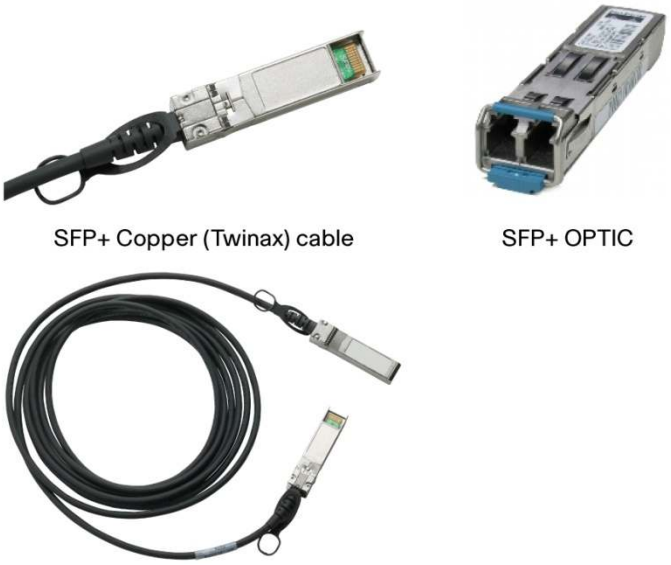
Cisco 10GBASE SFP+ Modules

Product Overview

The Cisco® 10GBASE SFP+ modules (Figure 1) offer customers a wide variety of 10 Gigabit Ethernet connectivity options for data center, enterprise wiring closet, and service provider transport applications.

Figure 1. Cisco 10GBASE SFP+ Modules



Features and Benefits

Main features of Cisco 10GBASE SFP+ modules include:

- Smallest 10G form factor
- Supports 10GBASE Ethernet
- Hot-swappable input/output device that plugs into an Ethernet SFP+ port of a Cisco switch
- Provides flexibility of interface choice
- Supports “pay-as-you-populate” model
- Supports digital optical monitoring capability
- Supports the Cisco quality identification (ID) feature that enables a Cisco switch to identify whether the module is certified and tested by Cisco
- Optical interoperability with 10GBASE XENPAK, 10GBASE X2, and 10GBASE XFP interfaces on the same link

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Cisco SFP-10G-SR

The Cisco 10GBASE-SR Module supports a link length of 26m on standard Fiber Distributed Data Interface (FDDI)-grade multimode fiber (MMF). Using 2000MHz*km MMF (OM3), up to 300m link lengths are possible. Using 4700MHz*km MMF (OM4), up to 400m link lengths are possible.

Cisco SFP-10G-LRM

The Cisco 10GBASE-LRM Module supports link lengths of 220m on standard Fiber Distributed Data Interface (FDDI) grade multimode fiber (MMF). To ensure that specifications are met over FDDI-grade, OM1 and OM2 fibers, the transmitter should be coupled through a mode conditioning patch cord. No mode conditioning patch cord is required for applications over OM3 or OM4. For additional information on mode conditioning patch cord requirements please see: http://www.cisco.com/en/US/prod/collateral/modules/ps5455/product_bulletin_c25-530836.html.

The Cisco 10GBASE-LRM Module also supports link lengths of 300m on standard single-mode fiber (SMF, G.652).

Cisco FET-10G

The Cisco FET-10G Fabric Extender Transceiver support link lengths up to 100m on laser-optimized OM3 or OM4 multimode fiber. It is supported on fabric links only from a Nexus 2000 to a Cisco parent switch. Note this product is not orderable individually. For more information refer to Nexus 2000 datasheet: http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/data_sheet_c78-507093.html.

Cisco SFP-10G-LR

The Cisco 10GBASE-LR Module supports a link length of 10 kilometers on standard single-mode fiber (SMF, G.652).

Cisco SFP-10G-ER

The Cisco 10GBASE-ER Module supports a link length of up to 40 kilometers on standard single-mode fiber (SMF, G.652).

Cisco SFP-10G-ZR

The Cisco 10GBASE-ZR Module supports link lengths of up to about 80 kilometers on standard single-mode fiber (SMF, G.652). This interface is not specified as part of the 10 Gigabit Ethernet standard and is instead built according to Cisco specifications.

