

Cisco 10GBASE SFP+ Modules

Contents

Product overview	3
Features and benefits	3
Cisco SFP-10G-T-X module	4
Cisco SFP-10G-SR-S module (S-Class)	4
Cisco SFP-10G-SR module	4
Cisco SFP-10G-SR-X module	5
Cisco SFP-10G-SR-I module	5
Cisco SFP-10G-LRM module	5
Cisco FET-10G module	5
Cisco SFP-10G-LR-S module (S-Class)	5
Cisco SFP-10G-LR module	5
Cisco SFP-10G-LR-X module	6
Cisco SFP-10G-LR10-I module	6
Cisco SFP-10G-ER-S module (S-Class)	7
Cisco SFP-10G-ER module	7
Cisco SFP-10G-ER-I module	7
Cisco SFP-10G-ZR-S module (S-Class)	7
Cisco SFP-10G-ZR module	7
Cisco SFP-10G-ZR-I module	8
Cisco SFP+ Twinax copper cables	8
Cisco SFP+ Active optical cables	9
Platform support	9
Product specifications	10
Warranty	19
Cisco environmental sustainability	19
Ordering information	20
Regulatory and standards compliance	21
Cisco Capital	22
Next steps	22
Document history	23

A broad range of industry-compliant SFP+ modules for 10 Gigabit Ethernet deployments in diverse networking environments.

Product overview

The Cisco® 10GBASE SFP+ modules (Figure 1) give you 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

Cisco SFP+ modules offer the following features and benefits.

- Industry’s smallest 10G form factor for greatest density per chassis
- Hot-swappable input/output device that plugs into an Ethernet SFP+ port of a Cisco switch (no need to power down if installing or replacing)
- Supports “pay-as-you-populate” model for investment protection and ease of technology migration
- Digital optical monitoring capability for strong diagnostic capabilities
- Optical interoperability with 10GBASE XENPAK, 10GBASE X2, and 10GBASE XFP interfaces on the same link
- Cisco quality Identification (ID) feature enables a Cisco platform to identify whether the module is certified and tested by Cisco

Cisco SFP-10G-T-X module

The Cisco 10GBASE-T module (Figure 2) offers connectivity options at the following data rates: 100M/1G/10Gbps. It has the SFP+ form factor and an RJ-45 interface so that CAT5e/CAT6A/CAT7 cables can be used to connect to end points with embedded 10GBASE-T ports. They are suitable for distances up to 30 meters and offers a cost-effective way to connect within racks and across adjacent racks.



Figure 2.
Cisco SFP+ 10GBASE-T module with RJ-45 connector

Table 1, details the specifications for the SFP-10G-T-X module, including cable type, distance, and data rates supported.

Table 1. SFP-10G-T-X cabling specifications

Cisco PIDs	Speeds	Cable Type	Distance	Max. Power Consumption (W)
SFP-10G-T-X	10Gbps	Cat6A/Cat7 or better	Up to 30 meters	2.5W
SFP-10G-T-X	100M/1Gbps	Cat5e/Cat6A/Cat7 or better	Up to 100 meters	1.0W

Cisco SFP-10G-SR-S module (S-Class)

The Cisco 10GBASE-SR module supports a link length of 26 meters on standard Fiber Distributed Data Interface (FDDI)-grade Multimode Fiber (MMF). Using 2000 MHz*km MMF (OM3), up to 300-meter link lengths are possible. Using 4700 MHz*km MMF (OM4), up to 400 meter link lengths are possible. SFP-10G-SR-S does not support FCoE.

Cisco SFP-10G-SR module

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-SR-X module

The Cisco SFP-10G-SR-X is a multirate* 10GBASE-SR, 10GBASE-SW and OTU2/OTU2e module for extended operating temperature range. It 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.

* Except for version 1, which supports only 10GBASE-SR.

