Cisco MDS 9000 Family Pluggable Transceivers

Product Overview

The Cisco® Small Form-Factor Pluggable (SFP), Enhanced Small Form-Factor Pluggable (SFP+), and X2 devices for use on the Cisco MDS 9000 family of products are hot-swappable transceivers that plug into ports on the Cisco MDS 9000 family director switching modules and fabric switches. These transceivers give users the flexibility to choose different cabling types and distances on a port-by-port basis.

Cisco SFP, SFP+, and X2 transceivers are available for use in conjunction with the Cisco MDS 9000 family products as outlined in Table 1.

Table 1. Cisco MDS 9000 Family Switching Modules and Fabric Switch Transceiver Support

Switching Module and Fabric Switch	DS-SFP-FC-2G-xx	DS-SFP-FC4G-xx	DS-SFP-FC8G-xx	DS-SFP-FCGE-xx	DS-SFP-GE-T	DS-X2-FC10G-xx (non CX4)[B]
DS-X9016	Yes			Yes		
DS-X9032	Yes			Yes		
DS-X9032-SSM	Yes			Yes		
DS-X9112		Yes[2]				
DS-X9124		Yes[2]				
DS-X9148		Yes[2]				
DS-HP-8GFC-K9[8]		Yes[7]	Yes			
DS-HP-8GFC-L-K9[8]		Yes[7]	Yes			
DS-X9248-48K9		Yes[2]	Yes[2]			
DS-X9224-96K9		Yes[2]	Yes[2]			
DS-X9248-96K9		Yes[2]	Yes[2]			
DS-X9302-14K9	Yes			Yes	Yes	
DS-X9304-18K9		Yes[2]		Yes[1]	Yes[D]	
DS-X9304-SMIP				Yes	Yes	
DS-X9308-SMIP				Yes	Yes	
DS-X9316-SSNK9				Yes[F]	Yes[F]	
DS-X9704						Yes[2]
DS-C9216A-K9	Yes			Yes		
DS-C9216i-K9	Yes			Yes	Yes	
DS-C9222i-K9		Yes[2]		Yes[1]	Yes[D]	
DS-C9120-K9	Yes			Yes		
DS-C9124-K9		Yes[2]				
DS-C9134-K9		Yes[2]				Yes[2, 5]
DS-C9140-K9	Yes			Yes		
DS-C9148-K9		Yes[2, 7]	Yes[2]			
DS-C9020-20K9		Yes				

Switching Module and Fabric Switch	DS-X2-FC10G-CX4=[C]	DS-X2-E10G-SR=[A]	DS-CWDM-xxxx=	DS-CWDM4Gxxxx=[A]	DWDM-SFP-xxxx=[A]	ONS-SC-4G-xx.x=[G]	DWDM-X2-xx.xx=[E]
DS-X9016			Yes		Yes		
DS-X9032			Yes		Yes		
DS-X9032-SSM			Yes		Yes		
DS-X9112			Yes	Yes[2]	Yes[2]	Yes[2]	
DS-X9124			Yes	Yes[2]	Yes[2]	Yes[2]	
DS-X9148			Yes	Yes[2]	Yes[2]	Yes[2]	
DS-X9248-48K9			Yes	Yes[2]	Yes[2]	Yes[2]	
DS-X9224-96K9			Yes	Yes[2]	Yes[2]	Yes[2]	
DS-X9248-96K9			Yes	Yes[2]	Yes[2]	Yes[2]	
DS-X9302-14K9			Yes[6]		Yes		
DS-X9304-18K9			Yes[6]	Yes[2]	Yes[2, 6]	Yes[2]	
DS-X9304-SMIP			Yes				
DS-X9308-SMIP			Yes				
DS-X9316-SSNK9			Yes[F]		Yes[F]		
DS-X9704	Yes[2]	Yes[2]					Yes[2]
DS-C9216A-K9			Yes		Yes		
DS-C9216i-K9			Yes[6]		Yes		
DS-C9222i-K9			Yes[6]	Yes[2]	Yes[2,6]	Yes[2]	
DS-C9120-K9			Yes		Yes		
DS-C9124-K9			Yes[3]	Yes[2, 4]		Yes[2]	
DS-C9134-K9	Yes[2]	Yes[2, F]	Yes[3]	Yes[4]			Yes[2, F]
DS-C9140-K9			Yes		Yes		
DS-C9148-K9				Yes[2]		Yes[2]	
DS-C9020-20K9							

A: Supported on switches running Cisco MDS 9000 SAN-OS Software Release 3.1(3) or later.
B: DS-X2-FC10G-ER supported on switches running Cisco MDS 9000 SAN-OS Software Release 3.1(3) or later.
C: Supported on switches running Cisco MDS 9000 SAN-OS Software Release 3.2(1) or later.
D: Supported on switches running Cisco MDS 9000 SAN-OS Software Release 3.3(1) or later.
E: Supported on switches running Cisco MDS 9000 NX-OS Software Release 4.1(1) or later.
F: Supported on switches running Cisco MDS 9000 NX-OS Software Release 4.2(1) or later.
G: Supported on switches running Cisco MDS 9000 NX-OS Software Release 5.0 or later.
1: Supported on Ethernet ports only.
2: Digital diagnostic monitoring supported.
3: Limited to 60 km.
4: Limited to 30 km.
5: DS-X2-FC10G-ER not supported.
6: Supported on both Fibre Channel and Ethernet ports.
7: Only DS-SFP-FC4G-SW is supported
8: Can only be ordered through HP

Note: Unless specific software version is mentioned, the transceivers listed above are supported in all NX-OS versions where corresponding linecards or chassis are supported.

Cisco 2-Gbps Fibre Channel SFPs

The Cisco 2-Gbps Fibre Channel SFPs (Figure 1) are designed to provide cost-effective Fibre Channel connectivity for the Cisco MDS 9000 Fibre Channel switching modules. There are two types of Cisco 2-Gbps Fibre Channel SFP: the Cisco Fibre Channel Shortwave SFP (part number DS-SFP-FC-2G-SW) and the Cisco Fibre Channel Longwave SFP (part number DS-SFP-FC-2G-LW). Each product offers 1/2-Gbps autosensing Fibre Channel connectivity.

Figure 1. Cisco 2-Gbps Fibre Channel SFPs

Technical Specifications

Connectors and Cabling

- Connectors: Dual LC connector

Table 2 summarizes the cabling specifications.

Table 2. Cisco 2-Gbps Fibre Channel SFP Cabling Specifications

SFP	Wavelength (nanometers)	Fiber Type	Core Size (microns)	Baud Rate (Gigabaud [GBd])	Cable Distance
DS-SFP-FC-2G-SW	850	MMF	62.5	1.0625	300 m (984 ft)
			62.5	2.125	150 m (492 ft)
			50.0 (Optical Multimode 2 [OM2])	1.0625	500 m (1640 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
DS-SFP-FC-2G-LW	1310	SMF	9.0	1.0625	10 km (6.2 miles)
			9.0	2.125	10 km (6.2 mi)

Note: The minimum cable distance for all SFPs listed (multimode fiber [MMF] and single-mode fiber [SMF]) is 6.5 feet (2 meters).

Dimensions

- Dimensions (H x W x D): 8.5 x 13.75 x 55.2 mm

Environmental Conditions and Power Requirements

Table 3 presents the optical parameters, and Table 4 presents the temperature ranges.