Cisco SFP+ Copper

Cisco SFP+ Copper Twinax cables are suitable for very short distances and offer a highly cost-effective way to connect within racks and across adjacent racks. Cisco offers passive Twinax cables in lengths of 1, 3 and 5 meters, and active Twinax cables in lengths of 7 and 10 meters.

Technical Specifications

Platform Support

Cisco SFP+ modules are supported on Cisco switches and routers. For more details, refer to the document “Cisco 10 Gigabit Ethernet Transceiver Modules Compatibility Matrix”: http://www.cisco.com/en/US/docs/interfaces_modules/transceiver_modules/compatibility/matrix/OL_6974.html.

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Connectors and Cabling

Connectors: Dual LC/PC connector (-SR, -LRM, -LR, -ER, -ZR and FET-10G).

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 SFP+ modules.

Table 1. SFP+ Port Cabling Specifications

Cisco SFP+	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km)***	Cable Distance*
Cisco SFP-10G-SR	850	MMF	62.5 62.5 50.0 50.0 50.0 50.0	160 (FDDI) 200 (OM1) 400 500 (OM2) 2000 (OM3) 4700 (OM4)	26m 33m 66m 82m 300m 400m
Cisco SFP-10G-LRM	1310	MMF SMF	62.5 50.0 50.0 G.652	500 400 500 -	220m 100m 220m 300m
Cisco FET-10G	850	MMF	50.0 50.0 50.0	500 (OM2) 2000 (OM3) 4700 (OM4)	25m 100m 100m
Cisco SFP-10G-LR	1310	SMF	G.652	-	10km
Cisco SFP-10G-ER**	1550	SMF	G.652	-	40km**
Cisco SFP-H10GB-CU1M	-	Twinax cable, passive, 30AWG cable assembly	-	-	1m
Cisco SFP-H10GB-CU3M	-	Twinax cable, passive, 30AWG cable assembly	-	-	3m
Cisco SFP-H10GB-CU5M	-	Twinax cable, passive, 24AWG cable assembly	-	-	5m
Cisco SFP-H10GB-ACU7M	-	Twinax cable, active, 30 AWG cable assembly	-	-	7m
Cisco SFP-H10GB-ACU10M	-	Twinax cable, active, 28 AWG cable assembly	-	-	10m

* Minimum cabling distance for -SR, -LRM, -LR, -ER modules is 2m, according to the IEEE 802.3ae.
** Links longer than 30km are considered engineered links as per IEEE 802.3ae.
*** Specified at transmission wavelength.
**** Requires 5 dB 1550nm fixed loss attenuator for < 20km. Attenuator is available as a spare. The part number is 15216-ATT-LC-5=.

Table 2 shows the main optical characteristics for the Cisco SFP+ 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 SFP-10G-SR	10GBASE-SR 850nm MMF	-1.2**	-7.3	-1.0	-9.9	840 to 860
Cisco SFP-10G-LRM	10GBASE-LRM 1310nm MMF and SMF	0.5	-6.5	0.5	-8.4 (in average) and -6.4 (in OMA)***	1260 to 1355

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Product	Type	Transmit Power (dBm)*		Receive Power (dBm)*		Transmit and Receive Wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
Cisco FET-10G	FET-10G 850nm MMF	-1.3	-8	-1	-9.9	840 to 860
Cisco SFP-10G-LR	10GBASE-LR 1310nm SMF	0.5	-8.2	0.5	-14.4	1260 to 1355
Cisco SFP-10G-ER	10GBASE-ER 1550nm SMF	4.0	-4.7	-1	-15.8	1530 to 1565

* Transmitter and receiver power is in average, unless specified.
** The launch power shall be the lesser of the class 1 safety limit or the maximum receive power. Class 1 laser requirements are defined by IEC 60825-1: 2001.
*** Both average and OMA specifications must be met simultaneously.