Cisco SFP-10G-SR-I module

The Cisco SFP-10G-SR-I is a multirate 10GBASE-SR, 10GBASE-SW and OTU2/2e module for industrial operating temperature range. This module also supports CPRI datarate options 3, 4, 5, 6, 7, 7a, 8. It 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 module

The Cisco 10GBASE-LRM Module supports link lengths of 220m on standard Fiber Distributed Data Interface (FDDI) grade Multimode Fiber (MMF). To make sure 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:

https://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 module

The Cisco FET-10G Fabric Extender Transceiver supports link lengths up to 100m on laser-optimized OM3 or OM4 multimode fiber. It is supported on fabric links from a Nexus 2000 to a Cisco parent switch only. Note this product is not orderable individually. For more information refer to Nexus 2000 datasheet:

https://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps10110/data_sheet_c78-507093.html.

Cisco SFP-10G-LR-S module (S-Class)

The Cisco 10GBASE-LR module supports a link length of 10 kilometers on standard Single-Mode Fiber (SMF) (G.652). SFP-10G-LR-S does not support FCoE.

Cisco SFP-10G-LR module

The Cisco 10GBASE-LR Module supports a link length of 10 kilometers on standard Single-Mode Fiber (SMF, G.652).

Cisco SFP-10G-LR-X module

The Cisco SFP-10G-LR-X is a multirate 10GBASE-LR, 10GBASE-LW, and OTU2/OTU2e module for extended operating temperature range. It supports a link length of 10 kilometers on standard Single-Mode Fiber (SMF, G.652).

Cisco SFP-10G-LR10-I module

The Cisco SFP-10G-LR10-I supports a link length of 10 kilometers on standard Single-Mode Fiber (SMF, G.652). The SFP-10G-LR10-I is for industrial operating temperature range. The SFP-10G-LR10-I also supports CPRI datrates options 3, 4, 5, 6, 7, 7a, 8.

Cisco SFP-10G-BXD-I and SFP-10G-BXU-I for 10Km (single-fiber bidirectional applications)

The Cisco SFP-10G-BXD-I and SFP-10G-BXU-I SFPs operate on a single strand of standard SMF.

A SFP-10G-BXD-I device is always connected to a SFP-10G-BXU-I device with a single strand of standard SMF with an operating transmission range up to 10 km.

The communication over a single strand of fiber is achieved by separating the transmission wavelength of the two devices, as depicted in Figure 3. SFP-10G-BXD-I transmits a 1330-nm channel and receives a 1270-nm signal, whereas SFP-10G-BXU-I transmits at a 1270-nm wavelength and receives a 1330-nm signal. Note in Figure 3 the presence of a Wavelength-Division Multiplexing (WDM) splitter integrated into the SFP to split the 1270-nm and 1330-nm light paths. This module also supports CPRI datarate options 3, 4, 5, 6, 7, 7a, 8.*

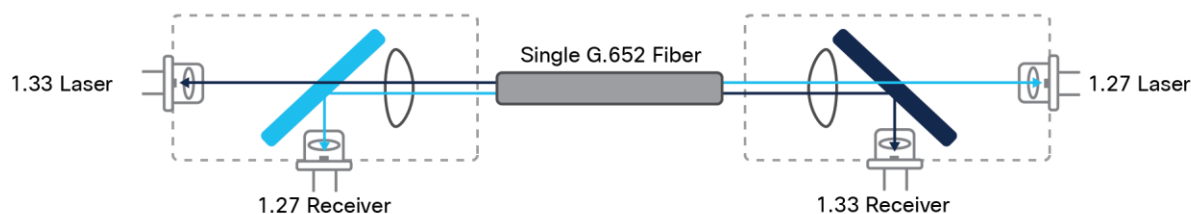


Figure 3.
Bidirectional transmission of a single strand of SMF

The SFP-10G-BXD-I and SFP-10G-BXU-I SFPs also support Digital Optical Monitoring (DOM) functions according to the industry-standard SFF-8472 Multisource Agreement (MSA). This feature gives the end user the ability to monitor real-time parameters of the SFP, such as optical output power, optical input power, temperature, laser bias current, and transceiver supply voltage.