Table 3. Optical Parameters

SFP	Average Transmit Power (decibels per milliwatt [dBm])		Average Receive Power (dBm)		Fiber Loss Budget (decibels [dB])
	Max	**Min**	**Max**	**Min**	
DS-SFP-FC-2G-SW	–2.5	–10.0	0	–	2.1 (62.5 microns) and 2.62 (50.0 microns [OM2])
DS-SFP-FC-2G-LW	–3	–11.7	–3	–	7.8

Table 4. Operating and Storage Temperature Ranges

SFP	Operating		Storage	
	Max	**Min**	**Max**	**Min**
DS-SFP-FC-2G-SW	40°C	0°C	85°C	–40°C
DS-SFP-FC-2G-LW	40°C	0°C	85°C	–40°C

Regulatory and Standards Compliance

- Compliant with Fibre Channel FC-PI 200-SM-LC-L, FC-PI 200-M5-SN-I, and 200-M6-SN-I 2.125 GBd specifications
- Compliant with Fibre Channel FC-PI 100-SM-LC-L, FC-PI 100-M5-SN-I, and FC-PI 100-M6-SN-I; and FC-PH2 100-SM-LC-L, FC-PH2 100-M5-SN-I, and FC-PH2 100-M6-SN-I 1.0625 GBd specifications
- Laser Class I 21CFR1040

Ordering Information

Table 5 provides ordering information.

Table 5. Cisco 2-Gbps Fibre Channel SFP Ordering Information

Part Number	Description
DS-SFP-FC-2G-SW	1/2-Gbps Fibre Channel-Shortwave, SFP, LC
DS-SFP-FC-2G-SW=	1/2-Gbps Fibre Channel-Shortwave, SFP, LC, Spare
DS-FC-SW-4PK=	1/2-Gbps Fibre Channel-Shortwave, SFP, LC, 4 pack, Spare
DS-SFP-FC-2G-LW	1/2-Gbps Fibre Channel-Longwave, SFP, LC
DS-SFP-FC-2G-LW=	1/2-Gbps Fibre Channel-Longwave, SFP, LC, Spare

Cisco 4-Gbps Fibre Channel SFPs

The Cisco 4-Gbps Fibre Channel SFPs (Figure 2) are designed to provide cost-effective Fibre Channel connectivity for the 1/2/4-Gbps ports on the Cisco MDS 9000 family platform. There are three types of Cisco 4-Gbps Fibre Channel SFP: the Cisco Fibre Channel Shortwave SFP (part number DS-SFP-FC4G-SW), the Cisco 4-km Fibre Channel Longwave SFP (part number DS-SFP-FC4G-MR), and the Cisco 10-km Fibre Channel Longwave SFP (part number DS-SFP-FC4G-LW). Each product offers 1/2/4-Gbps autosensing Fibre Channel connectivity.

Figure 2. Cisco 4-Gbps Fibre Channel SFPs

Technical Specifications

Connectors and Cabling

- Connectors: Dual LC connector

Table 6 summarizes the cabling specifications.

Table 6. Cisco 4-Gbps Fibre Channel SFP Cabling Specifications

SFP	Wavelength (nanometers)	Fiber Type	Core Size (microns)	Baud Rate (GBd)	Cable Distance
DS-SFP-FC4G-SW	850	MMF	62.5	1.0625	300 m (984 ft)
			62.5	2.125	150 m (492 ft)
			62.5	4.250	70 m (230 ft)
			50.0 (OM2)	1.0625	500 m (1640 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
			50.0 (OM2)	4.250	150 m (492 ft)
			50.0 (OM3)	1.0625	860 m (2821 ft)
			50.0 (OM3)	2.125	500 m (1640 ft)
			50.0 (OM3)	4.250	380 m (1246 ft)
DS-SFP-FC4G-MR	1310	SMF	9.0	1.0625	4 km (2.4 mi)
			9.0	2.125	4 km (2.4 mi)
			9.0	4.250	4 km (2.4 mi)
DS-SFP-FC4G-LW	1310	SMF	9.0	1.0625	10 km (6.2 mi)
			9.0	2.125	10 km (6.2 mi)
			9.0	4.250	10 km (6.2 mi)

Note: The minimum cable distance for all SFPs listed (MMF and SMF) is 6.5 feet (2 meters).

Dimensions

- Dimensions (H x W x D): 8.5 x 13.75 x 55.2 mm

Environmental Conditions and Power Requirements

Table 7 presents the optical parameters, and Table 8 presents the temperature ranges.

Table 7. Optical Parameters

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dB)
	Max	**Min**	**Max**	**Min**	
DS-SFP-FC4G-SW	–2.5	–9	0	–	1.78 (62.5 microns), 2.06 (50.0 microns [OM2]), and 2.88 (50.0 microns [OM3])
DS-SFP-FC4G-MR	–3	–11.2	–1	–	4.8
DS-SFP-FC4G-LW	–3	–8.4	–1	–	7.8

Table 8. Operating and Storage Temperature Ranges

SFP	Operating		Storage	
	Max	**Min**	**Max**	**Min**
DS-SFP-FC4G-SW	40°C	0°C	85°C	–40°C
DS-SFP-FC4G-MR	40°C	0°C	85°C	–40°C
DS-SFP-FC4G-LW	40°C	0°C	85°C	–40°C

Regulatory and Standards Compliance

- Compliant with Fibre Channel FC-PI 400-SM-LC-L, FC-PI 400-SM-LC-M, FC-PI 400-M5-SN-I, and FC-PI 400-M6-SN-I 4.25 GBd specifications
- Compliant with Fibre Channel FC-PI 200-SM-LC-L, FC-PI 200-M5-SN-I. and 200-M6-SN-I 2.125 GBd specifications

- Compliant with Fibre Channel FC-PI 100-SM-LC-L, FC-PI 100-M5-SN-I, and FC-PI 100-M6-SN-I; and FC-PH2 100-SM-LC-L, FC-PH2 100-M5-SN-I, and FC-PH2 100-M6-SN-I 1.0625 GBd specifications
- Laser Class I 21CFR1040

Ordering Information

Table 9 provides ordering information.

Table 9. Cisco Fibre Channel SFP Ordering Information

Part Number	Description
DS-SFP-FC4G-SW	1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC
DS-SFP-FC4G-SW=	1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC, Spare
DS-SFP-4G-SW-4=	1/2/4-Gbps Fibre Channel-Shortwave, SFP, LC, 4 pack, Spare
DS-SFP-FC4G-MR	1/2/4-Gbps Fibre Channel-Longwave 4-km, SFP, LC
DS-SFP-FC4G-MR=	1/2/4-Gbps Fibre Channel-Longwave 4-km, SFP, LC, Spare
DS-SFP-FC4G-LW	1/2/4-Gbps Fibre Channel-Longwave 10-km, SFP, LC
DS-SFP-FC4G-LW=	1/2/4-Gbps Fibre Channel-Longwave 10-km, SFP, LC, Spare

Cisco 8-Gbps Fibre Channel SFP+

The Cisco 8-Gbps Fibre Channel SFP+ (Figure 3) is designed to provide Fibre Channel connectivity for the 2/4/8-Gbps ports on the Cisco MDS 9000 family platform. There are two types of Cisco 8-Gbps Fibre Channel SFP+: the Cisco Fibre Channel Shortwave SFP+ (part number DS-SFP-FC8G-SW) and the Cisco Fibre Channel Longwave SFP+ (part number DS-SFP-FC8G-LW). Each product offers 2/4/8-Gbps autosensing Fibre Channel connectivity.

