9 Pluggable Modules for Ports

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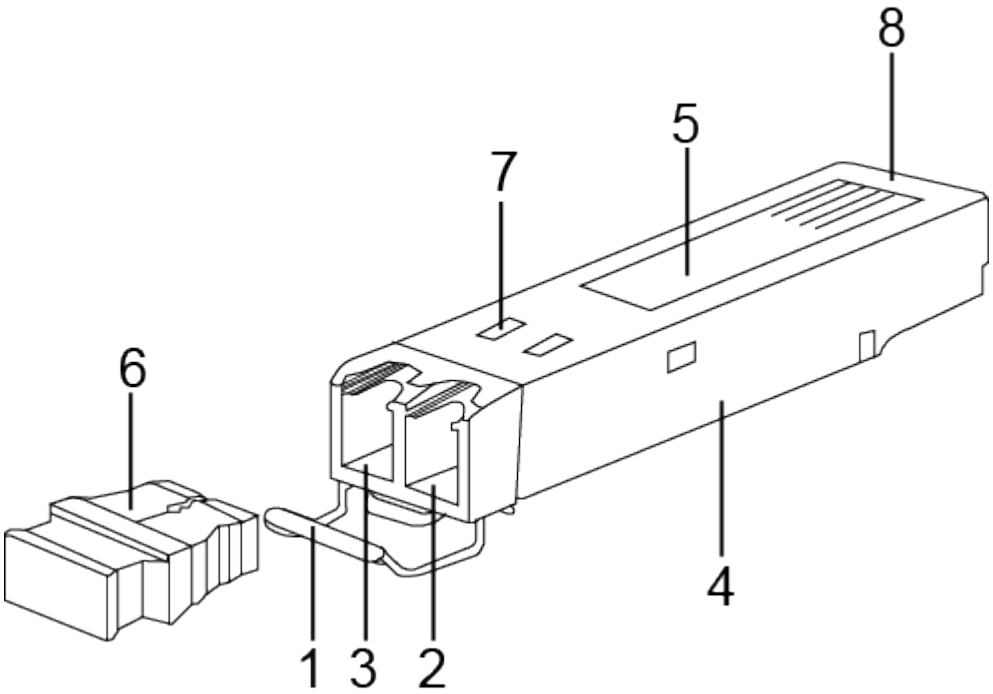
9.1 Understanding Optical Modules

9.1.1 Optical Module Appearance and Structure

Figure 9-1 shows the structure of an optical module.

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Figure 9-1 Optical module structure



1. Handle	2. Receiver	3. Transmitter	4. Shell
5. Label	6. Dust cap	7. Spring	8. Module connector

Figure 9-2 shows the appearance of an SFP/SFP+ optical module.

Figure 9-2 SFP/SFP+ optical module



Figure 9-3 shows the appearance of an SFP28 optical module.

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Figure 9-3 SFP28 optical module



Figure 9-4 shows the appearance of a QSFP+ optical module.

Figure 9-4 QSFP+ optical module



Figure 9-5 and **Figure 9-6** shows the appearance of a QSFP28 optical module.

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Figure 9-5 QSFP28 optical module (for LC optical fibers)



Figure 9-6 QSFP28 optical module (for MPO optical fibers)

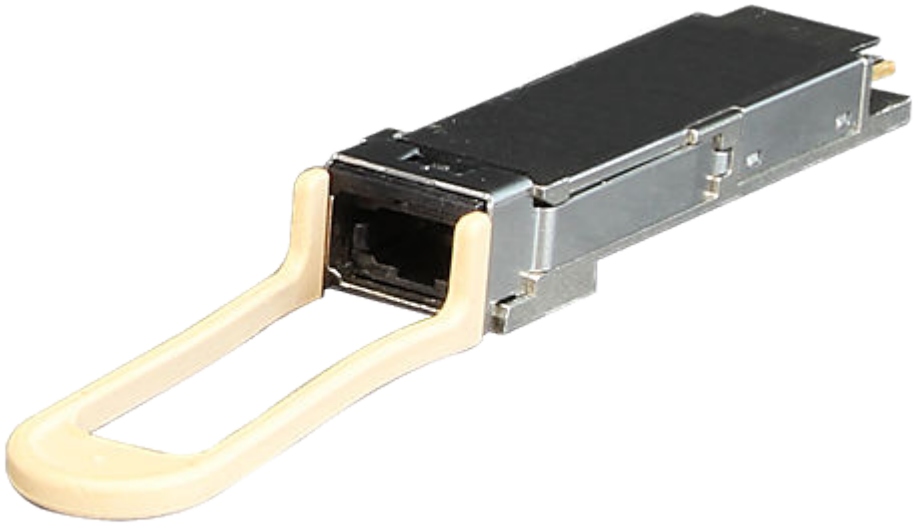


Figure 9-7 shows the appearance of a QSFP-DD optical module.

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Figure 9-7 QSFP-DD optical module

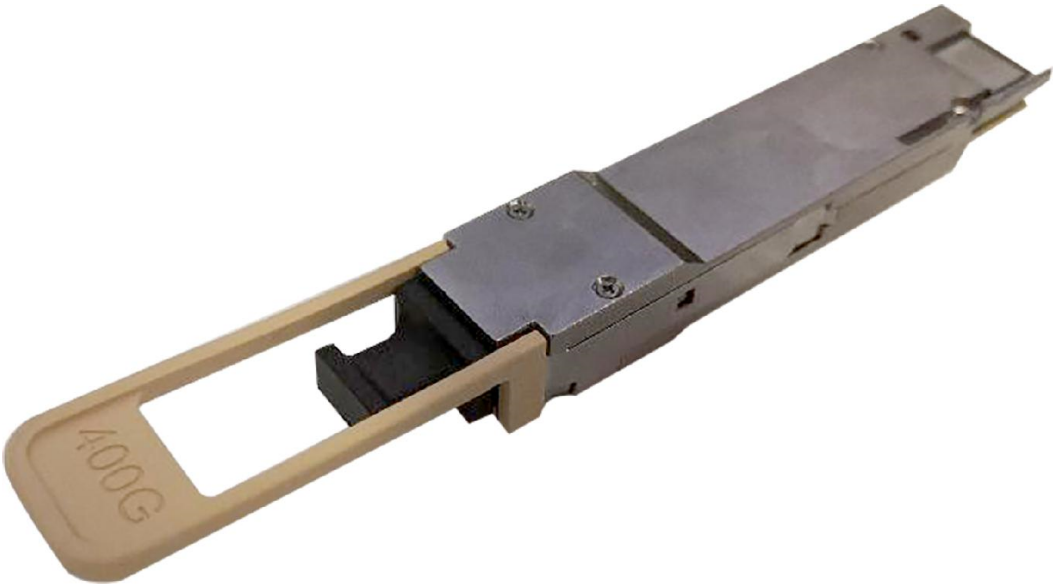


Figure 9-8 and **Figure 9-9** show CFP optical modules for different optical fibers.