*Version -02 of SFP-10G-BXD-I and SFP-10G-BXU-I supports the CPRI rates.

Cisco SFP-10G-ER-S module (S-Class)

The Cisco 10GBASE-ER module supports a link length of up to 40 kilometers on SMF (G.652). SFP-10G-ER-S does not support FCoE.

Cisco SFP-10G-ER module

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-ER-I module

The Cisco 10GBASE-ER Industrial Temperature Module supports a link length of up to 40 kilometers on standard Single-Mode Fiber (SMF, G.652). The SFP-10G-ER-I for Industrial Operating Temperature Range is a multirate 10GBASE-ER, 10GBASE-EW and OTU2/2e module.

Cisco SFP-10G-BX40D-I and SFP-10G-BX40U-I (for 40Km single-fiber bidirectional applications)

The Cisco SFP-10G-BX40D-I and SFP-10G-BX40U-I SFPs operate on a single strand of standard SMF.

A SFP-10G-BX40D-I device is always connected to a SFP-10G-BX40U-I device with a single strand of standard SMF with an operating transmission range up to 40 km.

The communication over a single strand of fiber is achieved by separating the transmission wavelength of the two devices. SFP-10G-BX40D-I transmits a 1330-nm channel and receives a 1270-nm signal. The SFP-10G-BX40U-I transmits at a 1270-nm wavelength and receives a 1330-nm signal.

The SFP-10G-BX40D-I and SFP-10G-BX40U-I SFPs support Digital Optical Monitoring (DOM) functions according to the industry-standard SFF-8472 Multisource Agreement (MSA). This feature gives the end user the ability to monitor real-time parameters of the SFP, such as optical output power, optical input power, temperature, laser bias current, and transceiver supply voltage.

Cisco SFP-10G-ZR-S module (S-Class)

The Cisco 10GBASE-ZR module supports link lengths of up to about 80 kilometers on standard SMF (G.652). This interface is not specified as part of the 10 Gigabit Ethernet standards and is, instead, built according to Cisco specifications. SFP-10G-ZR-S does not support FCoE.

Cisco SFP-10G-ZR module

The Cisco SFP-10G-ZR is a multirate 10GBASE-ZR, 10GBASE-ZW, and OTU2/OTU2e module. It 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-10G-ZR-I module

The Cisco SFP-10G-ZR-I is a multirate 10GBASE-ZR, 10GBASE-ZW, and OTU2/OTU2e module for industrial operating temperature range. The SFP-10G-ZR-I has a limiting electrical interface receiver, which does not require EDC PHY on the host board, it can be plugged into any SFP+ port. It supports link lengths of up to 70 kilometers on standard Single-Mode Fiber (SMF, G.652), assuming a fiber chromatic dispersion of 20 ps/(nm*km). This interface is not specified as part of the 10 Gigabit Ethernet standard and is instead built according to Cisco specifications. The SFP-10G-ZR-I has a cold start at -40⁰ C; the transceiver will be operational except optical traffic is not supported from -40⁰ to -28⁰ C, all other low speed features (DOM, I2C, etc.) are operational. The module is fully operational from -28⁰ C to 85⁰ C.

Cisco SFP+ Twinax copper cables

Cisco SFP+ Copper Twinax (Figure 4) direct-attach cables are suitable for very short distances and offer a cost-effective way to connect within racks and across adjacent racks. Cisco offers passive Twinax cables in lengths of 1, 1.5, 2, 2.5, 3, 4 and 5 meters, and active Twinax cables in lengths of 7 and 10 meters.



Figure 4.
Cisco direct-attach twinax copper cable assembly with SFP+ connectors

Cisco SFP+ Active optical cables

Cisco SFP+ Active Optical Cables (Figure 5) are direct-attach fiber assemblies with SFP+ connectors. They are suitable for very short distances and offer a cost-effective way to connect within racks and across adjacent racks. Cisco offers Active Optical Cables in lengths of 1, 2, 3, 5, 7, and 10 meters.