Figure 3. Cisco 8-Gbps Fibre Channel SFP+

Technical Specifications

Connectors and Cabling

- Connectors: Dual LC connector

Table 10 summarizes the cabling specifications.

Table 10. Cisco 8-Gbps Fibre Channel SFP+ Cabling Specifications

SFP+	Wavelength (nanometers)	Fiber Type	Core Size (microns)	Baud Rate (GBd)	Cable Distance
DS-SFP-FC8G-SW	850	MMF	62.5	2.125	150 m (492 ft)
			62.5	4.250	70 m (230 ft)
			62.5	8.500	21 m (69 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
			50.0 (OM2)	4.250	150 m (492 ft)

			50.0 (OM2)	8.500	50 m (164 ft)
			50.0 (OM3)	2.125	500 m (1640 ft)
			50.0 (OM3)	4.250	380 m (1246 ft)
			50.0 (OM3)	8.500	150 m (492 ft)
			50.0 (OM4)	2.125	520 m (1706 ft)
			50.0 (OM4)	4.250	400 m (1312 ft)
			50.0 (OM4)	8.500	190 m (623 ft)
DS-SFP-FC8G-LW	1310	SMF	9.0	2.125	10 km (6.2 mi)
			9.0	4.250	10 km (6.2 mi)
			9.0	8.500	10 km (6.2 mi)

Note: The minimum cable distance for all SFP+ listed (MMF and SMF) is 6.5 feet (2 meters).

Dimensions

- Dimensions (H x W x D): 8.5 x 13.55 x 56.5 mm

Environmental Conditions and Power Requirements

Table 11 presents the optical parameters, and Table 12 presents the temperature ranges.

Table 11. Optical Parameters

SFP+	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dB)		
	Max	**Min**	**Max**	**Min**			
DS-SFP-FC8G-SW	–1.3	–10 (2 Gbps) –9 (4 Gbps) –8.2 (8 Gbps)	0	–	(62.5 microns)	(50.0 microns [OM2])	(50.0 microns [OM3])
					2.10 (2 Gbps) 1.78 (4 Gbps) 1.58 (8 Gbps)	2.62 (2 Gbps) 2.06 (4 Gbps) 1.68 (8 Gbps)	3.31 (2 Gbps) 2.88 (4 Gbps) 2.04 (8 Gbps)
DS-SFP-FC8 Gbps-LW	–3 (2 Gbps) –1 (4 Gbps) +0.5 (8 Gbps)	–11.7 (2 Gbps) –8.4 (4 Gbps) –8.4 (8 Gbps)	–3 (2 Gbps) –1 (4 Gbps) +0.5 (8 Gbps)	–	7.8 (2 Gbps) 7.8 (4 Gbps) 6.4 (8 Gbps)		

Table 12. Operating and Storage Temperature Ranges

SFP+	Operating		Storage	
	Max	**Min**	**Max**	**Min**
DS-SFP-FC8G-SW	40℃	0℃	85℃	–40℃
DS-SFP-FC8G-LW	40℃	0℃	85℃	–40℃

Regulatory and Standards Compliance

- Compliant with Fibre Channel FC-PI 800-SM-LC-L, FC-PI 800-M5-SN-S, FC-PI 800-M5E-SN-I, and FC-PI 800-M6-SN-S 8.5 GBd specifications
- Compliant with Fibre Channel FC-PI 400-SM-LC-L, FC-PI 400-M5-SN-I, FC-PI 400-M5E-SN-I, and FC-PI 400-M6-SN-I 4.25 GBd specifications
- Compliant with Fibre Channel FC-PI 200-SM-LC-L, FC-PI 200-M5-SN-I, FC-PI 200-M5E-SN-I, and 200-M6-SN-I 2.125 GBd specifications
- Laser Class I 21CFR1040

Ordering Information

Table 13 provides ordering information.

Table 13. Cisco Fibre Channel SFP+ Ordering Information

Part Number	Description
DS-SFP-FC8G-SW	2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC
DS-SFP-FC8G-SW=	2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC, Spare
DS-SFP-8G-SW-4=	2/4/8-Gbps Fibre Channel-Shortwave, SFP+, LC, 4 pack, Spare
DS-SFP-FC8G-LW	2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC
DS-SFP-FC8G-LW=	2/4/8-Gbps Fibre Channel-Longwave, SFP+, LC, Spare

Cisco Tri-Rate Multiprotocol SFPs

To ease management and sparing concerns, Cisco offers SFPs that can be used in both Fibre Channel (FC) and Gigabit Ethernet (GE) ports. The Cisco Tri-Rate Multiprotocol SFPs can run at 1- and 2-Gbps Fibre Channel and 1-Gbps Ethernet, thus enabling the user to use one type of SFP for all ports on the Cisco MDS 9000 family platform.

There are two types of Cisco Tri-Rate Multiprotocol SFP (Figure 4): the Cisco Tri-Rate Multiprotocol Shortwave SFP (part number DS-SFP-FCGE-SW) and the Cisco Tri-Rate Multiprotocol Longwave SFP (part number DS-SFP-FCGE-LW). Each product offers autosensing 1/2-Gbps Fibre Channel connectivity and 1-Gbps Ethernet connectivity.

Figure 4. Cisco Tri-Rate Multiprotocol SFPs

Technical Specifications

Connectors and Cabling

- Connectors: Dual LC connector

Table 14 summarizes the cabling specifications.

Table 14. Cisco Tri-Rate Multiprotocol SFP Cabling Specifications

SFP	Wavelength (nanometers)	Fiber Type	Core Size (microns)	Baud Rate (GBd)	Cable Distance
DS-SFP-FCGE-SW	850	MMF	62.5	1.0625	300 m (984 ft)
			62.5	2.125	150 m (492 ft)
			50.0 (OM2)	1.0625	500 m (1640 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
DS-SFP-FCGE-LW	1310	SMF	9.0	1.0625	10 km (6.2 mi)
			9.0	2.125	10 km (6.2 mi)

Note: The minimum cable distance for all SFPs listed (MMF and SMF) is 6.5 feet (2 meters).

Dimensions

- Dimensions (H x W x D): 8.5 x 13.75 x 55.2 mm

Environmental Conditions and Power Requirements

Table 15 presents the optical parameters, and Table 16 presents the temperature ranges.

Table 15. Optical Parameters

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Max	Min	Max	Min	
DS-SFP-FCGE-SW	–1.2	–10.0 (FC) and –9.5 (GE)	0	–17 (GE)	• 2.1 (FC: 62.5 microns) and 2.62 (FC: 50.0 microns [OM2]) • 2.38 (GE: 62.5 microns) and 3.37 (GE: 50.0 microns [OM2])
DS-SFP-FCGE-LW	–3	–11.0	–3	–19 (GE)	• 7.8 (FC) • 4.57 (GE)

Note: The fiber loss budget is derived from taking the difference between the minimum average transmit power and the minimum average receive power and subtracting the link penalties. The specified fiber loss budget should be used in calculating the maximum link distance.