Figure 9-8 CFP 100GE optical module (for LC optical fibers)



Figure 9-9 CFP 100GE optical module (for MPO optical fibers)



Figure 9-10 shows the appearance of a CXP optical module.

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Figure 9-10 CXP 100GE optical module (for MPO optical fibers)



Figure 9-11 and **Figure 9-12** show CFP2 optical modules for different optical fibers.

Figure 9-11 CFP2 100GE optical module (for LC optical fibers)



Figure 9-12 CFP2 100GE optical module (for MPO optical fibers)



9.1.2 Types of Optical Modules

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Optical modules are available in various types to meet diversified requirements.

- **Classified by transmission rates**

  Depending on transmission rates, optical modules are classified into 400GE, 100GE, 40GE, 25GE, 10GE, FE, and GE optical modules.

- **Classified by encapsulation types**

  The higher transmission rate an optical module provides, the more complex structure it has. According to the encapsulation type, optical modules are classified into SFP, eSFP, SFP+, XFP, SFP28, QSFP+, CXP, CFP, QSFP28, and QSFP-DD. All optical modules are hot swappable.

  - SFP: small form-factor pluggable. SFP optical modules support LC fiber connectors.
  - eSFP: enhanced small form-factor pluggable. An eSFP module is an SFP module that supports monitoring of voltage, temperature, bias current, transmit optical power, and receive optical power. Because all the SFP optical modules support these monitoring functions, eSFP is also called SFP.
  - SFP+: small form-factor pluggable plus, SFP with a higher rate. SFP+ modules are more sensitive to electromagnetic interference (EMI) because they have a higher rate. To reduce EMI, SFP+ modules have more springs than SFP modules and the cages for SFP+ modules on a card are tighter.
  - XFP: 10 Gigabit small form-factor pluggable. X is the Roman numeral 10, meaning that all XFP optical modules provide a 10 Gbit/s transmission rate. XFP optical modules support LC fiber connectors. XFP optical modules are wider and longer than SFP+ optical modules.
  - SFP28: with the same interface size as an SFP+ module. An SFP28 interface can use a 25GE SFP28 optical module or 10GE SFP+ optical module.
  - QSFP+: quad small form-factor pluggable. QSFP+ optical modules support MPO fiber connectors and are larger than SFP+ modules.
  - CXP: hot-pluggable high-density parallel optics transceiver form factor, which provides 12 channels of traffic in each of the Tx and Rx directions. It applies only to short multimode links.
  - CFP: C form-factor pluggable, a new standard for high-speed, hot-pluggable optical transceivers that support data communication and telecommunication applications. Dimensions of a CFP optical module are 144.75 mm x 82 mm x 13.6 mm (W x D x H).
  - QSFP28: with the same interface size as a QSFP+ module. A QSFP28 interface can use a 100GE QSFP28 optical module or a 40GE QSFP+ optical module.
  - QSFP-DD: quad small form factor pluggable-double density. A QSFP-DD optical module is a high-speed pluggable optical module defined by QSFP-DD MSA.

- **Classified by physical layer standards**

  Different physical layer standards are defined to allow data transmission in different modes. Therefore, different types of optical modules are produced to comply with these standards. For details, see **Standards compliance** of the specific optical module.

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- **Classified by modes**

  Optical fibers are classified into single-mode and multimode fibers. Therefore, optical modules are also classified into single-mode and multimode modules to support different optical fibers.

  – Single-mode optical modules are used with single-mode fibers. Single-mode fibers support a wide band and large transmission capacity, and are used for long-distance transmission.

  – Multimode optical modules are used with multimode fibers. Multimode fibers have lower transmission performance than single-mode fibers because of modal dispersion, but their costs are also lower. They are used for small-capacity, short-distance transmission.

Wavelength division multiplexing modules differ from other optical modules in center wavelengths. A common optical module has a center wavelength of 850 nm, 1310 nm, or 1550 nm, whereas a wavelength division multiplexing module transmits lights with different center wavelengths. Wavelength division multiplexing modules are classified into two types: coarse wavelength division multiplexing (CWDM) and dense wavelength division multiplexing (DWDM). Within the same band, DWDM modules are available in more types and use wavelength resources more efficiently than CWDM modules. DWDM and CWDM modules allow lights with different center wavelengths to be transmitted on one fiber without interfering each other. Therefore, a passive multiplexer can be used to combine the lights into one channel, which is then split into multiple channels by a demultiplexer on the remote end. This reduces the optical fibers required. DWDM and CWDM modules are used for long-distance transmission.

The transmit power of a long-distance optical module is often larger than its overload power. Therefore, when using such optical modules, select optical fibers of an appropriate length to ensure that the actual receive power is smaller than the overload power. If the optical fibers connected to a long-distance optical module are too short, use an optical attenuator to reduce the receive power on the remote optical module. Otherwise, the remote optical module may be burnt.

9.1.3 Optical Module Terms

Transmission distance	Maximum distance over which optical signals can transmit. Optical signals sent from different types of sources can transmit over different distances due to negative effects of optical fibers, such as dispersion and attenuation.
Interface rate	Maximum rate of electrical signals that an optical device can transmit without bit errors. The interface rates defined in Ethernet standards include 125 Mbit/s, 1.25 Gbit/s, 10.3125 Gbit/s, and 41.25 Gbit/s.

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Encapsulation type

Appearance type of an optical module. Encapsulation types of optical modules include SFP, eSFP, SFP+, XFP, SFP28, QSFP+, CXP, CFP, QSFP28, and QSFP-DD.

- SFP: small form-factor pluggable.
- eSFP: enhanced small form-factor pluggable. An eSFP module is an SFP module that supports monitoring of voltage, temperature, bias current, transmit optical power, and receive optical power. Because all the SFP optical modules support these monitoring functions, eSFP is also called SFP.
- SFP+: small form-factor pluggable plus, SFP with a higher rate. SFP+ modules are more sensitive to electromagnetic interference (EMI) because they have a higher rate. To reduce EMI, SFP+ modules have more springs than SFP modules and the cages for SFP+ modules on a card are tighter.
- XFP: 10GE optical module. X is the Roman numeral 10.
- SFP28: with the same interface size as an SFP+ module. An SFP28 interface can use a 25 GE SFP28 optical module or 10GE SFP+ optical module.
- QSFP+: Quad SFP+, four-channel SFP+.
- CXP: hot-pluggable high-density parallel optics transceiver form factor, which provides 12 channels of traffic in each of the Tx and Rx directions. It applies only to short multimode links.
- CFP: C form-factor pluggable, a new standard for high-speed, hot-pluggable optical transceivers that support data communication and telecommunication applications. Dimensions of a CFP optical module are 144.75 mm x 82 mm x 13.6 mm (W x D x H).
- QSFP28: with the same interface size as a QSFP+ module. A QSFP28 interface can use a 100GE QSFP28 optical module or a 40GE QSFP+ optical module.
- QSFP-DD: quad small form factor pluggable-double density. A QSFP-DD optical module is a high-speed pluggable optical module defined by QSFP-DD MSA.