Figure 5.
Cisco direct-attach active optical cables with SFP+ connectors

Platform support

Cisco SFP+ modules are supported on a wide range of Cisco switches and routers*:

Table 2. Cisco Platforms

<ul style="list-style-type: none">• 7600 Series Router• ASR 901• ASR 903• ASR 1000 Series Router• ASR 9000 Series Router• ASR 9000v Series Router• Catalyst 2350 and 2360 Series Switches• Catalyst 2960-S, 2960-X, and 2960-XR Series Switches• Catalyst 3100 Blade Switches• Catalyst 3560, 3560-E, and 3560-X Series Switches• Catalyst 3750, 3750-E, and 3750-X Series Switches• Catalyst 3850 Series Switches	<ul style="list-style-type: none">• Catalyst 4500 and 4500-X Series Switches• CRS Router• MDS 9000• ME 4500• ME 4900NCS 6000 Series Router• Nexus 2000, 3000, and 4000 Series Switches• Nexus 9000 and 9500 (modular) Series Switches• RF Gateway Series• SCE 8000• Shared Port Adapter (SPA)• Unified Computing System (UCS) Switches
---	--

* Not all devices listed support every module. For details about which modules run in which devices and other compatibility information, refer to the document “Cisco 10 Gigabit Ethernet Transceiver Modules Compatibility Matrix”:
https://www.cisco.com/en/US/docs/interfaces_modules/transceiver_modules/compatibility/matrix/OL_6974.html.

Additional platforms may continually be added; please check the compatibility matrix for the latest information and for the Cisco compatible operating system for each platform.

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.

Product specifications

Table 3 provides cabling specifications for the Cisco SFP+ modules.

Table 3. SFP+ port cabling specifications

Cisco SFP+	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km) ³	Cable Distance ^{*1}
Cisco SFP-10G-SR-S ^a Cisco SFP-10G-SR Cisco SFP-10G-SR-X Cisco SFP-10G-SR-I ^a	850	MMF	62.5	160 (FDDI)	26m
			62.5	200 (OM1)	33m
			50.0	400	66m
			50.0	500 (OM2)	82m
			50.0	2000 (OM3)	300m
			50.0	4700 (OM4)	400m
Cisco SFP-10G-LRM	1310	MMF	62.5	500	220m
		SMF	50.0	400	100m
			50.0	500	220m
			G.652	-	300m
Cisco FET-10G	850	MMF	50.0	500 (OM2)	25m
			50.0	2000 (OM3)	100m
			50.0	4700 (OM4)	100m
			50.0	4700 (OM5)	100m
Cisco SFP-10G-LR-S ^a Cisco SFP-10G-LR Cisco SFP-10G-LR-X Cisco SFP-10G-LR10-I ^b	1310	SMF	G.652	-	10km
Cisco SFP-10G-BXD-I	1330	SMF	G.652	-	10km ^b
Cisco SFP-10G-BXU-I	1270	SMF	G.652	-	10km ^b
Cisco SFP-10G-ER-S ^{4a} Cisco SFP-10G-ER ⁴ Cisco SFP-10G-ER-I ⁴	1550	SMF	G.652	-	40km ^{*2}

