull tab color
QSFP-H40G-AOC2M	-		-	-	2m		Brown
QSFP-H40G-AOC3M	-		-	-	3m		Orange
QSFP-H40G-AOC5M	-		-	-	5m		Gray
QSFP-H40G-AOC7M	-		-	-	7m		Blue
QSFP-H40G-AOC10M	-		-	-	10m		Red
QSFP-H40G-AOC15M	-		-	-	15m		Black
QSFP-H40G-AOC20M	-		-	-	20m		Green
QSFP-H40G-AOC25M	-	Active optical cable assembly	-	-	25m	1.5 each end	Green
QSFP-H40G-AOC30M	-		-	-	30m		Green
QSFP-4X10G-AOC1M	-		-	-	1m		Beige
QSFP-4X10G-AOC2M	-		-	-	2m		Brown
QSFP-4X10G-AOC3M	-		-	-	3m		Orange
QSFP-4X10G-AOC5M	-		-	-	5m		Gray
QSFP-4X10G-AOC7M	-		-	-	7m		Blue
QSFP-4X10G-AOC10M	-		-	-	10m		Red
CVR-QSFP-SFP10G	-	Adapter	-	-	-	-	-

*1 Minimum cabling distance is 0.5 meters for -SR4 and -CSR4 modules, and 2 meters for -LR4 and -ER4 according to the IEEE 802.3 standard.

*2 Considered an engineered link with maximum 1 decibel loss budget.

*3 Specified at transmission wavelength, when available.

*4 Links longer than 30 km for the same link power budget are considered engineered links as per IEEE 802.3 Table 87-6. Depending upon link architecture, attenuation may be required to guarantee operation.

*5 Depends upon fiber quality.

*6 Modal Bandwidth at 850nm

Note: All Cisco QSFP modules and cables exceed IEEE specifications, guaranteeing a link Bit-Error Rate (BER) better than 1E-15 with some exceptions:

- QSFP-40G-CSR-S guarantees a link BER of 1E-12 when supporting 300/400/440m on OM3/OM4/OM5.
- QSFP-40G-SR-BD guarantees a link BER of 1E-12 when supporting 150/150m on OM4/OM5.
- QSFP-40G-SR4-S guarantees a link BER of 1E-12 when supporting 100/150/150m on OM3/OM4/OM5.
- QSFP-40G-CSR4 complies with IEEE specifications, guaranteeing a link BER better than 1E-12.

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- QSFP-40G-LR4-S guarantees a link BER of 1E-12 when supporting 10km on SMF.
- QSFP-40G-ER4 complies with IEEE/OTU3 specifications, is guaranteed up to BER 1E-12.
- QSFP-4x10G-LR-S guarantees a link BER of 1E-12 when supporting 10km on SMF.
- WSP-Q40GLR4L guarantees a link BER of 1E-12 when supporting 2km on SMF.

Table 3. Loss budget comparison of Cisco QSFP BiDi with 40GBASE-SR4 specifications

Optical modules	MMF type	Reach (Meters)	Total loss budget (dB)	BER
QSFP-40G-SR4	OM3	100m	1.9	1E-15
	OM4/OM5	150/150m	1.5	1E-15
QSFP-40G-SR-BD **QSFP-40G-BD-RX**	OM3	100m	1.9*	1E-15
	OM4/OM5	150/150m	1.5	1E-12

* QSFP-40G-SR-BD has 0.7 decibel incremental margin (in addition to 1.9 decibel total loss budget shown in Table 4), 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.

Table 4. Allowable connector loss for BiDi links

Distance (m)	Allowable connector loss (dB)			
	OM3		OM4/OM5	
	FCoE (BER 1e-15)	Ethernet (BER 1e-12)	FCoE (BER 1e-15)	Ethernet (BER 1e-12)
10	3.9	4.6	3.9	4.6
20	3.8	4.5	3.8	4.5
30	3.7	4.4	3.7	4.4
40	3.5	4.2	3.6	4.3
50	3.3	4.0	3.5	4.2
60	3.1	3.8	3.4	4.1
70	2.8	3.5	3.3	4.0
80	2.5	3.2	3.1	3.8
90	2.0	2.7	2.8	3.5
100	1.5	2.2	2.6	3.3
110	-	-	2.3	3.0
120	-	-	1.9	2.6
130	-	-	1.5	2.2