Center wavelength

Wavelength measured at the midpoint of the half-amplitude line in the transmit spectrum.

Fiber mode

Mode of fibers defining based on core diameters and features of optical fibers. Optical fibers are classified into single-mode fibers and multi-mode fibers. Generally, multi-mode fibers have large core diameters and severe dispersion, so they transmit optical signals over short distances when working with multi-mode optical modules. Single-mode fibers have small dispersion and can transmit optical signals over long distances when working with single-mode optical modules.

Modal bandwidth

Bandwidth measured at a point with transmit power several dB lower than that of the point with the peak center wavelength. Modal bandwidth reflects spectrum characteristics of an optical module.

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Fiber diameter	Diameter of the core of a fiber. According to international standards for optical fibers, the diameter of a multi-mode fiber is 62.5 um or 50 um, and the diameter of a single-mode fiber is 9 um.
Fiber class	Optical signals with different wavelengths have their best working windows in different optical fibers. To help efficiently adjust wavelengths or dispersion features of optical fibers and change their refractive indexes, the following classes are defined: multi-mode fiber (G.651), common single-mode fiber (G.652), shifted dispersion fiber (G.653), and non-zero shifted dispersion fiber (G.655). G.651 and G.652 are commonly used fiber classes.
Connector type	Type of the interface on an optical module to accommodate a fiber. Commonly used connector types are LC (applicable to all the SFP, SFP+, and XFP modules) and MPO (applicable to 150 m QSFP+, 100 m CFP, and CXP modules).
Transmit optical power	Output optical power of an optical module when it is working properly.
Receiver sensitivity	Minimum average input optical power that the receiver of an optical module can receive within a range of bit error rate (BER = 10^{-12}).
Overload optical power	Maximum average input optical power that the receiver of an optical module can receive within a range of bit error rate (BER = 10^{-12}).
Extinction ratio	Minimum ratio of the average optical power with signals transmitted against the average optical power without signals transmitted in complete modulation mode. The extinction ratio indicates the capability of an optical module to identify signal 0 and signal 1.

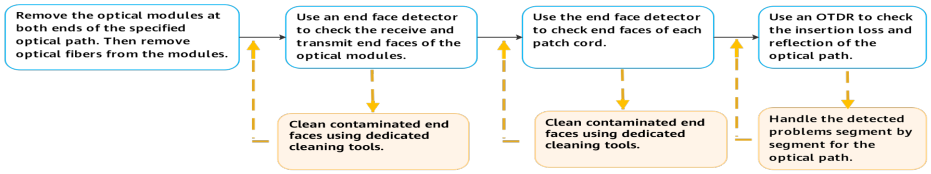
9.1.4 Guide to Using Optical Modules

Precautions for optical module installation:

- If a cabinet with a door is used, a sufficient distance must be reserved between the 400GE optical module and the cabinet door to prevent the puller or patch cord from bumping on the door.
- When optical path quality is tested using an OTDR, optical fibers must be removed from the associated optical module. This is because the OTDR's transmit optical power is far greater than the optical power damage threshold at the receive end of an optical module.

Method of checking an optical path:

Figure 9-13 Method of checking an optical path



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Method of cleaning the end faces of an optical fiber:

Before cleaning the end faces of an optical fiber that is in use, ensure that the optical fiber has no optical signals. To achieve this, shut down the ports at both ends of the fiber. Then, clean the end faces and insert the optical fiber back into the corresponding port.

To clean the end faces of an optical fiber that is not in use, remove the dust-proof cap from the fiber connector (or the patch cord connector of the involved optical component), and put the dust-proof cap into a dedicated cleaning kit. After the cleaning is complete, re-install the dust-proof cap.

- Use the untouched part of a lint-free wipe to wipe the connector end face along one direction.
- If the end face of an optical fiber cannot be cleaned due to serious contamination, use a lint-free wipe dipped with cleanser to wipe the end face along one direction. Then, use a dry lint-free wipe to clean the end face. Ensure that the end face is dry before using the optical fiber.
- After the cleaning is complete, immediately install a dust-proof cap for any optical fiber connector that is not in use.

Precautions for using a lint-free wipe to clean the end face of an optical fiber:

- Use a smooth surface of the lint-free wipe for cleaning.
- Ensure that the optical fiber connector is vertical to the lint-free wipe during cleaning.
- Wipe the end face along the direction of the lint-free wipe's grain.
- Wipe the end face along one direction only.
- Any part of a lint-free wipe can be used only once, and a small piece of lint-free wipe can be used to clean only one connector.

Method of using lint-free swabs to clean the optical port of an optical module:

Remove the dust-proof cap from the optical port of the optical module, and put the dust-proof cap into a dedicated cleaning kit.

- Select a proper lint-free swab based on the type of the optical port to be cleaned. (For SC optical ports, use lint-free swabs with a diameter of 2.5 mm; for LC and MTRJ optical ports, use lint-free swabs with a diameter of 1.25 mm.) Dip the lint-free swab into cleanser, insert it into the inside of the optical port, and clean the optical port by rotating the swab 360 degrees in one direction along the inner wall of the optical port.
- Insert a dry lint-free swab of the same type into the inside of the optical port and clean the optical port by rotating the swab 360 degrees in one direction along the inner wall of the optical port.
- Cap the optical port after the cleaning is complete.

Precautions for using lint-free swabs to clean the optical port of an optical module:

- When cleaning the optical port of an optical module, clean the end faces of associated optical fibers to prevent the optical fibers from dirtying the optical port.

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- Typically, each lint-free swab can be used for cleaning only once. If a used lint-free swab is confirmed clean and can be reused, it can be used for a maximum of three times. For example, a lint-free swab that is ever used to dry an optical port can be used for a maximum of three times.

Safety precautions:

- ESD prevention: Optical modules are active optical/electrical components and are extremely sensitive to ESD. Therefore, take strict measures to protect against ESD when operating optical modules.
  - Touch only the shell of an optical module, and do not touch the module, especially the edge connector, with bare bands.
  - Wear an ESD wrist strap and a pair of ESD gloves when operating an optical module. When wearing an ESD wrist strap, ensure that one end of the ESD wrist strap is in close contact with your wrist, and the other end is inserted into the ESD jack of the cabinet or rack.
  - Avoid any contact between optical modules and your clothing. This is because the ESD voltages generated by the clothing are beyond the protection scope of the ESD wrist band, and will damage optical modules.
  - Optical modules must be packed in their original packages or ESD bags before being transferred.

  If strict ESD preventive measures are not taken when you operate an optical module, the optical module may fail intermittently or completely due to ESD damages.
- Laser protection: Do not look into optical ports without eye protection when reseating a module.

Inspecting optical fiber connectors:

The Ethernet port rate is increasing and the quality requirement for optical fibers and optical cables is higher. **Table 9-1** describes requirements for the loss of optical fiber connectors according to the standard ANSI/TIA-568-C or GBT50312-2016.