Cisco SFP+	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km) ³	Cable Distance ¹
Cisco SFP-10G-BX40D-I ^{*6}	1330	SMF	G.652	-	40km
Cisco SFP-10G-BX40U-I ^{*6}	1270	SMF	G.652	-	40km
Cisco SFP-10G-ZR-S ^{*5a} Cisco SFP-10G-ZR ^{*5}	1550	SMF	G.652	-	80km
Cisco SFP-10G-ZR-I ^{*5a}	1550	SMF	G.652	-	70km
Cisco SFP-H10GB-CU1M	-	Twinax cable, passive, 30AWG cable assembly	-	-	1m
Cisco SFP-H10GB-CU1-5M	-	Twinax cable, passive, 30AWG cable assembly	-	-	1.5m
Cisco SFP-H10GB-CU2M	-	Twinax cable, passive, 30AWG cable assembly	-	-	2m
Cisco SFP-H10GB-CU2-5M	-	Twinax cable, passive, 30AWG cable assembly	-	-	2.5m
Cisco SFP-H10GB-CU3M	-	Twinax cable, passive, 30AWG cable assembly	-	-	3m
Cisco SFP-H10GB-CU4M	-	Twinax cable, passive, 24AWG or 26AWG cable assembly	-	-	4m
Cisco SFP-H10GB-CU5M	-	Twinax cable, passive, 24AWG or 26AWG 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
Cisco SFP-10G-AOC1M	-	Active Optical Cable assembly	-	-	1m
Cisco SFP-10G-AOC2M	-	Active Optical Cable assembly	-	-	2m
Cisco SFP-10G-AOC3M	-	Active Optical Cable assembly	-	-	3m

Cisco SFP+	Wavelength (nm)	Cable Type	Core Size (Microns)	Modal Bandwidth (MHz*km) ^{*3}	Cable Distance ^{*1}
Cisco SFP-10G-AOC5M	-	Active Optical Cable assembly	-	-	5m
Cisco SFP-10G-AOC7M	-	Active Optical Cable assembly	-	-	7m
Cisco SFP-10G-AOC10M	-	Active Optical Cable assembly	-	-	10m

*1 Minimum cabling distance for -SR, -LRM, -LR, -ER modules is 2m, according to the IEEE 802.3ae.

*2 Links longer than 30km are considered engineered links as per IEEE 802.3ae.

*3 Specified at transmission wavelength.

*4 Requires 5 dB 1550nm fixed loss attenuator for < 20km. Attenuator is available as a spare. The part number is 15216 ATT LC 5=.

*5 Requires 15dB attenuator if Link Distance < 5km.

Requires 10dB attenuator if Link Distance is between 5km and 25km.

Requires 5dB attenuator if Link Distance is between 25km and 45km.

*6 Requires 15dB attenuator if Link Distance < 5km.

Requires 10dB attenuator if Link Distance is between 5km and 15km.

Requires 5dB attenuator if Link Distance is between 15km and 25km.

Attenuator is available as a spare. The part numbers:

- 5dB - 15216 ATT LC 5=
- 10dB - 15216 ATT LC 10=
- 15dB - 15216 ATT LC 15=

a - No FCoE support.

b - Links up to 15 km are supported as engineered links as long as channel insertion loss < 6.2 dB.

Table 4 lists the main optical characteristics for the Cisco SFP+ modules.

Table 4. 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-S Cisco SFP-10G-SR	10GBASE-SR 850nm MMF	-1.2**	-7.3	-1.0	-9.9	840 to 860
Cisco SFP-10G-SR-X Cisco SFP-10G-SR-I	10GBASE-SR, 10GBASE-SW and OTU2e 850nm MMF	-1.2**	-7.3	-1.0	-9.9	840 to 860