Table 16. Operating and Storage Temperature Ranges

SFP	Operating		Storage	
	Max	Min	Max	Min
DS-SFP-FCGE-SW	40℃	0℃	85℃	–40℃
DS-SFP-FCGE-LW	40℃	0℃	85℃	–40℃

Regulatory and Standards Compliance

- Compliant with Fibre Channel FC-PI 200-SM-LC-L, FC-PI 200-M5-SN-I, and FC-PI 200-M6-SN-I 2.125 GBd; and IEEE 802.3 Gigabit Ethernet (1.25 GBd) 1000BASE-SX specifications
- Compliant with the Fibre Channel FC-PI 100-SM-LC-L, FC-PI 100-M5-SN-I, and FC-PI 100-M6-SN-I; and FC-PH2 100-SM-LC-L, FC-PH2 100-M5-SN-I, and FC-PH2 100-M6-SN-I 1.0625 GBd specifications
- Laser Class I 21CFR1040

Warranty

- Standard warranty: One year

Ordering Information

Table 17 provides ordering information.

Table 17. Cisco Tri-Rate Multiprotocol SFP Ordering Information

Part Number	Description
DS-SFP-FCGE-SW	1/2-Gbps Fibre Channel and Gigabit Ethernet-Shortwave, SFP, LC
DS-SFP-FCGE-SW=	1/2-Gbps Fibre Channel and Gigabit Ethernet-Shortwave, SFP, LC, Spare
DS-SFP-FCGE-LW	1/2-Gbps Fibre Channel and Gigabit Ethernet-Longwave, SFP, LC
DS-SFP-FCGE-LW=	1/2-Gbps Fibre Channel and Gigabit Ethernet-Longwave, SFP, LC, Spare

Cisco Copper Gigabit Ethernet SFPs

To enable even more cabling flexibility, the Cisco MDS 9000 family offers a copper Gigabit Ethernet SFP. Based on the 1000BASE-T standard, the Cisco Copper Gigabit Ethernet SFP (Figure 5) provides cost-effective connectivity for data center applications. The Cisco Copper Gigabit Ethernet SFP (part number DS-SFP-GE-T) allows a user to use standard Category-5 unshielded twisted pair (UTP) cabling for Ethernet connectivity.

Figure 5. Cisco Copper Gigabit Ethernet SFP

Technical Specifications

Connectors and Cabling

- Connectors: RJ-45 connector

Table 18 summarizes the cabling specifications.

Table 18. Cisco Copper Gigabit Ethernet SFP Cabling Specifications

SFP	Cable Type	Cable Distance
DS-SFP-GE-T	Category 5 UTP	100 m (328 ft)

Dimensions

- Dimensions (H x W x D): 13.75 x 13.75 x 67.8 mm

Environmental Conditions and Power Requirements

Table 19 presents the temperature ranges.

Table 19. Operating and Storage Temperature Ranges

SFP	Operating		Storage	
	Max	**Min**	**Max**	**Min**
DS-SFP-GE-T	40℃	0℃	85℃	–40℃

Regulatory and Standards Compliance

- Compliant with the IEEE 802.3 Gigabit Ethernet (1.25 GBd) 1000BASE-T specification

Warranty

- Standard warranty: One year

Ordering Information

Table 20 provides ordering information.

Table 20. Cisco Copper Gigabit Ethernet SFP Ordering Information

Part Number	Description
DS-SFP-GE-T	1-Gbps Copper Gigabit Ethernet SFP, 1000Base-T, RJ-45
DS-SFP-GE-T=	1-Gbps Copper Gigabit Ethernet SFP, 1000Base-T, RJ-45, Spare

Cisco 10-Gbps Fibre Channel X2 Transceivers

The Cisco Fibre Channel X2 transceivers are designed to provide high-performance Fibre Channel connectivity for the 10-Gbps Fibre Channel ports on the Cisco MDS 9000 family platform. There are three types of Cisco 10-Gbps Fibre Channel X2 transceivers for transmission on optical cables: Cisco Short Reach (up to 300 m; part number DS-X2-FC10G-SR), Cisco Long Reach (up to 10 km; part number DS-X2-FC10G-LR), and Cisco Extended Reach (up to 40 km; part number DS-X2-FC10G-ER) (Figure 6). There is also a 10-Gbps Fibre Channel X2 transceiver for transmission on copper cable (up to 15 m; part number DS-X2-FC10G-CX4) (Figure 7). Each product offers 10-Gbps Fibre Channel connectivity.

Figure 6. Cisco 10-Gbps Fibre Channel X2 Transceiver (Part Numbers DS-X2-FC10G-SR, DS-X2-FC10G-LR, and DS-X2-FC10G-ER)

Figure 7. Cisco 10-Gbps Fibre Channel CX4 X2 Transceiver (Part Number DS-X2-FC10G-CX4)

Technical Specifications

Connectors and Cabling

- Connectors
  - Dual SC connector (DS-X2-FC10G-SR, DS-X2-FC10G-LR, and DS-X2-FC10G-ER)
  - CX4 Connector (DS-X2-FC10G-CX4)

Table 21 summarizes the cabling specifications.

Table 21. X2 Port Cabling Specifications

X2	Wavelength (nanometers)	Fiber Type	Core Size (microns)	Baud Rate (GBd)	Cable Distance
DS-X2-FC10G-SR	850	MMF	62.5	10.51875	33 m (108 ft)
			50.0 (OM3)	10.51875	300 m (984 ft)
DS-X2-FC10G-LR	1310	SMF	9.0	10.51875	10 km (6.2 mi)
DS-X2-FC10G-ER	1550	SMF	9.0	10.51875	40 km (24.8 mi)
DS-X2-FC10G-CX4	–	Copper	–	10.51875	15 m (49.2 ft)

Note: The minimum cable distance for all listed transceivers (MMF and SMF) except CX4 is 6.5 feet (2 meters).

Dimensions

- Dimensions (H x W x D): 19.2 x 41.8 x 90.8 mm

Environmental Conditions and Power Requirements

Table 22 presents the optical parameters, and Table 23 presents the temperature ranges.

Table 22. Optical Parameters

X2	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Max	**Min**	**Max**	**Min**	
DS-X2-FC10G-SR	–1.2	–7.3	–1.0	–9.9	2.6 (50.0 microns [OM3])
DS-X2-FC10G-LR	0.5	–8.2	0.5	–14.4	6.2
DS-X2-FC10G-ER	4.0	–4.7	–1.0	–15.8	11.1

Note: DS-X2-FC10G-CX4 is not an optical module and is therefore not listed in this table.

Table 23. Operating and Storage Temperature Ranges

X2	Operating		Storage	
	Max	**Min**	**Max**	**Min**
DS-X2-FC10G-SR	40°C	0°C	85°C	–40°C
DS-X2-FC10G-LR	40°C	0°C	85°C	–40°C
DS-X2-FC10G-ER	40°C	0°C	85°C	–40°C
DS-X2-FC10G-CX4	40°C	0°C	85°C	–40°C

Regulatory and Standards Compliance

- Compliant with Fibre Channel 10GFC 1200-M6-SN-I, 10GFC 1200-M5-SN-I, 10GFC 1200-M5E-SN-I, and 10GFC 1200-SM-LL-L 10.51875 GBd specifications
- Compliant with IEEE 802.3 10GBASE-ER
- Compliant with IEEE 802.3 10GBASE-CX4
- Laser Class I 21CFR1040

Ordering Information

Table 24 provides ordering information.