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Distance (m)	Allowable connector loss (dB)			
	OM3		OM4/OM5	
	FCoE (BER 1e-15)	Ethernet (BER 1e-12)	FCoE (BER 1e-15)	Ethernet (BER 1e-12)
140	-	-	1.0	1.7
150	-	-	0.4	1.1
Comments	Assumed fiber loss at 100m: 0.4dB	Assumed fiber loss at 100m: 0.4dB	Assumed fiber loss at 150m: 0.5dB	Assumed fiber loss at 150m: 0.5dB

Table 5. Allowable connector loss for BiDi links with passive optical tap

Distance (m)	Allowable connector loss (dB)	
	OM3	OM4/OM5
20	1.5	1.5
50	1.0	1.2
75	-	1.0
Comments	Fiber loss @max distance: 0.4dB Ethernet (BER 1e-12) Passive Optical Tap Loss: 3.5dB	

Table 6 shows the key optical characteristics for the Cisco QSFP modules.

Table 6. Optical characteristics

Product	Type	Transmit power (dBm)[*5]		Receive power (dBm)[*5]		Transmit and receive wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
Cisco QSFP-40G-SR4-S	40GBASE-SR4, 4 lanes, 850 nm MMF	2.4, per lane	-7.6, per lane	2.4, per lane	-9.5, per lane	840 to 860
Cisco QSFP-40G-SR4	40GBASE-SR4, 4 lanes, 850 nm MMF	-1, per lane[*6]	-7.6, per lane	2.4, per lane	-9.5, per lane	840 to 860
Cisco QSFP-40G-SR-BD	40GBASE-SR-BiDi, Duplex MMF	+5, per lane	-4, per lane	+5, per lane	-6, per lane	832 to 918
Cisco QSFP-40G-BD-RX	40GBASE-SR-BiDi, Duplex MMF, Monitor	N/A	N/A	+5, per lane	-6, per lane	832 to 918
Cisco FET-40G	Fabric Extender, 4 lanes, 850 nm MMF	-1, per lane[*6]	-8.0, per lane	-1.0, per lane	-9.9, per lane	840 to 860
Cisco QSFP-40G-CSR-S	40GBASE-CSR, Duplex MMF	+3, per lane	-7 per lane	+3, per lane	-9, per lane	Four lanes: 850, 880, 910, 940

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Product	Type	Transmit power (dBm)[*5]		Receive power (dBm)[*5]		Transmit and receive wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
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 WSP-Q40GLR4L	40GBASE-LR4-Lite, 1310 nm, SMF	2.3, per lane	-10, per lane	2.3, per lane	-13.7, per lane	Four lanes: 1271, 1291, 1311, 1331
Cisco QSFP-40G-LR4-S	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
Cisco QSFP-40G-LR4	40GBASE-LR4 with OTU3 data rate support, 1310 nm, SMF	2.3, per lane	-7, per lane	2.3, per lane	-13.7, per lane	Four lanes: 1271, 1291, 1311, 1331
Cisco QSFP-4X10G-LR-S	4x10GBASE-LR, 1310 nm, SMF	0.5, per lane	-8.2, per lane	0.5, per lane	-14.4, per lane	1260 to 1355
Cisco QSFP-40G-ER4	40GBASE-ER4 with OTU3 data rate support, 1310 nm, SMF	4.5, per lane	-2.7, per lane	-4.5, per lane	-21.2, per lane	Four lanes: 1271, 1291, 1311, 1331

[*5] Transmitter and receiver power is average, unless specified.

[*6] Version -01 of QSFP-40G-SR4 allows for a maximum transmit power of +1 decibel per milliwatt per lane.