Product	Type	Transmit Power (dBm)*		Receive Power (dBm)*		Transmit and Receive Wavelength (nm)
		Maximum	Minimum	Maximum	Minimum	
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
Cisco FET-10G	FET-10G 850nm MMF	-1.3	-8	-1	-9.9	840 to 860
Cisco SFP-10G-LR-S Cisco SFP-10G-LR	10GBASE-LR 1310nm SMF	0.5	-8.2	0.5	-14.4	1260 to 1355
Cisco SFP-10G-LR-X	10GBASE-LR, 10GBASE-LW and OTU2e 1310nm SMF	0.5	-8.2	0.5	-14.4	1260 to 1355
Cisco SFP-10G-LR10-I	10GBASE-LR, CPRI 1310 SMF	0.5	-8.2	0.5	-14.4	1260 to 1355
Cisco SFP-10G-BXD-I	10G-SFP Bidirectional for 10km	0.5	-8.2	0.5	-14.4	1320 to 1340 (Tx) 1260 to 1280 (Rx)
Cisco SFP-10G-BXU-I	10G-SFP Bidirectional for 10km	0.5	-8.2	0.5	-14.4	1260 to 1280 (Tx) 1320 to 1340 (Rx)
Cisco SFP-10G-ER-S Cisco SFP-10G-ER Cisco SFP-10G-ER-I	10GBASE-ER 1550nm SMF	4.0	-4.7	-1	-15.8	1530 to 1565
Cisco SFP-10G-BX40D-I	10G-SFP Bidirectional for 40km	4.5	-2.7	-9	-21.2	1320 to 1340 (Tx) 1260 to 1280 (Rx)
Cisco SFP-10G-BX40U-I	10G-SFP Bidirectional for 40km	4.5	-2.7	-9	-21.2	1260 to 1280 (Tx) 1320 to 1340 (Rx)
Cisco SFP-10G-ZR-S Cisco SFP-10G-ZR Cisco SFP-10G-ZR-I	10GBASE-ZR 1550nm SMF	4.0	0	-7	-24	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 5 details optical specifications for the Cisco SFP-10G-ZR modules.

Table 5. SFP-10G-ZR, SFP-10G-ZR-S 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	

*Maximum chromatic dispersion for SFP-10G-ZR and SFP-10G-ZR-S is 1600 ps/nm.

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 6. SFP-10G-ZR-I 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@ 1400 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	

*Maximum chromatic dispersion for SFP-10G-ZR-I is 1400 ps/nm.

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

Table 7. SFP+ optical modules color code

Product	Bail Latch Color
Cisco SFP-10G-T-X	Golden/Yellow
Cisco SFP-10G-SR-S Cisco SFP-10G-SR Cisco SFP-10G-SR-X Cisco SFP-10G-SR-I	Beige
Cisco SFP-10G-LRM	Orange
Cisco FET-10G	Brown
Cisco SFP-10G-LR-S Cisco SFP-10G-LR Cisco SFP-10G-LR-X Cisco SFP-10G-LR10-I	Blue
Cisco SFP-10G-BXD-I Cisco SFP-10G-BXU-I	Blue
Cisco SFP-10G-ER-S Cisco SFP-10G-ER Cisco SFP-10G-ER-I	Red
Cisco SFP-10G-BX40D-I Cisco SFP-10G-BX40U-I	Red
Cisco SFP-10G-ZR-S Cisco SFP-10G-ZR Cisco SFP-10G-ZR-I	Green
Cisco SFP-H10GB-CU1M	Beige
Cisco SFP-H10GB-CU1-5M	Black
Cisco SFP-H10GB-CU2M	Brown
Cisco SFP-H10GB-CU2-5M	Yellow
Cisco SFP-H10GB-CU3M	Orange
Cisco SFP-H10GB-CU4M	Green
Cisco SFP-H10GB-CU5M	Gray
Cisco SFP-H10GB-ACU7M	Blue

Product	Bail Latch Color
Cisco SFP-H10GB-ACU10M	Red
Cisco SFP-10G-AOC1M	Beige
Cisco SFP-10G-AOC2M	Brown
Cisco SFP-10G-AOC3M	Orange
Cisco SFP-10G-AOC5M	Gray
Cisco SFP-10G-AOC7M	Blue
Cisco SFP-10G-AOC10M	Red

Table 8 provides the maximum power consumption and operating temperature range ratings per Cisco SFP+ module.