Table 24. Cisco 10-Gbps Fibre Channel X2 Transceiver Ordering Information

Part Number	Description
DS-X2-FC10G-SR	10-Gbps Fibre Channel-Short-reach, X2, SC
DS-X2-FC10G-SR=	10-Gbps Fibre Channel-Short-reach, X2, SC, Spare
DS-X2-FC10G-LR	10-Gbps Fibre Channel-Long-reach, X2, SC

DS-X2-FC10G-LR=	10-Gbps Fibre Channel-Long-reach, X2, SC, Spare
DS-X2-FC10G-ER	10-Gbps Fibre Channel-Extended-reach, X2, SC
DS-X2-FC10G-ER=	10-Gbps Fibre Channel-Extended-reach, X2, SC, Spare
DS-X2-FC10G-CX4	10-Gbps Fibre Channel-Copper Transceiver, X2, CX4
DS-X2-FC10G-CX4=	10-Gbps Fibre Channel-Copper Transceiver, X2, CX4, Spare
DS-CAB-15M=	15m Cable for 10G Copper X2 transceiver, spare
DS-CAB-1M=	1m Cable for 10G Copper X2 transceiver, spare

Cisco 10-Gbps Ethernet X2 Transceivers

The Cisco Ethernet X2 Transceiver Short Reach (up to 300 m; part number DS-X2-E10G-SR) enables high-performance Fibre Channel connectivity for the Cisco MDS 9000 family 10-Gbps Fibre Channel switching module to an existing Ethernet Dense Wavelength-Division Multiplexing (DWDM) transponder (Figure 8). The data format transmitted by the Ethernet X2 transceiver (DS-X2-E10G-SR) onto the fiber is identical to that transmitted by the Fibre Channel transceiver (DS-X2-FC10G-SR), except that the Fibre Channel packets are clocked at the 10 gigabit Ethernet rate, which allows Fibre Channel packets to be carried over an existing 10-Gbps Ethernet DWDM infrastructure. The Cisco MDS 9000 family 10-Gbps Fibre Channel switching module will automatically detect DS-X2-E10G-SR; no software configuration is required.

Figure 8. Cisco 10-Gbps Ethernet X2 Transceiver

Technical Specifications

Connectors and Cabling

- Connectors: Dual SC connector

Table 25 summarizes the cabling specifications.

Table 25. Cisco 10-Gbps Ethernet X2 Transceiver Cabling Specifications

X2	Wavelength (nanometers)	Fiber Type	Core Size (microns)	Baud Rate (GBd)	Cable Distance
DS-X2-E10G-SR	850	MMF	62.5	10.3125	33 m (108 ft)
			50.0 (OM3)	10.3125	300 m (984 ft)

Note: The minimum cable distance for all transceivers listed (MMF and SMF) is 6.5 feet (2 meters).

Dimensions

- Dimensions (H x W x D): 19.2 x 41.8 x 90.8 mm

Environmental Conditions and Power Requirements

Table 26 presents the optical parameters, and Table 27 presents the temperature ranges.

Table 26. Optical Parameters

X2	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget
	Max	Min	Max	Min	
DS-X2-E10G-SR	–1.2	–7.3	–1.0	–9.9	2.6 (50.0 microns [OM3])

Table 27. Operating and Storage Temperature Ranges

X2	Operating		Storage	
	Max	Min	Max	Min
DS-X2-E10G-SR	40℃	0℃	85℃	–40℃

Regulatory and Standards Compliance

- Compliant with IEEE 802.3 10GBASE-SR
- Laser Class I 21CFR1040

Ordering Information

Table 28 provides ordering information.

Table 28. Cisco 10-Gbps Ethernet X2 Transceiver Ordering Information

Part Number	Description
DS-X2-E10G-SR=	10-Gbps Ethernet-Short-reach, X2, SC, Spare

Cisco Coarse Wavelength-Division Multiplexing Extended Distance SFP Solution

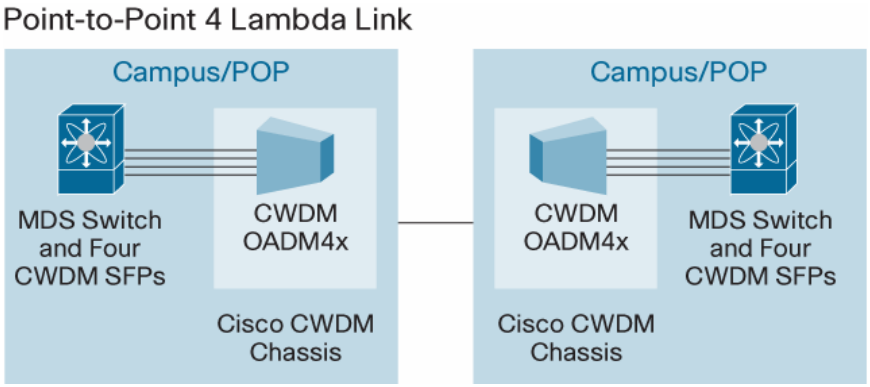
The Cisco MDS 9000 family offers cost-effective multiprotocol extended distance connectivity that optimizes the use of a customer's existing optical infrastructure through the Cisco Coarse Wavelength-Division Multiplexing (CWDM) SFP solution (Figure 9). The Cisco CWDM SFP solution has two main components: a set of eight wavelength-specific SFPs and a set of CWDM optical add-drop modules (OADMs). A Cisco CWDM chassis enables rack-mounting of up to two Cisco CWDM OADMs. The Cisco CWDM OADMs are passive and require no power or configuration.

Figure 9. Cisco CWDM Extended Distance SFP Solution

The Cisco CWDM SFP solution enables the transport of up to eight channels over one pair of single-mode fiber strands, enabling enterprises to increase the bandwidth of an existing optical infrastructure without adding new fiber strands. The solution can be used in parallel with other Cisco SFP devices on the same platform.

Figure 10 shows a common point-to-point deployment scenario for the Cisco MDS 9000 family using the Cisco CWDM SFP solution. Two endpoints are directly connected through a fiber link. The Cisco CWDM SFP solution enables customers to add or drop up to eight channels onto a pair of single-mode fiber strands. As a result, the need for additional fiber is reduced. Redundant point-to-point links can be implemented by adding or dropping redundant channels onto a second pair of single-mode fiber strands.

Figure 10. Point-to-Point Architecture (Dual-Fiber Link)



Cisco 1/2-Gbps CWDM SFPs

Technical Specifications for Cisco 1/2-Gbps CWDM SFPs

Connectors and Cabling

- Equipment: Standard SFP interface
- Network: Dual LC connector

Dimensions

- Dimensions (H x W x D): 8.5 x 13.75 x 55.2 mm

Environmental Conditions and Power Requirements

Table 29 presents the optical parameters, and Table 30 presents the temperature ranges.