Table 9-1 Maximum attenuation of the optical fiber connector

Type	Maximum Attenuation of an Optical Fiber Connector (dB)
Fiber splicing connector	0.3
Optical mechanical connector	0.3
Optical connector	0.75

NOTE

Fiber cores are connected through connectors, such as the ODF, optical attenuator, and flange, in splicing and mechanical modes.

The following describes requirements in IEEE Std 802.3-2018 for the reflection of the optical fiber connector when Ethernet ports (such as 400GE) use PAM4

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encoding to double the rate. More connectors bring lower requirements for the reflection.

- QSFP-DD-400G-SR8: The maximum discrete reflectance shall be less than -20 dB.
- QSFP-DD-400G-FR4:

Table 9-2 QSFP-DD-400G-FR4 maximum value for each discrete reflectance

Number of Discrete Reflectance Above -55 dB	Maximum Value for Each Discrete Reflectance (dB)
1	-25
2	-31
4	-35
6	-38
8	-40
10	-41

- QSFP-DD-400G-LR8:

Table 9-3 QSFP-DD-400G-LR8 maximum value for each discrete reflectance

Number of Discrete Reflectance Above -55 dB	Maximum Value for Each Discrete Reflectance (dB)
1	-22
2	-29
4	-33
6	-35
8	-37
10	-39

- QSFP-DD-400G-DR4:

Table 9-4 QSFP-DD-400G-DR4 maximum value for each discrete reflectance

Number of Discrete Reflectance Above -55 dB	Maximum Value for Each Discrete Reflectance (dB)
1	-37
2	-42
4	-45

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Number of Discrete Reflectance Above -55 dB	Maximum Value for Each Discrete Reflectance (dB)
6	-47
8	-48
10	-49

The loss of optical fiber connectors and reflectance values are tested and processed as follows:

1. After the optical fiber at the peer end is disconnected, use the OTDR meter to test the local end. Check whether the loss and reflection of each link and node are normal. (The loss of a fiber splicing connector should be less than 0.3 dB, the loss of a connector should be less than 0.75 dB, and the reflection of a connector should be less than -30 dB.) If the test result is not within the required range, process the abnormal port.
2. Locate the equipment room where the port resides based on the distance between abnormal points in the OTDR test result. Preliminarily determine the port location, disconnect the port, and perform an OTDR test on the port that reports alarms. Check whether the distance is consistent with that in the previous test. If not, continue to test other ports.
3. After the abnormal port is found, test the port using a fiber end-face inspector. If the port is dirty, clean it.
4. After the port is cleaned, restore the port, and ensure that the connector is tightened. Perform an OTDR test on the port to check whether loss and reflection of each link and node are normal.
5. If the fault persists, replace the flange and perform an OTDR test on the port that reports alarms to check whether loss and reflection of each link and node are normal.
6. If the fault persists, replace the optical fiber and perform an OTDR test on the port that reports alarms to check whether loss and reflection of each link and node are normal.
7. If multiple abnormal points exist on the link, repeat steps 2 to 6.

Precautions for using optical modules on devices with port-side air intake or exhaust:

Data center switches with port-side air intake or exhaust have varying heat dissipation capabilities and therefore support different optical modules. **Table 9-5** lists the optical modules supported by data center switches with port-side air intake or exhaust.

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Table 9-5 Optical modules supported by data center switches with port-side air intake or exhaust

Optical Module Encapsulation Type	Port-side Air Exhaust	Port-side Air Intake
SFP+	• 10G-AOC/10G-SR/10G-LR • 10G-BIDI within 10 km	10G-AOC/10G-SR/10G-LR/10G-ER/10G-ZR/10G-BIDI
SFP28	25G-AOC/25G-SR/25G-LR	25G-AOC/25G-SR/25G-LR
QSFP28	• 40G series • 100G-SR4/100G-CWDM4/100G-CWDM4-lite/100G-SWDM4/100G-LX4/100G-AOC	• 40G series • 100G-SR4/100G-CWDM4/100G-CWDM4-lite/100G-SWDM4/100G-LX4/100G-AOC/100G-DR1/100G-FR1/100G-LR1/100G-BIDI/100G-4WDM-40/100G-ER4
QSFP56	200G-SR4/200G-AOC	200G-SR4/200G-FR4/200G-AOC
QSFP-DD	400G-SR8/400G-AOC	400G-SR8/AOC/FR4/DR4

9.1.5 Rules for Optical Module Interoperation

Interoperation Rules

Optical modules with the same standards can interoperate with each other. The standards define the rate, wavelength, and transmission distance of optical modules, but not their encapsulation modes (two interoperated optical modules can have different encapsulation modes).

If you need to achieve interoperability between optical modules with different standards, contact technical support personnel.

When connecting this product to other products, comply with the preceding optical module interoperation rules.

Standards Description

The following describes the standards, using 1000BASE-LX10 as an example:

- 1000 indicates the rate (1000 Mbit/s, in this case). Other rates include 10 Mbit/s, 100 Mbit/s, 10 Gbit/s, 40 Gbit/s, 100 Gbit/s, 200 Gbit/s and 400 Gbit/s.
- BASE indicates baseband transmission.
- L represents a center wavelength of the laser. Currently, the following center wavelengths are available: S (short wavelength: 850 nm), L (long wavelength: 1310 nm), E (extra long wavelength: 1550 nm), and B (single-fiber bidirectional long wavelength).

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- X represents the encoding format. The encoding formats include T (twisted pair), X (8B/10B), R (64B/66B), and W (WIS).
- 10 indicates the number of channels. Currently, the value can be 4 or 10. If there is no number, the value is 1.

NOTE

This example provides the definitions in IEEE standards, which are not applicable to all optical modules, for example, non-standard optical modules.

The following organizations or agreements define standards related to optical modules:

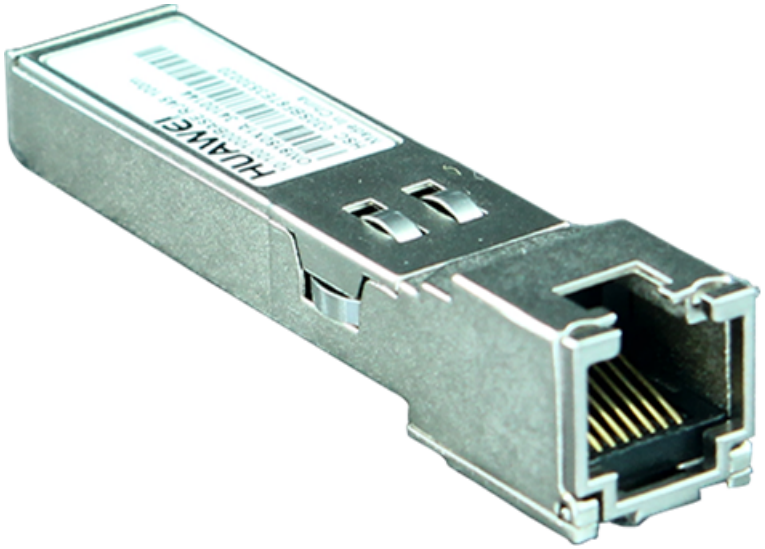
- IEEE 802.3, which defines MAC and PHY standards
- Small Form Factor (SFF) committee or Multi-Source Agreements (MSAs), which define optical module hardware, software, and structure standards

9.2 Understanding Copper Modules

Copper modules are also called RJ45 modules. Unlike optical modules, copper modules do not perform electrical-optical conversion. When two optical interfaces have copper modules installed, the interfaces can be connected using a copper cable. Currently, Huawei offers only GE copper modules with RJ45 interfaces. GE copper modules work with Category 5 network cables, comply with 1000BASE-T (IEEE 802.3ab), and support a maximum transmission distance of 100 m.