Table 8. SFP+ modules power consumption

Product	Power Consumption (W)	Operating Temperature Range
Cisco SFP-10G-T-X	2.5W	EXT
Cisco SFP-10G-SR-S Cisco SFP-10G-SR	1	COM
Cisco SFP-10G-SR-I	1	IND
Cisco SFP-10G-SR-X	1	EXT
Cisco SFP-10G-LRM	1	COM
Cisco FET-10G	1	COM
Cisco SFP-10G-LR-S Cisco SFP-10G-LR	1	COM
Cisco SFP-10G-LR-X	1	EXT
Cisco SFP-10G-LR10-I	1	IND
Cisco SFP-10G-BXD-I Cisco SFP-10G-BXU-I	1	IND
Cisco SFP-10G-ER-S Cisco SFP-10G-ER	1.5	COM
Cisco SFP-10G-ER-I	1.5	IND
Cisco SFP-10G-BX40D-I Cisco SFP-10G-BX40U-I	1.2	IND

Product	Power Consumption (W)	Operating Temperature Range
Cisco SFP-10G-ZR-S Cisco SFP-10G-ZR	1.5	COM
Cisco SFP-10G-ZR-I	2	IND*
Cisco SFP-H10GB-CU1M	0.1	COM
Cisco SFP-H10GB-CU1-5M	0.1	COM
Cisco SFP-H10GB-CU2M	0.1	COM
Cisco SFP-H10GB-CU2-5M	0.1	COM
Cisco SFP-H10GB-CU3M	0.1	COM
Cisco SFP-H10GB-CU4M	0.1	COM
Cisco SFP-H10GB-CU5M	0.1	COM
Cisco SFP-H10GB-ACU7M	1	COM
Cisco SFP-H10GB-ACU10M	1	COM
Cisco SFP-10G-AOC1M	1	COM
Cisco SFP-10G-AOC2M	1	COM
Cisco SFP-10G-AOC3M	1	COM
Cisco SFP-10G-AOC5M	1	COM
Cisco SFP-10G-AOC7M	1	COM
Cisco SFP-10G-AOC10M	1	COM

* The SFP-10G-ZR-I has a cold start at -40°C, the transceiver will be operational except optical traffic is not supported from -40°C to -28°C, all other low speed features(DOM, I2C, etc.) are operational. The module is fully operational -28°C to 85°C.

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 (COM): 0 to 70°C (32 to 158°F)
- Extended temperature range (EXT): -5 to 85°C (23 to 185°F)
- Industrial temperature range (IND): -40 to 85°C (-40 to 185°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

Cisco environmental sustainability

Information about Cisco’s environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the “Environment Sustainability” section of Cisco’s [Corporate Social Responsibility](#) (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the “Environment Sustainability” section of the CSR Report) are provided in the following table:

Sustainability	Topic	Reference
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries and packaging	WEEE Compliance
	Information on product takeback and resuse program	Cisco Takeback and Reuse Program
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
	Countries and Regions Supported	Regulatory Compliance Page 19
Power	Power (Including Pluggable)	Table 6 : Power Consumption
Material	Product packaging weight and materials	Contact: environment@cisco.com
	Weight	Dimensions Page 17

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

Ordering information

Table 9 provides the ordering information for Cisco SFP+ modules and related cables.