Table 7. Cable breakout location

Product name	Breakout location (From 40G End)
Copper Cables	
Cisco QSFP-4SFP10-CU0-5	0 meters
Cisco QSFP-4SFP10G-CU1M	0.33 meters
Cisco QSFP-4SFP10G-CU2M	0.66 meters
Cisco QSFP-4SFP10G-CU3M	1 meter
Cisco QSFP-4SFP10G-CU4M	1.5 meters
Cisco QSFP-4SFP10G-CU5M	2 meters
Cisco QSFP-4X10G-AC7M	4 meters
Cisco QSFP-4X10G-AC10M	7 meters

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Product name	Breakout location (From 40G End)
Active Optical Cables	
Cisco QSFP-4X10G-AOC1M	0.33 meters
Cisco QSFP-4X10G-AOC2M	0.66 meters
Cisco QSFP-4X10G-AOC3M	1 meter
QSFP-4X10G-AOC5M	2 meters
Cisco QSFP-4X10G-AOC7M	4 meters
Cisco QSFP-4X10G-AOC10M	7 meters

* The breakout structure should not causing interference with adjacent port module or cable

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.

Table 8 provides the cable dimensions, bend radius, face place distance and jacket material and jacket color for the AOCs and DACs.

Table 8. Cable Dimensions

Product Number	AWG	QSFP end			SFP end			Jacket Material	Jacket Color
		Diameter (mm)	Bend Radius (mm)	Face plate distance (mm)	Diameter (mm)	Bend Radius (mm)	Face plate distance. (mm)		
QSFP-H40G-CU0-5M=	30	7	50	100				PVC	Black
QSFP-H40G-CU1M=	30	7	50	100				PVC	Black
QSFP-H40G-CU2M=	30	7	50	100				PVC	Black
QSFP-H40G-CU3M=	30	7	50	100				PVC	Black
QSFP-H40G-CU4M=	26	9	50	100				PVC	Black
QSFP-H40G-CU5M=	26	9	50	100				PVC	Black
QSFP-H40G-ACU7M=	26	9	50	100				PVC	Black
QSFP-H40G-ACU10M=	26	9	50	100				PVC	Black
QSFP-4SFP10-CU0-5=	30	7	50	100	5	45	70	PVC	Black
QSFP-4SFP10G-CU1M=	30	7	50	100	5	45	70	PVC	Black
QSFP-4SFP10G-CU2M=	30	7	50	100	5	45	70	PVC	Black

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Product Number	AWG	QSFP end			SFP end			Jacket Material	Jacket Color
		Diameter (mm)	Bend Radius (mm)	Face plate distance (mm)	Diameter (mm)	Bend Radius (mm)	Face plate distance. (mm)		
QSFP-4SFP10G-CU3M=	30	7	50	100	5	45	70	PVC	Black
QSFP-4SFP10G-CU4M=	26	9	50	100	5	45	70	PVC	Black
QSFP-4SFP10G-CU5M=	26	9	50	100	5	45	70	PVC	Black
QSFP-4X10G-AC7M=	26	9	50	100	5	45	70	PVC	Black
QSFP-4X10G-AC10M=	26	9	50	100	5	45	70	PVC	Black
QSFP-H40G-AOC1M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC2M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC3M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC5M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC7M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC10M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC15M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC20M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC25M=		3.5	60	115				PVC	Orange
QSFP-H40G-AOC30M=		3.5	60	115				PVC	Orange
QSFP-4X10G-AOC1M=		3.5	60	100	3	30	80	PVC	Orange
QSFP-4X10G-AOC2M=		3.5	60	100	3	30	80	PVC	Orange
QSFP-4X10G-AOC3M=		3.5	60	100	3	30	80	PVC	Orange
QSFP-4X10G-AOC5M=		3.5	60	100	3	30	80	PVC	Orange
QSFP-4X10G-AOC7M=		3.5	60	100	3	30	80	PVC	Orange
QSFP-4X10G-AOC10M=		3.5	60	100	3	30	80	PVC	Orange

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Environmental conditions

Operating temperature range:

- Commercial temperature range: 0 to 70° C (32 to 158° F). Exceptions are
  - QSFP BiDi (QSFP-40G-SR-BD): +10 to 70° C (50 to 158° F)
  - QSFP BiDi Monitor (QSFP-40G-BD-RX): +10 to 70° C (50 to 158° F)
  - QSFP LR4 Lite (WSP-Q40GLR4L): +10 to 60° C (50 to 140° F)
- Storage temperature range: -40 to 85° C (-40 to 185° F)

Warranty

- Standard warranty: 5 years
- Expedited replacement available via a Cisco SMARTnet® Service support contract

Product Sustainability

Information about Cisco's environmental, social and governance (ESG) initiatives and performance is provided in Cisco's CSR and sustainability reporting.