Table 3 details optical specifications for the Cisco SFP-10G-ZR modules

Table 3. SFP-10G-ZR Optical Parameters

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes and Conditions
Transmitter						
Transmitter wavelength		1530		1565	nm	
Side-mode suppression ratio	SMSR	30			dB	
Transmitter extinction ratio		9			dB	
Transmitter optical output power	Pout	0		4.0	dBm	Average power coupled into single-mode fiber
Receiver						
Receiver optical input wavelength		1260		1565	nm	Receiver Sensitivity specified over 1530-1565nm only, with 3dB degradation permitted from 1260-1530nm
Receiver damage threshold		+5			dBm	
Receiver Overload		-7			dBm	
Receiver performance at 10GE LAN and 10GE WAN rates, non-FEC application						
Receiver sensitivity		-24			dBm	At BER=1E-12 with PRBS31 and 10GE frame
Chromatic Dispersion Penalty@ 1600 ps/nm				3	dB	
Receiver performance at OTU2/OTU2e rates, FEC application						
Receiver sensitivity		-27			dBm	At Pre-FEC BER=1E-5 for GFEC and Pre-FEC BER=7E-4 for EFEC with PRBS31 and OTU2 frame
Chromatic Dispersion Penalty@ 1300 ps/nm				3	dB	

Note: Parameters are specified over temperature and at end of life unless otherwise noted. When shorter distances of single-mode fiber are used (<40km), an inline optical attenuator must be used to avoid overloading and damaging the receiver.

Table 4 describes the bail latch color code for each type of optical SFP+ module.

Table 4. SFP+ Optical Modules Color Code

Product	Bail Latch Color
Cisco SFP-10G-SR	Beige
Cisco SFP-10G-LRM	Orange
Cisco FET-10G	Brown

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Product	Bail Latch Color
Cisco SFP-10G-LR	Blue
Cisco SFP-10G-ER	Red
Cisco SFP-10G-ZR	Green
Cisco SFP-H10GB-CU1M	Beige
Cisco SFP-H10GB-CU3M	Orange
Cisco SFP-H10GB-CU5M	Gray
Cisco SFP-H10GB-ACU7M	Blue
Cisco SFP-H10GB-ACU10M	Red

Dimensions

Dimensions (H x W x D): 8.5 x 13.4 x 56.5mm. Cisco SFP+ connectors typically weigh 75 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 5 provides the maximum power consumption ratings per Cisco SFP+ module

Table 5. SFP+ Modules Maximum Power Consumption

Product	Power Consumption (W)
Cisco SFP-10G-SR	1
Cisco SFP-10G-LRM	1
Cisco FET-10G	1
Cisco SFP-10G-LR	1
Cisco SFP-10G-ER	1.5
Cisco SFP-10G-ZR	1.5
Cisco SFP-H10GB-CU1M	1
Cisco SFP-H10GB-CU3M	1
Cisco SFP-H10GB-CU5M	1
Cisco SFP-H10GB-ACU7M	1
Cisco SFP-H10GB-ACU10M	1

Warranty

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

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Ordering Information

Table 6 provides the ordering information for Cisco SFP+ modules and related cables.

Table 6. Ordering Information

Description	Product Number
SFP+ Modules	
Cisco 10GBASE-SR SFP+ Module for MMF	SFP-10G-SR
Cisco 10GBASE-LRM SFP+ Module for MMF and SMF	SFP-10G-LRM
Cisco 10GBASE-LR SFP+ Module for SMF	SFP-10G-LR
Cisco 10GBASE-ER SFP+ Module for SMF	SFP-10G-ER
Cisco 10GBASE-ZR SFP+ Module for SMF	SFP-10G-ZR
SFP+ Copper Modules	
10GBASE-CU SFP+ Cable 1 Meter, passive	SFP-H10GB-CU1M
10GBASE-CU SFP+ Cable 3 Meter, passive	SFP-H10GB-CU3M
10GBASE-CU SFP+ Cable 5 Meter, passive	SFP-H10GB-CU5M
10GBASE-CU SFP+ Cable 7 Meter, active	SFP-H10GB-ACU7M
10GBASE-CU SFP+ Cable 10 Meter, active	SFP-H10GB-ACU10M

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 802.3ae (-SR, -LRM, LR, -ER)
- SFP+ MSA SFF-8431 (Optical Modules and Passive Twinax cables)
- SFP+ MSA SFF-8461 (Active Twinax cables)

Safety:

- Laser Class 1 21CFR-1040 LN#50 7/2001
- Laser Class 1 IEC60825-1
- Cable jacket of SFP+ copper modules is UL #E116441 Compliant
- All length SFP+ copper cables are ELV and RoHS Compliant

Additional Information

For more information about Cisco 10GBASE SFP+ fiber modules or 10GBase SFP+ copper modules (twinax cable), contact your sales representative or visit: http://www.cisco.com/en/US/products/ps6574/index.html.

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