Table 9. Ordering information

Description	Product Number
Cisco 10GBASE-T SFP+ Module for CAT6A cables (up to 30 meters)	SFP-10G-T-X
Cisco 10GBASE-SR SFP+ Module for MMF S-Class	SFP-10G-SR-S
Cisco 10GBASE-SR SFP+ Module for MMF	SFP-10G-SR
Cisco multirate 10GBASE-SR, 10GBASE-SW and OTU2e SFP+ Module for MMF, extended temperature range	SFP-10G-SR-X
Cisco multirate 10GBASE-SR, 10GBASE-SW and OTU2e SFP+ Module for MMF, industrial temperature range	SFP-10G-SR-I
Cisco 10GBASE-LRM SFP+ Module for MMF and SMF	SFP-10G-LRM
Cisco 10GBASE-LR SFP+ Module for SMF S-Class	SFP-10G-LR-S
Cisco 10GBASE-LR SFP+ Module for SMF	SFP-10G-LR
Cisco multirate 10GBASE-LR, 10GBASE-LW and OTU2e SFP+ Module for SMF, extended temperature range	SFP-10G-LR-X
Cisco multirate 10GBASE-LR, CPRI 3-8, Industrial Temperature Module	SFP-10G-LR10-I
Cisco 10GBASE-BX10-D Bidirectional for 10km	SFP-10G-BXD-I
Cisco 10GBASE-BX10-U Bidirectional for 10km	SFP-10G-BXU-I
Cisco 10GBASE-ER SFP+ Module for SMF S-Class	SFP-10G-ER-S
Cisco 10GBASE-ER SFP+ Module for SMF	SFP-10G-ER
Cisco multirate 10GBASE-ER, 10GBASE-EW and OTU2e SFP+ Module for SMF, Industrial Temperature range	SFP-10G-ER-I
Cisco 10GBASE-BX40-D Bidirectional for 40km	SFP-10G-BX40D-I
Cisco 10GBASE-BX40-U Bidirectional for 40km	SFP-10G-BX40U-I
Cisco 10GBASE-ZR SFP+ Module for SMF S-Class	SFP-10G-ZR-S
Cisco multirate 10GBASE-ZR, 10GBASE-ZW and OTU2e SFP+ Module for SMF	SFP-10G-ZR
Cisco multirate 10GBASE-ZR, 10GBASE-ZW and OTU2e SFP+ Module for SMF	SFP-10G-ZR-I
10GBASE-CU SFP+ Cable 1 Meter, passive	SFP-H10GB-CU1M
10GBASE-CU SFP+ Cable 1.5 Meter, passive	SFP-H10GB-CU1-5M

Description	Product Number
10GBASE-CU SFP+ Cable 2 Meter, Passive	SFP-H10GB-CU2M
10GBASE-CU SFP+ Cable 2.5 Meter, Passive	SFP-H10GB-CU2-5M
10GBASE-CU SFP+ Cable 3 Meter, passive	SFP-H10GB-CU3M
10GBASE-CU SFP+ Cable 4 Meter, passive	SFP-H10GB-CU4M
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
10GBASE-AOC SFP+ Cable 1 Meter	SFP-10G-AOC1M
10GBASE-AOC SFP+ Cable 2 Meter	SFP-10G-AOC2M
10GBASE-AOC SFP+ Cable 3 Meter	SFP-10G-AOC3M
10GBASE-AOC SFP+ Cable 5 Meter	SFP-10G-AOC5M
10GBASE-AOC SFP+ Cable 7 Meter	SFP-10G-AOC7M
10GBASE-AOC SFP+ Cable 10 Meter	SFP-10G-AOC10M

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 802.3: 10-Gigabit Ethernet
- ITU-T G.709: Interfaces for the Optical Transport Network
- ITU-T G.975: GFEC
- ITU-T G.975.1: EFEC
- SFP+ MSA SFF-8431 (Optical Modules, Active Optical Cables, 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

Cisco Capital

Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. [Learn more](#).

Next steps

Learn more about Cisco 10GBASE SFP+ fiber modules or 10GBase SFP+ copper modules (twinax cable) by contacting your sales representative or visiting <https://www.cisco.com/en/US/products/ps6574/index.html>.

For S-Class SFP+ 10 Gigabit Modules, refer to the link below:

<https://www.cisco.com/c/en/us/products/interfaces-modules/transceiver-modules/datasheet-listing.html>.

Document history

New or revised topic	Described in	Date
New PID SFP-10G-LR10-I added	Ordering Information	March 04, 2021
New PIDs SFP-10G-SR-I, SFP-10G-ZR-I added	Ordering Information	July 15, 2022

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at <https://www.cisco.com/go/offices>.

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: <https://www.cisco.com/go/trademarks>. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)