

## CISCO SFPs for GE Operations



### Overview

Cisco Small Form-Factor Pluggable (SFP) Gigabit Interface Converter is a hot-swappable input/output device that plugs into a Gigabit Ethernet port or slot, linking the port with the network. SFPs can be intermixed in combinations of 1000BASE-T, 1000BASE-SX, 1000BASE-LX/LH, 1000BASE-EX, 1000BASE-ZX, or 1000BASE-BX10-D/U on a port-by-port basis.

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## Features

### 1000BASE-T SFP for Copper networks

The 1000BASE-T SFP operates on standard Category 5 unshielded twisted pair copper cabling of up to 100m (328 ft) link length. Cisco 1000BASE-T SFP modules support 10/100/1000 autonegotiation and Auto MDI/MDIX.

### 1000BASE-SX SFP for Multimode Fiber Only

The 1000BASE-SX SFP, compatible with the IEEE 802.3z 1000BASE-SX standard, operates on legacy 50  $\mu\text{m}$  multimode fiber links up to 550 m and on 62.5  $\mu\text{m}$  Fiber Distributed Data Interface (FDDI)-grade multimode fibers up to 220 m. It can support up to 1km over laser-optimized 50  $\mu\text{m}$  multimode fiber cable.

### 1000BASE-LX/LH SFP for Both Multimode and Single-Mode Fibers

The 1000BASE-LX/LH SFP, compatible with the IEEE 802.3z 1000BASE-LX standard, operates on standard single-mode fiber-optic link spans of up to 10 km and up to 550 m on any multimode fibers. When used over legacy multimode fiber type, the transmitter should be coupled through a mode conditioning patch cable.

### 1000BASE-EX SFP for Long-Reach Single-Mode Fibers

The 1000BASE-EX SFP operates on standard single-mode fiber-optic link spans of up to 40 km in length. A 5-dB inline optical attenuator should be inserted between the fiber-optic cable and the receiving port on the SFP at each end of the link for back-to-back connectivity.

### 1000BASE-ZX SFP for Long-Reach Single-Mode Fibers

The 1000BASE-ZX SFP operates on standard single-mode fiber-optic link spans of up to approximately 70 km in length. The SFP provides an optical link budget of 23 dB, but the precise link span length depends on multiple factors such as fiber quality, number of splices, and connectors.

When shorter distances of single-mode fiber (SMF) are used, it might be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. A 10-dB inline optical attenuator should be inserted between the fiber-optic cable plant and the receiving port on the SFP at each end of the link whenever the fiber-optic cable span loss is less than 8 dB.

### 1000BASE-BX10-D and 1000BASE-BX10-U SFP for Single-Fiber Bidirectional Applications

The 1000BASE-BX-D and 1000BASE-BX-U SFPs, compatible with the IEEE 802.3ah 1000BASE-BX10-D and 1000BASE-BX10-U standards, operate on a single strand of standard SMF.

A 1000BASE-BX10-D device is always connected to a 1000BASE-BX10-U 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: 1000BASE-BX10-D transmits a 1490-nm channel and receives a 1310-nm signal, whereas 1000BASE-BX10-U transmits at a 1310-nm wavelength and receives a 1490-nm signal. Note in Figure 3 the presence of a wavelength-division multiplexing (WDM) splitter integrated into the SFP to split the 1310-nm and 1490-nm light paths.

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## Specifications

### Connectors and Cabling

Connectors include the following:

- Dual LC/PC connector (1000BASE-SX, 1000BASE-LX/LH, and 1000BASE-ZX)
- Single LC/PC connector (1000BASE-BX-D and 1000BASE-BX-U)
- RJ-45 connector (1000BASE-T)

**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 SFPs that you install in the Gigabit Ethernet port. Note that all SFP ports have LC-type connectors, and the minimum cable distance for all SFPs listed (multimode and single-mode fiber) is 6.5 feet (2 m).

**Table 1.** SFP Port Cabling Specifications

Product	Wavelength (nm)	Fiber Type	Core Size (μm)	Modal Bandwidth (MHz* Km)	Operating Distance (m)
1000BASE-SX	850	MMF	62.5	160	220 (722 ft)
			62.5	200	275 (902 ft)
			50	400	500 (1,640 ft)
			50	500	550 (1,804 ft)
			50	2000	1000 (3281 ft)
1000BASE-LX/LH	1310	MMF*	62.5	500	550 (1,804 ft)
			50	400	550 (1,804 ft)
			50	500	550 (1,804 ft)
		SMF	-**	-	10,000 (32,821 ft)
1000BASE-EX	1310	SMF	-**	-	40,000 (131,234 ft)
1000BASE-ZX	1550	SMF	-	-	Approximately 70 km depending on link loss
1000BASE-BX-U	1310	SMF	-**	-	10,000 (32,821 ft)
1000BASE-BS-D	1490	SMF	-**	-	10,000 (32,821 ft)

\*A mode-conditioning patch cord, as specified by the IEEE standard, is required regardless of the span length. Note how the mode conditioning patch cord for 62.5- $\mu$ m fibers has a different specification from the mode-conditioning patch cord for 50- $\mu$ m fibers.

\*\*ITU-T G.652 SMF as specified by the IEEE 802.3z standard.

## Optical Specifications

Table 2 gives optical parameters for the SFPs.

**Table 2.** Main Optical Parameters

Product	Transmit Power (dBm)	Receive Power Range (dBm)
1000BASE-SX	-3 to -9.5	0 to -17
1000BASE-LX/LH	-3 to -9.5	-3 to -20
1000BASE-EX	+3 to -1	+1 to -22
1000BASE-ZX	+5 to 0	-3 to -23
1000BASE-BX10-D 1000BASE-BX10-U	-3 to -9	-3 to -19.5

## Dimensions

Dimensions (H x W x D): 8.5 x 13.4 x 56.5 mm. Cisco SFPs 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°C 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)

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**Quality Link Connections**





## Ordering Information

Product Description	Product Number
1000BASE-T standard	GLC-T
1000BASE-SX short wavelength; without DOM	GLC-SX-MM
1000BASE-LX/LH long-wavelength/long haul; without DOM	GLC-LH-SM
1000BASE-ZX extended distance;	GLC-ZX-SM
1000BASE-BX10-D downstream bidirectional single fiber; with DOM	GLC-BX-D
1000BASE-BX10-U upstream bidirectional single fiber; with DOM	GLC-BX-U
1000BASE-T NEBS 3 ESD	SFP-GE-T
1000BASE-SX short wavelength; with DOM	SFP-GE-S
1000BASE-LX/LH long-wavelength; with DOM	SFP-GE-L
1000BASE-EX long-wavelength; with DOM	GLC-EX-SMD
1000BASE-ZX extended distance; with DOM	SFP-GE-Z
1000BASE-SX short wavelength; rugged	GLC-SX-MM-RGD
1000BASE-LX/LH long wavelength; rugged	GLC-LX-SM-RGD
1000BASE-ZX extended distance; rugged	GLC-ZX-SM-RGD

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