Figure 9-14 shows a GE SFP copper module.

Figure 9-14 Appearance of a GE SFP copper module



9.3 FE SFP_eSFP Optical Modules

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9.3.1 eSFP-FE-LX-SM1310

Table 9-6 eSFP-FE-LX-SM1310 specifications

Item	Value
Basic Information	
Module name	eSFP-FE-LX-SM1310
Part Number	02315205
Model	eSFP-FE-LX-SM1310
Form factor	eSFP
Application standard/Type	100BASE-LX
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Mbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 15 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	-8.0 dBm
Minimum Tx optical power (AVG) [dBm]	-15.0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-31 dBm
Overload power (AVG) [dBm]	-8.0 dBm

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9.3.2 SFP-FE-LX-SM1310-BIDI

Table 9-7 SFP-FE-LX-SM1310-BIDI specifications

Item	Value
Basic Information	
Module name	SFP-FE-LX-SM1310-BIDI
Part Number	02315203
Model	SFP-FE-LX-SM1310-BIDI
Form factor	eSFP
Application standard/Type	100BASE-BX
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Mbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 15 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1550(RX)1310(TX)
Maximum Tx optical power (AVG) [dBm]	-8.0 dBm
Minimum Tx optical power (AVG) [dBm]	-15.0 dBm
Minimum extinction ratio [dB]	8.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-32.0 dBm
Overload power (AVG) [dBm]	-8.0 dBm
NOTE BIDI optical modules must be used in pairs. For example, SFP-FE-LX-SM1310-BIDI must be used with SFP-FE-LX-SM1550-BIDI.	

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9.3.3 SFP-FE-LX-SM1550-BIDI

Table 9-8 SFP-FE-LX-SM1550-BIDI specifications

Item	Value
Basic Information	
Module name	SFP-FE-LX-SM1550-BIDI
Part Number	02315202
Model	SFP-FE-LX-SM1550-BIDI
Form factor	eSFP
Application standard/Type	100BASE-BX
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
Transmission rate [bit/s]	100Mbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 15 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310(RX)1550(TX)
Maximum Tx optical power (AVG) [dBm]	-8.0 dBm
Minimum Tx optical power (AVG) [dBm]	-15.0 dBm
Minimum extinction ratio [dB]	8.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-32.0 dBm
Overload power (AVG) [dBm]	-8.0 dBm
NOTE BIDI optical modules must be used in pairs. For example, SFP-FE-LX-SM1550-BIDI must be used with SFP-FE-LX-SM1310-BIDI.	

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9.3.4 SFP-FE-SX-MM1310

Table 9-9 SFP-FE-SX-MM1310 specifications

Item	Value
Basic Information	
Module name	SFP-FE-SX-MM1310
Part Number	02315233
Model	SFP-FE-SX-MM1310
Form factor	SFP
Application standard/Type	100BASE-FX
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Not Supported
Transmission rate [bit/s]	100Mbit/s
Target transmission distance [km]	Multimode fiber (OM1) (with diameter of 62.5 μm): 2 km Multimode fiber (with diameter of 50 μm): 2 km Multimode fiber (OM2) (with diameter of 50 μm): 2 km
Modal bandwidth [MHz*km]	Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	-14.0 dBm
Minimum Tx optical power (AVG) [dBm]	-19.0 dBm
Minimum extinction ratio [dB]	10 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-30.0 dBm

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Item	Value
Overload power (AVG) [dBm]	-14.0 dBm

9.3.5 S-SFP-FE-LH40-SM1310

Table 9-10 S-SFP-FE-LH40-SM1310 specifications

Item	Value
Basic Information	
Module name	S-SFP-FE-LH40-SM1310
Part Number	02317344
Model	S-SFP-FE-LH40-SM1310
Form factor	eSFP
Application standard/Type	100BASE-EX
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Mbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0 dBm
Minimum Tx optical power (AVG) [dBm]	-5.0 dBm
Minimum extinction ratio [dB]	10.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-37.0 dBm
Overload power (AVG) [dBm]	-10.0 dBm

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9.4 GE eSFP Optical Modules

9.4.1 eSFP-GE-SX-MM850 (02315204)

Table 9-11 eSFP-GE-SX-MM850 specifications

Item	Value
Basic Information	
Module name	eSFP-GE-SX-MM850
Part Number	02315204
Model	eSFP-GE-SX-MM850
Form factor	eSFP
Application standard/Type	1000BASE-SX
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	-20°C to +85°C (-4°F to +185°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Multimode optical fiber (diameter: 62.5 μm): 220 m Multi-mode (OM1) optical fiber (diameter: 62.5 μm): 275 m Multimode optical fiber (diameter: 50 μm): 500 m Multimode (OM2) optical fiber (diameter: 50 μm): 550 m
Modal bandwidth [MHz*km]	Multimode optical fiber: 160 MHz*km Multi-mode (OM1) optical fiber: 200 MHz*km Multimode optical fiber: 400 MHz*km Multi-mode (OM2) optical fiber: 500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	-2.5 dBm
Minimum Tx optical power (AVG) [dBm]	-9.5 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-17.0 dBm
Overload power (AVG) [dBm]	0 dBm

9.4.2 eSFP-GE-SX-MM850 (02313URD)

Table 9-12 eSFP-GE-SX-MM850 specifications

Item	Value
Basic Information	
Module name	eSFP-GE-SX-MM850
Part Number	02313URD
Model	eSFP-GE-SX-MM850
Form factor	eSFP
Application standard/Type	1000BASE-SX
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s

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Item	Value
Target transmission distance [km]	Multimode optical fiber (diameter: 62.5 μm): 220 m Multi-mode (OM1) optical fiber (diameter: 62.5 μm): 275 m Multimode optical fiber (diameter: 50 μm): 500 m Multimode (OM2) optical fiber (diameter: 50 μm): 550 m
Modal bandwidth [MHz*km]	Multimode optical fiber: 160 MHz*km Multi-mode (OM1) optical fiber: 200 MHz*km Multimode optical fiber: 400 MHz*km Multi-mode (OM2) optical fiber: 500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-2.5 dBm
Minimum Tx optical power (AVG) [dBm]	-9.5 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-17.0 dBm
Overload power (AVG) [dBm]	0 dBm

9.4.3 eSFP-GE-ZX100-SM1550

Table 9-13 eSFP-GE-ZX100-SM1550 specifications

Item	Value
Basic Information	
Module name	eSFP-GE-ZX100-SM1550
Part Number	02315206
Model	eSFP-GE-ZX100-SM1550
Form factor	eSFP

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Item	Value
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 100 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1550 nm
Maximum Tx optical power (AVG) [dBm]	5 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-30.0 dBm
Overload power (AVG) [dBm]	-9.0 dBm

9.4.4 LE2MGSC40DE0

Table 9-14 LE2MGSC40DE0 specifications

Item	Value
Basic Information	
Module name	LE2MGSC40DE0
Part Number	02310KVV
Model	LE2MGSC40DE0
Form factor	eSFP
Connector type	LC
Optical fiber type	SMF

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Item	Value
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1490(RX)1310(TX)
Maximum Tx optical power (AVG) [dBm]	3.0 dBm
Minimum Tx optical power (AVG) [dBm]	-2.0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-23 dBm
Overload power (AVG) [dBm]	-3.0 dBm
NOTE Single-fiber bidirectional (BIDI) optical modules must be used in pairs. For example, LE2MGSC40DE0 must be used with LE2MGSC40ED0.	