Table 29. Optical Parameters for Cisco 1/2-Gbps CWDM SFPs

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes and Conditions
Transmitter center wavelength	lambda_c	(x–4)	–	(x+7)	nm	Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm
Side-mode suppression ratio	SMSR	30	–	–	dB	–
Transmitter optical output power	Pout	0.0		5.0	dBm	Average power coupled into single-mode fiber
Receiver optical input power (BER <10-12 with PRBS 2-7-1)	Pin	–28.0	–	–7.0	dBm	At 2.12 Gbps, 140°F (60°C) case temperature
Receiver optical input power (BER <10-12 with PRBS 2-7-1)	Pin	–29.0	–	–7.0	dBm	At 1.25 Gbps, 140°F (60°C) case temperature
Receiver optical input wavelength	Lambda_in	1450	–	1620	nm	–
Transmitter extinction ratio	OMI	9	–	–	dB	–
Dispersion penalty at 100 km (62.1 mi)	–	–	–	3	dB	At 2.12 Gbps

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes and Conditions
Dispersion penalty at 100 km (62.1 mi)	–	–	–	2	dB	At 1.25 Gbps

Note:

- Parameters are specified over temperature and at end of life unless otherwise noted.
- When shorter distances of single-mode fiber are used, you may need to insert an inline optical attenuator in the link to avoid overloading the receiver.

Table 30. Operating and Storage Temperature Ranges

Operating		Storage	
Max	**Min**	**Max**	**Min**
40℃	0℃	85℃	–40℃

Regulatory and Standards Compliance

- Compatible with 1000BASE-X standard as specified in IEEE 802.3z
- Compatible with Fibre Channel Draft Physical Interface Specification (FC-PI 10.0)
- Laser Class I 21CFR1040

Ordering Information

Table 31 provides ordering information.

Table 31. Cisco 1/2-Gbps CWDM SFP Ordering Information

Part Number	Description	Color
DS-CWDM-1470=	1470 nm CWDM 1/2-Gbps Fibre Channel SFP	Gray
DS-CWDM-1490=	1490 nm CWDM 1/2-Gbps Fibre Channel SFP	Violet
DS-CWDM-1510=	1510 nm CWDM 1/2-Gbps Fibre Channel SFP	Blue
DS-CWDM-1530=	1530 nm CWDM 1/2-Gbps Fibre Channel SFP	Green
DS-CWDM-1550=	1550 nm CWDM 1/2-Gbps Fibre Channel SFP	Yellow
DS-CWDM-1570=	1570 nm CWDM 1/2-Gbps Fibre Channel SFP	Orange
DS-CWDM-1590=	1590 nm CWDM 1/2-Gbps Fibre Channel SFP	Red
DS-CWDM-1610=	1610 nm CWDM 1/2-Gbps Fibre Channel SFP	Brown

Cisco 4-Gbps CWDM SFPs

Technical Specifications for Cisco 4-Gbps CWDM SFPs

Connectors and Cabling

- Equipment: Standard SFP interface
- Network: Dual LC connector

Dimensions

- Dimensions (H x W x D): 8.46 x 13.27 x 56.64 mm

Environmental Conditions and Power Requirements

Table 32 presents the optical parameters, and Table 33 presents the temperature ranges.

Table 32. Optical Parameters for Cisco 4-Gbps CWDM SFPs

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes and Conditions
Transmitter center wavelength	lambda_c	(x–6)	x	(x+6)	nm	Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm
Side-mode suppression ratio	SMSR	30	–	–	dB	–
Transmitter optical output power	Pout	1.0	–	5.0	dBm	Average power coupled into single-mode fiber
Receiver optical input power (BER <10-12 with PRBS 2-23-1)	Pin	–15.7	–	0.0	dBm	140°F (60°C) case temperature
Link budget	–	17.8	–	–	dB	
Receiver optical input wavelength	Lambda_in	1450	–	1620	nm	–
Transmitter extinction ratio	OMI	4	–	–	dB	–
Dispersion penalty at 25 km (15.5 mi)	–	–	–	3	dB	–

Note:

- In typical point-to-point deployments, all wavelengths have a minimum reach of 40 km (24.8 mi).
- Parameters are specified over temperature and at end of life unless otherwise noted.
- When shorter distances of single-mode fiber are used, you may need to insert an inline optical attenuator in the link to avoid overloading the receiver.
- Up to 24 Cisco 4-Gbps CWDM SFP Transceivers are supported in a single Cisco MDS 9000 family switching module.
- When interoperating a Cisco 4-Gbps CWDM SFP Transceiver with a Cisco 1/2-Gbps CWDM SFP Transceiver, you must manually configure the port speeds on the Cisco 4-Gbps CWDM SFP Transceiver to 1 or 2 Gbps.

Table 33. Operating and Storage Temperature Ranges

Operating		Storage	
Max	**Min**	**Max**	**Min**
40°C	0°C	85°C	–40°C

Regulatory and Standards Compliance

- Compatible with Fibre Channel Draft Physical Interface Specification (FC-PI -4 6.01)
- Laser Class I 21CFR1040

Ordering Information

Table 34 provides ordering information.

Table 34. Cisco 4-Gbps CWDM SFP Ordering Information

Part Number	Description	Color
DS-CWDM4G1470=	1470 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Gray
DS-CWDM4G1490=	1490 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Violet
DS-CWDM4G1510=	1510 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Blue
DS-CWDM4G1530=	1530 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Green
DS-CWDM4G1550=	1550 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Yellow
DS-CWDM4G1570=	1570 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Orange

Part Number	Description	Color
DS-CWDM4G1590=	1590 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Red
DS-CWDM4G1610=	1610 nm CWDM 1/2/4-Gbps Fibre Channel SFP	Brown

Cisco CWDM OADMs

Technical Specifications for Cisco CWDM OADMs

The Cisco CWDM OADMs are passive devices that provide the capability to multiplex and demultiplex, or add and drop wavelengths from multiple fibers onto one fiber. The OADM connectors are interfaced with color-matching Cisco CWDM SFPs on the equipment side. All modules are the same size. The Cisco CWDM chassis enables rack mounting for up to two Cisco CWDM OADMs in a single rack unit.

The Cisco MDS 9000 family offers two CWDM OADMs and a multiplexer and demultiplexer:

- **Cisco Dual Fiber 4-Channel OADMs (part numbers DS-CWDMOADM4A= and DS-CWDMOADM4B=):** This device allows you to add and drop four channels (with different wavelengths) onto one direction of an optical ring. The other wavelengths are passed through the OADM. Dual fiber is used for both network and SFP connections. The four wavelengths are set to 1470, 1490, 1510, and 1530 nm for DS-CWDMOADM4A=, and 1550, 1570, 1590, and 1610 nm for DS-CWDMOADM4B=.
- **Cisco Dual Fiber 8-Channel Multiplexer/Demultiplexer (DS-CWDM-MUX8A=):** This device allows you to multiplex and demultiplex eight separate channels onto one pair of fiber. Dual fiber is used for both network and SFP connections. The eight wavelengths are set to 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm.

Tables 35 and 36 provide comparisons of the OADM types.

Table 35. OADM Type Comparison

Product Number	Type	Architecture Options
DS-CWDMOADM4x=	OADM	Ring and point-to-point
DS-CWDM-MUX8A=	Multiplexer/demultiplexer	Ring and point-to-point

Table 36. Maximum Insertion Loss in dB for Each Passive CWDM Filter

Model	Maximum Insertion Loss (dB)			
	Add/Drop	**Pass 1550**	**Pass 1300**	**Monitor**
DS-CWDMOADM4x=	1.8	2.1	2.1	23
DS-CWDM-MUX8A=	2.2	–	–	23

Connectors and Cabling

- DS-CWDMOADM4x=: Dual LC connector
- DS-CWDM-MUX8A=: Dual LC connector

Environmental Conditions and Power Requirements

The operating temperature range is 23 to 131℉ (–5 and 55℃), and the storage temperature range is –40 to 185℉ (–40 to 85℃).