Table 9. Product Sustainability

Sustainability Topic		Reference
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteriesand packaging	WEEECompliance
	Information on product takeback and resuse program	CiscoTakeback and Reuse Program
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
Power	Power (including Pluggable)	Table 2: Power Consumption
Material	Product packaging weight and materials	Contact: environment@cisco.com
	Weight	Dimensions section: page 16

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Ordering information

Table 10 provides the ordering information for Cisco SFP+ modules and related cables.

Table 10. Ordering information

Description	Product number
QSFP Optics Modules	
Cisco 40GBASE-SR4 QSFP Module for MMF	QSFP-40G-SR4-S
Cisco 40GBASE-SR4 QSFP Module for MMF	QSFP-40G-SR4
Cisco 40GBASE-SR Bi-Directional QSFP Module for Duplex MMF	QSFP-40G-SR-BD
Cisco 40GBASE-SR Bi-Directional QSFP Monitor Module for Duplex MMF	QSFP-40G-BD-RX
Cisco Fabric Extender Transceiver	FET-40G
Cisco 40GBASE-CSR QSFP Module for Duplex MMF	QSFP-40G-CSR-S
Cisco 40GBASE-CSR4 QSFP Module for MMF	QSFP-40G-CSR4
Cisco 40GBASE-LR4L QSFP Module for SMF	WSP-Q40GLR4L
Cisco 40GBASE-LR4 QSFP Module for SMF	QSFP-40G-LR4-S
Cisco 40GBASE-LR4 QSFP Module for SMF with OTU-3 data-rate support	QSFP-40G-LR4
Cisco 4x10GBASE-LR QSFP Modules for SMF	QSFP-4X10G-LR-S
Cisco 40GBASE-ER4 Module for SMF with OTU-3 data-rate support	QSFP-40G-ER4
QSFP Direct-Attach Copper Modules	
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 0.5-meter, passive	QSFP-H40G-CU0-5M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 1-meter, passive	QSFP-H40G-CU1M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 2-meter, passive	QSFP-H40G-CU2M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 3-meter, passive	QSFP-H40G-CU3M
Cisco 40GBASE-CR4 QSFP direct-attach copper cable, 4-meter, passive	QSFP-H40G-CU4M
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-CR4 QSFP to 4 10GBASE-CU SFP+ direct-attach breakout cable, 1/2-meter, passive	QSFP-4SFP10-CU0-5

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Description	Product number
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, 2-meter, passive	QSFP-4SFP10G-CU2M
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, 4-meter, passive	QSFP-4SFP10G-CU4M
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-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
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 20-meter	QSFP-H40G-AOC20M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 25-meter	QSFP-H40G-AOC25M
Cisco 40GBase-AOC QSFP direct-attach Active Optical Cable, 30-meter	QSFP-H40G-AOC30M
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
QSFP 40G to SFP+ 10G Adapter Module	CVR-QSFP-SFP10G

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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:

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

Table 11. Laser class

Product	Laser Class
Cisco QSFP-40G-SR4-S	1
Cisco QSFP-40G-SR4	1M
Cisco QSFP-40G-SR-BD	1M
Cisco QSFP-40G-BD-RX	1
Cisco FET-40G	1
Cisco QSFP-40G-CSR-S	1
Cisco QSFP-40G-CSR4	1M
Cisco WSP-Q40GLR4L	1
Cisco QSFP-40G-LR4-S	1
Cisco QSFP-40G-LR4	1
Cisco QSFP-4X10G-LR-S	1
Cisco QSFP-40G-ER4	1

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Additional information

For more information about Cisco 40GBASE 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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Document history

New or Revised	Topic	Described In Date
Addition of 440m reach on OM5 for QSFP-40G-CSR-S	For the power section refer to Table 2: Power consumption Weight is in Dimensions section on Page 16	
	Table 2: Cable distance	April 26, 2022

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