9.4.5 LE2MGSC40ED0

Table 9-15 LE2MGSC40ED0 specifications

Item	Value
Basic Information	
Module name	LE2MGSC40ED0
Part Number	02310KVU
Model	LE2MGSC40ED0
Form factor	eSFP
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC

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Item	Value
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310(RX)1490(TX)
Maximum Tx optical power (AVG) [dBm]	3.0 dBm
Minimum Tx optical power (AVG) [dBm]	-2.0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-23 dBm
Overload power (AVG) [dBm]	-3.0 dBm
NOTE Single-fiber bidirectional (BIDI) optical modules must be used in pairs. For example, LE2MGSC40ED0 must be used with LE2MGSC40DE0.	

9.4.6 SFP-GE-LX-SM1310 (02315200)

Table 9-16 SFP-GE-LX-SM1310 specifications

Item	Value
Basic Information	
Module name	SFP-GE-LX-SM1310
Part Number	02315200
Model	SFP-GE-LX-SM1310
Form factor	eSFP
Application standard/Type	1000BASE-LX10
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC

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Item	Value
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode (G.652) optical fiber (diameter: 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	-3.0 dBm
Minimum Tx optical power (AVG) [dBm]	-9.0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-20.0 dBm
Overload power (AVG) [dBm]	-3.0 dBm

9.4.7 SFP-GE-LX-SM1310 (02313URF)

Table 9-17 SFP-GE-LX-SM1310 specifications

Item	Value
Basic Information	
Module name	SFP-GE-LX-SM1310
Part Number	02313URF
Model	SFP-GE-LX-SM1310
Form factor	eSFP
Application standard/Type	1000BASE-LX10
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode (G.652) optical fiber (diameter: 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	-3.0 dBm
Minimum Tx optical power (AVG) [dBm]	-9.0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-20.0 dBm
Overload power (AVG) [dBm]	-3.0 dBm

9.4.8 SFP-GE-LX-SM1310-BIDI

Table 9-18 SFP-GE-LX-SM1310-BIDI specifications

Item	Value
Basic Information	
Module name	SFP-GE-LX-SM1310-BIDI
Part Number	02315285
Model	SFP-GE-LX-SM1310-BIDI
Form factor	eSFP
Application standard/Type	1000BASE-BX10
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported

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Item	Value
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode (G.652) optical fiber (diameter: 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1490(RX)1310(TX)
Maximum Tx optical power (AVG) [dBm]	-3.0 dBm
Minimum Tx optical power (AVG) [dBm]	-9.0 dBm
Minimum extinction ratio [dB]	6 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19.5 dBm
Overload power (AVG) [dBm]	-3.0 dBm
NOTE Single-fiber bidirectional (BIDI) optical modules must be used in pairs. For example, SFP-GE-LX-SM1310-BIDI must be used with SFP-GE-LX-SM1490-BIDI.	

9.4.9 SFP-GE-LX-SM1490-BIDI

Table 9-19 SFP-GE-LX-SM1490-BIDI specifications

Item	Value
Basic Information	
Module name	SFP-GE-LX-SM1490-BIDI
Part Number	02315286
Model	SFP-GE-LX-SM1490-BIDI
Form factor	eSFP
Application standard/Type	1000BASE-BX10
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported

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Item	Value
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310(RX)1490(TX)
Maximum Tx optical power (AVG) [dBm]	-3.0 dBm
Minimum Tx optical power (AVG) [dBm]	-9.0 dBm
Minimum extinction ratio [dB]	6 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19.5 dBm
Overload power (AVG) [dBm]	-3.0 dBm
NOTE Single-fiber bidirectional (BIDI) optical modules must be used in pairs. For example, SFP-GE-LX-SM1490-BIDI must be used with SFP-GE-LX-SM1310-BIDI.	

9.4.10 S-SFP-GE-LH40-SM1310

Table 9-20 S-SFP-GE-LH40-SM1310 specifications

Item	Value
Basic Information	
Module name	S-SFP-GE-LH40-SM1310
Part Number	02317346
Model	S-SFP-GE-LH40-SM1310
Form factor	eSFP
Application standard/Type	1000BASE-EX
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported

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Item	Value
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0 dBm
Minimum Tx optical power (AVG) [dBm]	-5.0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-23 dBm
Overload power (AVG) [dBm]	-3.0 dBm

9.4.11 S-SFP-GE-LH80-SM1550

Table 9-21 S-SFP-GE-LH80-SM1550 specifications

Item	Value
Basic Information	
Module name	S-SFP-GE-LH80-SM1550
Part Number	02317348
Model	S-SFP-GE-LH80-SM1550
Form factor	eSFP
Application standard/Type	1000BASE-ZX
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s

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Item	Value
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 80 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1550 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	-2.0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-23 dBm
Overload power (AVG) [dBm]	-3.0 dBm

9.4.12 CWDM-SFPGE-LH40-1471

Table 9-22 CWDM-SFPGE-LH40-1471 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1471
Part Number	02312FWB
Model	CWDM-SFPGE-LH40-1471
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km

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Item	Value
Transmitter Optical Characteristics	
Center wavelength [nm]	1471 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

9.4.13 CWDM-SFPGE-LH40-1491

Table 9-23 CWDM-SFPGE-LH40-1491 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1491
Part Number	02312FVX
Model	CWDM-SFPGE-LH40-1491
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1491 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

9.4.14 CWDM-SFPGE-LH40-1511

Table 9-24 CWDM-SFPGE-LH40-1511 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1511
Part Number	02312FWC
Model	CWDM-SFPGE-LH40-1511
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1511 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm

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Item	Value
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

9.4.15 CWDM-SFPGE-LH40-1531

Table 9-25 CWDM-SFPGE-LH40-1531 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1531
Part Number	02312FWQ
Model	CWDM-SFPGE-LH40-1531
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1531 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm

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Item	Value
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

9.4.16 CWDM-SFPGE-LH40-1551

Table 9-26 CWDM-SFPGE-LH40-1551 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1551
Part Number	02312FWR
Model	CWDM-SFPGE-LH40-1551
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1551 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	