The Cisco CWDM OADMs and the Cisco CWDM chassis are passive components that do not require power.

Dimensions and Weight

All the Cisco CWDM OADMs have the same dimensions: W x D x H: 21.2 x 3.0 x 26.5 cm. Two of these modules fit into one Cisco CWDM chassis. The Cisco CWDM chassis is one-rack-unit (1RU) in height and fits in a standard 19-inch rack.

Regulatory and Standards Compliance

- Network Equipment Building Standards (NEBS) Level 3

Warranty

- Standard warranty: One year

Ordering Information

Table 37 provides ordering information.

Table 37. Cisco Dual Fiber 4-Channel OADM, Dual Fiber 8-Channel Multiplexer/Demultiplexer, and CWDM Chassis Ordering Information

Product Number	Description
DS-CWDMOADM4A=	4-channel (1470, 1490, 1510, and 1530 nm) optical add/drop multiplexer OADM
DS-CWDMOADM4B=	4-channel (1550, 1570, 1590, and 1610 nm) optical add/drop multiplexer OADM
DS-CWDM-MUX8A=	8-channel multiplexer/demultiplexer
DS-CWDMCHASSIS=	2-slot chassis for Cisco OADM and multiplexer/demultiplexer

Cisco Dense Wavelength-Division Multiplexing Extended Distance Solution

2-Gbps DWDM SFP Transceiver

The Cisco DWDM SFP modules enable enterprises and service providers to provide scalable, easy-to-deploy DWDM Fibre Channel services in their networks.

The main features of the Cisco DWDM SFP include:

- Support for International Telecommunication Union (ITU) 100-GHz wavelength grid
- Match for wavelength plan of Cisco ONS 100-GHz product family
- Fixed-wavelength SFP, with 32 SFP models

Note: Up to eight 2-Gbps DWDM SFPs are supported in a single Cisco MDS 9000 family switching module. Refer to http://www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/product_data_sheet0900aecd80582763.html for details.

Ordering Information

Table 38 provides ordering information.

Table 38. Cisco 2-Gbps DWDM SFP Transceiver Ordering Information

Part Number	Description
DWDM-SFP-6061=	Cisco 1560.61 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5979=	Cisco 1559.79 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5898=	Cisco 1558.98 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5817=	Cisco 1558.17 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5655=	Cisco 1556.55 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5575=	Cisco 1555.75 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5494=	Cisco 1554.94 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5413=	Cisco 1554.13 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5252=	Cisco 1552.52 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5172=	Cisco 1551.72 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-5092=	Cisco 1550.92 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare

Part Number	Description
DWDM-SFP-5012=	Cisco 1550.12 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4851=	Cisco 1548.51 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4772=	Cisco 1547.72 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4692=	Cisco 1546.92 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4612=	Cisco 1546.12 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4453=	Cisco 1544.53 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4373=	Cisco 1543.73 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4294=	Cisco 1542.94 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4214=	Cisco 1542.14 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-4056=	Cisco 1540.56 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3977=	Cisco 1539.77 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3898=	Cisco 1538.98 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3819=	Cisco 1538.19 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3661=	Cisco 1536.61 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3582=	Cisco 1535.82 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3504=	Cisco 1535.04 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3425=	Cisco 1534.25 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3268=	Cisco 1532.68 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3190=	Cisco 1531.90 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3112=	Cisco 1531.12 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare
DWDM-SFP-3033=	Cisco 1530.33 NM DWDM Gigabit Ethernet and 1/2-Gbps Fibre Channel SFP, spare

4-Gbps DWDM SFP Transceiver

The Cisco 4-Gbps DWDM SFP modules enable enterprises and service providers to provide scalable, easy-to-deploy DWDM Fibre Channel services in their networks. Direct integration of 4G DWDM optics in the Cisco MDS 9000 platform dramatically reduces capital and operational expenses for an FC over DWDM network, avoiding the need of DWDM Transponders and Muxponders.

The main features of the Cisco 4-Gbps DWDM SFP include:

- Support for International Telecommunication Union (ITU) 100-GHz wavelength grid
- Match for wavelength plan of Cisco ONS 100-GHz product family
- Fixed-wavelength SFP, with 40 SFP models

Ordering Information

Based upon customer usage, Cisco has identified and selected particular high-usage wavelengths, and will maintain shorter lead-times on these items. The short lead-time 4-Gbps DWDM SFP modules are from 1546.1 to 1560.6 with a 4 skip 1 approach. These part numbers are identified in Table 39. Table 40 identifies the rest of the 4-Gbps DWDM SFP modules.

Table 39. Cisco 4-Gbps DWDM SFP Transceiver Ordering Information—Commonly Used Wavelengths

PID	Description
ONS-SC-4G-50.1=	SFP – 4G FC 1550.12, 100 GHz, LC
ONS-SC-4G-50.9=	SFP – 4G FC 1550.92, 100 GHz, LC
ONS-SC-4G-51.7=	SFP – 4G FC 1551.72, 100 GHz, LC
ONS-SC-4G-52.5=	SFP – 4G FC 1552.52, 100 GHz, LC
ONS-SC-4G-54.1=	SFP – 4G FC 1554.13, 100 GHz, LC

PID	Description
ONS-SC-4G-54.9=	SFP – 4G FC 1554.94, 100 GHz, LC
ONS-SC-4G-55.7=	SFP – 4G FC 1555.75, 100 GHz, LC
ONS-SC-4G-56.5=	SFP – 4G FC 1556.55, 100 GHz, LC
ONS-SC-4G-58.1=	SFP – 4G FC 1558.17, 100 GHz, LC
ONS-SC-4G-58.9=	SFP – 4G FC 1558.98, 100 GHz, LC
ONS-SC-4G-59.7=	SFP – 4G FC 1559.79, 100 GHz, LC
ONS-SC-4G-60.6=	SFP – 4G FC 1560.61, 100 GHz, LC

Table 40. Cisco 4-Gbps DWDM SFP Transceiver Ordering Information – Other Wavelengths

PID	Description
ONS-SC-4G-30.3=	SFP – 4G FC 1530.33, 100 GHz, LC
ONS-SC-4G-31.1=	SFP – 4G FC 1531.12, 100 GHz, LC
ONS-SC-4G-31.9=	SFP – 4G FC 1531.90, 100 GHz, LC
ONS-SC-4G-32.6=	SFP – 4G FC 1532.68, 100 GHz, LC
ONS-SC-4G-33.4=	SFP – 4G FC 1533.47, 100 GHz, LC
ONS-SC-4G-34.2=	SFP – 4G FC 1534.25, 100 GHz, LC
ONS-SC-4G-35.0=	SFP – 4G FC 1535.04, 100 GHz, LC
ONS-SC-4G-35.8=	SFP – 4G FC 1535.82, 100 GHz, LC
ONS-SC-4G-36.6=	SFP – 4G FC 1536.61, 100 GHz, LC
ONS-SC-4G-37.4=	SFP – 4G FC 1537.40, 100 GHz, LC
ONS-SC-4G-38.1=	SFP – 4G FC 1538.19, 100 GHz, LC
ONS-SC-4G-38.9=	SFP – 4G FC 1538.98, 100 GHz, LC
ONS-SC-4G-39.7=	SFP – 4G FC 1539.77, 100 GHz, LC
ONS-SC-4G-40.5=	SFP – 4G FC 1540.56, 100 GHz, LC
ONS-SC-4G-41.3=	SFP – 4G FC 1541.35, 100 GHz, LC
ONS-SC-4G-42.1=	SFP – 4G FC 1542.14, 100 GHz, LC
ONS-SC-4G-42.9=	SFP – 4G FC 1542.94, 100 GHz, LC
ONS-SC-4G-43.7=	SFP – 4G FC 1543.73, 100 GHz, LC
ONS-SC-4G-44.5=	SFP – 4G FC 1544.53, 100 GHz, LC
ONS-SC-4G-45.3=	SFP – 4G FC 1545.32, 100 GHz, LC
ONS-SC-4G-46.1=	SFP – 4G FC 1546.12, 100 GHz, LC
ONS-SC-4G-46.9=	SFP – 4G FC 1546.92, 100 GHz, LC
ONS-SC-4G-47.7=	SFP – 4G FC 1547.72, 100 GHz, LC
ONS-SC-4G-48.5=	SFP – 4G FC 1548.51, 100 GHz, LC
ONS-SC-4G-49.3=	SFP – 4G FC 1549.32, 100 GHz, LC
ONS-SC-4G-53.3=	SFP – 4G FC 1553.33, 100 GHz, LC
ONS-SC-4G-57.3=	SFP – 4G FC 1557.36, 100 GHz, LC
ONS-SC-4G-61.4=	SFP – 4G FC 1561.43, 100 GHz, LC

For More Information

For more information about the Cisco MDS 9000 Series Multilayer SAN Switches, visit

http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/brochure_c02-452560.html

Cisco 10-Gbps Ethernet DWDM X2 Transceiver

The Cisco 10-Gbps Ethernet DWDM X2 Transceiver pluggable module (part number DWDM-X2-xx.xx=) enables high-performance Fibre Channel connectivity for the Cisco MDS 9000 family 10-Gbps Fibre Channel switching module to an existing Ethernet DWDM infrastructure. The data format transmitted by the Ethernet DWDM X2 transceiver (DWDM-X2-xx.xx=) onto the fiber is identical to that transmitted by the Fibre Channel X2 transceiver (DS-X2-FC10G-SR), except that the Fibre Channel packets are clocked at the 10 Gigabit Ethernet rate, which allows Fibre Channel packets to be carried over an existing 10-Gbps Ethernet DWDM infrastructure. The Cisco MDS 9000 10-Gbps Fibre Channel switching module will automatically detect DWDM-X2-xx.xx=; no software configuration is required.

The main features of the Cisco 10-Gbps Ethernet DWDM X2 Transceiver include:

- Support for 32 nontunable ITU 100-GHz wavelengths compatible with the Cisco ONS DWDM channel plan
- Support for digital optical monitoring capability

A detailed data sheet is available at http://www.cisco.com/en/US/products/ps6576/index.html and http://www.cisco.com/en/US/products/hw/modules/ps5455/products_data_sheets_list.html.

Ordering Information

Table 41 provides ordering information.

Table 41. Cisco 10-Gbps Ethernet DWDM X2 Transceiver Ordering Information

Part Number	Description	ITU Channel
DWDM-X2-60.61=	10GBASE-DWDM 1560.61 nm X2 (100-GHz ITU grid)	21
DWDM-X2-59.79=	10GBASE-DWDM 1559.79 nm X2 (100-GHz ITU grid)	22
DWDM-X2-58.98=	10GBASE-DWDM 1558.98 nm X2 (100-GHz ITU grid)	23
DWDM-X2-58.17=	10GBASE-DWDM 1558.17 nm X2 (100-GHz ITU grid)	24
DWDM-X2-56.55=	10GBASE-DWDM 1556.55 nm X2 (100-GHz ITU grid)	26
DWDM-X2-55.75=	10GBASE-DWDM 1555.75 nm X2 (100-GHz ITU grid)	27
DWDM-X2-54.94=	10GBASE-DWDM 1554.94 nm X2 (100-GHz ITU grid)	28
DWDM-X2-54.13=	10GBASE-DWDM 1554.13 nm X2 (100-GHz ITU grid)	29
DWDM-X2-52.52=	10GBASE-DWDM 1552.52 nm X2 (100-GHz ITU grid)	31
DWDM-X2-51.72=	10GBASE-DWDM 1551.72 nm X2 (100-GHz ITU grid)	32
DWDM-X2-50.92=	10GBASE-DWDM 1550.92 nm X2 (100-GHz ITU grid)	33
DWDM-X2-50.12=	10GBASE-DWDM 1550.12 nm X2 (100-GHz ITU grid)	34
DWDM-X2-48.51=	10GBASE-DWDM 1548.51 nm X2 (100-GHz ITU grid)	36
DWDM-X2-47.72=	10GBASE-DWDM 1547.72 nm X2 (100-GHz ITU grid)	37
DWDM-X2-46.92=	10GBASE-DWDM 1546.92 nm X2 (100-GHz ITU grid)	38
DWDM-X2-46.12=	10GBASE-DWDM 1546.12 nm X2 (100-GHz ITU grid)	39
DWDM-X2-44.53=	10GBASE-DWDM 1544.53 nm X2 (100-GHz ITU grid)	41
DWDM-X2-43.73=	10GBASE-DWDM 1543.73 nm X2 (100-GHz ITU grid)	42
DWDM-X2-42.94=	10GBASE-DWDM 1542.94 nm X2 (100-GHz ITU grid)	43
DWDM-X2-42.14=	10GBASE-DWDM 1542.14 nm X2 (100-GHz ITU grid)	44
DWDM-X2-40.56=	10GBASE-DWDM 1540.56 nm X2 (100-GHz ITU grid)	46
DWDM-X2-39.77=	10GBASE-DWDM 1539.77 nm X2 (100-GHz ITU grid)	47
DWDM-X2-38.98=	10GBASE-DWDM 1538.98 nm X2 (100-GHz ITU grid)	48
DWDM-X2-38.19=	10GBASE-DWDM 1538.19 nm X2 (100-GHz ITU grid)	49
DWDM-X2-36.61=	10GBASE-DWDM 1536.61 nm X2 (100-GHz ITU grid)	51

Part Number	Description	ITU Channel
DWDM-X2-35.82=	10GBASE-DWDM 1535.82 nm X2 (100-GHz ITU grid)	52
DWDM-X2-35.04=	10GBASE-DWDM 1535.04 nm X2 (100-GHz ITU grid)	53
DWDM-X2-34.25=	10GBASE-DWDM 1534.25 nm X2 (100-GHz ITU grid)	54
DWDM-X2-32.68=	10GBASE-DWDM 1532.68 nm X2 (100-GHz ITU grid)	56
DWDM-X2-31.90=	10GBASE-DWDM 1531.90 nm X2 (100-GHz ITU grid)	57
DWDM-X2-31.12=	10GBASE-DWDM 1531.12 nm X2 (100-GHz ITU grid)	58
DWDM-X2-30.33=	10GBASE-DWDM 1530.33 nm X2 (100-GHz ITU grid)	59

For More Information

For more information about the Cisco MDS 9000 Series Multilayer SAN Switches, visit http://www/en/US/products/hw/ps4159/ps4358/index.html.

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 **www.cisco.com/go/offices.**

Printed in USA C78-332774-13 11/10