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Item	Value
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

9.4.17 CWDM-SFPGE-LH40-1571

Table 9-27 CWDM-SFPGE-LH40-1571 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1571
Part Number	02312FWS
Model	CWDM-SFPGE-LH40-1571
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1571 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

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9.4.18 CWDM-SFPGE-LH40-1591

Table 9-28 CWDM-SFPGE-LH40-1591 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1591
Part Number	02312FWT
Model	CWDM-SFPGE-LH40-1591
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1591 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

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9.4.19 CWDM-SFPGE-LH40-1611

Table 9-29 CWDM-SFPGE-LH40-1611 specifications

Item	Value
Basic Information	
Module name	CWDM-SFPGE-LH40-1611
Part Number	02312FWU
Model	CWDM-SFPGE-LH40-1611
Form factor	eSFP
Application standard/Type	GE-CWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	1Gbit/s
Target transmission distance [km]	Single-mode fiber: 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1611 nm
Maximum Tx optical power (AVG) [dBm]	5.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19 dBm
Overload power (AVG) [dBm]	-3 dBm

9.5 GE SFP Copper Modules

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9.5.1 SFP-1000BaseT (02314171)

Table 9-30 SFP-1000BaseT specifications

Item	Value
Basic Information	
Module name	SFP-1000BaseT
Part Number	02314171
Model	SFP-1000BaseT
Form factor	SFP
Application standard/Type	1000BASE-T (SFP-GE-T)
Connector type	RJ45
DDM options	Not Supported
Target transmission distance [km]	0.1 km

9.5.2 SFP-1000BaseT (02313URG)

Table 9-31 SFP-1000BaseT specifications

Item	Value
Basic Information	
Module name	SFP-1000BaseT
Part Number	02313URG
Model	SFP-1000BaseT
Form factor	SFP
Application standard/Type	1000BASE-T (SFP-GE-T)
Connector type	RJ45
DDM options	Not Supported
Target transmission distance [km]	0.1 km

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9.5.3 SFP-1000BaseT-G2

Table 9-32 SFP-1000BaseT-G2 specifications

Item	Value
Basic Information	
Module name	SFP-1000BaseT-G2
Part Number	02314BDD
Model	SFP-1000BaseT-G2
Form factor	SFP
Application standard/Type	1000BASE-T (SFP-GE-T)
Connector type	RJ45
DDM options	Not Supported
Target transmission distance [km]	0.1 km

NOTE

Version support: V200R022C00 and later versions

9.5.4 SFP-1000BaseT-MP

Table 9-33 SFP-1000BaseT-MP specifications

Item	Value
Basic Information	
Module name	SFP-1000BaseT-MP
Part Number	02313GCE
Model	SFP-1000BaseT-MP
Form factor	SFP
Application standard/Type	1000BASE-T (SFP-GE-T)
Connector type	RJ45
DDM options	Not Supported
Target transmission distance [km]	0.1 km

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9.6 2G, 4G, 8G, and 16G SFP Optical Modules

9.6.1 SFP-FC2G-LW

Table 9-34 Technical specifications

Item	Description
Part number	02311BJG
Version support	V100R006C00 and later versions
Transceiver form factor	SFP
Transmission speed	2G
Center wavelength (nm)	1310
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	Single-mode fiber (G.652) (with diameter of 9 μm): 15 km
Modal bandwidth	-
Transmit power (dBm)	-5 to 0
Maximum receiver sensitivity (dBm)	-21
Overload power (dBm)	0
Extinction ratio (dB)	≥ 8.2
Operating temperature	0°C to 70°C (32°F to 158°F)

9.6.2 SFP-FC2G-SW

Table 9-35 Technical specifications

Item	Description
Part number	02311BJH

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Item	Description
Version support	V100R005C10 and later versions
Transceiver form factor	SFP
Transmission speed	2G
Center wavelength (nm)	850
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	• Multimode fiber (OM2) (with diameter of 50 μm): 0.3 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.5 km
Modal bandwidth	• Multimode fiber (OM2): 500 MHz*km • Multimode fiber (OM3): 2000 MHz*km
Transmit power (dBm)	-9.5 to -2.5
Maximum receiver sensitivity (dBm)	-17
Overload power (dBm)	0
Extinction ratio (dB)	≥ 9
Operating temperature	-20°C to 85°C (-4°F to 185°F)

9.6.3 SFP-FC4G-LW

Table 9-36 Technical specifications

Item	Description
Part number	02311BJE
Version support	V100R005C10 and later versions
Transceiver form factor	SFP
Transmission speed	2G/4G
Center wavelength (nm)	1310
Connector type	LC

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Item	Description
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Modal bandwidth	-
Transmit power (dBm)	-8.4 to -1
Maximum receiver sensitivity (dBm)	-18
Overload power (dBm)	0
Extinction ratio (dB)	≥ 9
Operating temperature	0°C to 70°C (32°F to 158°F)

9.6.4 SFP-FC4G-SW

Table 9-37 Technical specifications

Item	Description
Part number	02311BJF
Version support	V100R005C10 and later versions
Transceiver form factor	SFP
Transmission speed	2G/4G
Center wavelength (nm)	850
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	Multimode fiber (OM3) (with diameter of 50 μm): 0.3 km
Modal bandwidth	Multimode fiber (OM3): 2000 MHz*km
Transmit power (dBm)	-9 to -1.5

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Item	Description
Maximum receiver sensitivity (dBm)	-15
Overload power (dBm)	0
Extinction ratio (dB)	≥ 3
Operating temperature	-20°C to 85°C (-4°F to 185°F)

9.6.5 SFP-FC8G-LW

Table 9-38 Technical specifications

Item	Description
Part number	02311BJA
Version support	V100R005C10 and later versions
Transceiver form factor	SFP
Transmission speed	2G/4G/8G
Center wavelength (nm)	1310
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Modal bandwidth	-
Transmit power (dBm)	-8.4 to 0.5
Maximum receiver sensitivity (dBm)	-13.8
Overload power (dBm)	0.5
Extinction ratio (dB)	≥ 3.5
Operating temperature	0°C to 70°C (32°F to 158°F)

9.6.6 SFP-FC8G-SW

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Table 9-39 Technical specifications

Item	Description
Part number	02311BJL
Version support	V100R005C10 and later versions
Transceiver form factor	SFP
Transmission speed	2G/4G/8G
Center wavelength (nm)	850
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	2G: • Multimode fiber (OM2) (with diameter of 50 μm): 0.3 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.5 km 4G: • Multimode fiber (OM2) (with diameter of 50 μm): 0.15 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.38 km 8G: • Multimode fiber (OM2) (with diameter of 50 μm): 0.05 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.15 km
Modal bandwidth	• Multimode fiber (OM2): 500 MHz*km • Multimode fiber (OM3): 2000 MHz*km
Transmit power (dBm)	-8.2 to -1.3
Maximum receiver sensitivity (dBm)	-11.2
Overload power (dBm)	0
Extinction ratio (dB)	≥ 9
Operating temperature	0°C to 70°C (32°F to 158°F)

9.6.7 SFP-FC16G-SW

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Table 9-40 Technical specifications

Item	Description
Part number	02311TPA
Version support	V200R003C00 and later versions
Transceiver form factor	SFP+
Transmission speed	4G/8G/16G
Center wavelength (nm)	850
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	4G: • Multimode fiber (OM2) (with diameter of 50 μm): 0.15 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.38 km 8G: • Multimode fiber (OM2) (with diameter of 50 μm): 0.05 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.15 km 16G: • Multimode fiber (OM2) (with diameter of 50 μm): 0.035 km • Multimode fiber (OM3) (with diameter of 50 μm): 0.1 km
Modal bandwidth	• Multimode fiber (OM2): 500 MHz*km • Multimode fiber (OM3): 2000 MHz*km
Transmit power (dBm)	-7.8 to 0
Maximum receiver sensitivity (dBm)	-10.5
Overload power (dBm)	0
Extinction ratio (dB)	≥ 9
Operating temperature	0°C to 70°C (32°F to 158°F)

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9.7 10GE SFP+ Optical Modules

9.7.1 LE2MXSC80FF0

Table 9-41 Technical specifications

Item	Description
Part number	02310JFE
Version support	Supported only in V100R001C00 and V100R002C00
Transceiver form factor	SFP+
Transmission speed	10G
Center wavelength (nm)	1550
Standards compliance	10GBASE-ZR
Connector type	LC
Type of the end face of the fiber ceramic ferrule	PC or UPC
Applicable cable and maximum transmission distance	Single-mode fiber (G.652) (with diameter of 9 μm): 80 km
Modal bandwidth	-
Transmit power (dBm)	0 to 4
Maximum receiver sensitivity (dBm)	-24
Overload power (dBm)	-7
Extinction ratio (dB)	≥ 9
Operating temperature	0°C to 70°C

9.7.2 OMXD30000 (02318169)

Table 9-42 OMXD30000 specifications

Item	Value
Basic Information	

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Item	Value
Module name	OMXD30000
Part Number	02318169
Model	OMXD30000
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm

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Item	Value
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.3 OMXD30000 (02313URC)

Table 9-43 OMXD30000 specifications

Item	Value
Basic Information	
Module name	OMXD30000
Part Number	02313URC
Model	OMXD30000
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m

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Item	Value
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.4 OSX010000 (02318170)

Table 9-44 OSX010000 specifications

Item	Value
Basic Information	
Module name	OSX010000
Part Number	02318170
Model	OSX010000
Form factor	SFP+
Application standard/Type	10GBASE-LR
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-12.6 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.5 OSX010000 (02313URK)

Table 9-45 OSX010000 specifications

Item	Value
Basic Information	
Module name	OSX010000
Part Number	02313URK
Model	OSX010000
Form factor	SFP+
Application standard/Type	10GBASE-LR
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported

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Item	Value
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-12.6 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.6 OSX040N01

Table 9-46 OSX040N01 specifications

Item	Value
Basic Information	
Module name	OSX040N01
Part Number	02310CNF
Model	OSX040N01
Form factor	SFP+
Application standard/Type	10GBASE-ER
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s

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Item	Value
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1550 nm
Maximum Tx optical power (AVG) [dBm]	4.0 dBm
Minimum Tx optical power (AVG) [dBm]	-4.7 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-14.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.7 OSXD22N00

Table 9-47 OSXD22N00 specifications

Item	Value
Basic Information	
Module name	OSXD22N00
Part Number	02310CRM
Model	OSXD22N00
Form factor	SFP+
Application standard/Type	10GBASE-LRM
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s

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Item	Value
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 220 m Multimode fiber (OM1) (with diameter of 62.5 μm): 220 m Multimode fiber (with diameter of 50 μm): 100 m Multimode fiber (OM2) (with diameter of 50 μm): 220 m Multimode fiber (OM3) (with diameter of 50 μm): 220 m
Modal bandwidth [MHz*km]	Multimode fiber: 160/500 MHz*km Multimode fiber (OM1): 200/500 MHz*km Multimode fiber: 400/400 MHz*km Multimode fiber (OM2): 500/500 MHz*km Multimode fiber (OM3): 1500/500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-6.5 dBm
Overload power (AVG) [dBm]	1.5 dBm

9.7.8 SFP-10G-BXD1

Table 9-48 SFP-10G-BXD1 specifications

Item	Value
Basic Information	
Module name	SFP-10G-BXD1
Part Number	02310QDT

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Item	Value
Model	SFP-10G-BXD1
Form factor	SFP+
Application standard/Type	10GBASE-BX
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	-40°C to +85°C (-40°F to +185°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1270(RX)1330(TX)
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-14.4 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.9 SFP-10G-BXU1

Table 9-49 SFP-10G-BXU1 specifications

Item	Value
Basic Information	
Module name	SFP-10G-BXU1
Part Number	02310QBJ
Model	SFP-10G-BXU1

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Item	Value
Form factor	SFP+
Application standard/Type	10GBASE-BX
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	-40°C to +85°C (-40°F to +185°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1330(RX)1270(TX)
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-14.4 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.10 SFP-10G-ER

Table 9-50 SFP-10G-ER specifications

Item	Value
Basic Information	
Module name	SFP-10G-ER
Part Number	02314GFL
Model	SFP-10G-ER
Form factor	SFP+

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Item	Value
Application standard/Type	10GBASE-ER
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Random failure rate (60% CL, 50°C case temperature)	300 FIT
Optical power diagnosis accuracy [dB]	2 dB
Transmitter Optical Characteristics	
Center wavelength [nm]	1550 nm
Maximum Tx optical power (AVG) [dBm]	4.0 dBm
Minimum Tx optical power (AVG) [dBm]	-4.7 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-14.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.11 SFP-10G-ER-1310

Table 9-51 SFP-10G-ER-1310 specifications

Item	Value
Basic Information	
Module name	SFP-10G-ER-1310
Part Number	02311RLX
Model	SFP-10G-ER-1310

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Item	Value
Form factor	SFP+
Application standard/Type	10GBASE-ER
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	4.0 dBm
Minimum Tx optical power (AVG) [dBm]	-2.0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-20 dBm
Overload power (AVG) [dBm]	-7.0 dBm
NOTE When connected to a 10GBASE-ER standard optical module (1550 nm, 10 Gbit/s, 40 km), an SFP-10G-ER-1310 optical module supports only 20 km of maximum transmission distance.	

9.7.12 SFP-10G-ER-SM1270-BIDI

Table 9-52 SFP-10G-ER-SM1270-BIDI specifications

Item	Value
Basic Information	
Module name	SFP-10G-ER-SM1270-BIDI
Part Number	02311BJC

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Item	Value
Model	SFP-10G-ER-SM1270-BIDI
Form factor	SFP+
Application standard/Type	10GBASE-BDER
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1330(RX)1270(TX)
Maximum Tx optical power (AVG) [dBm]	5 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-18 dBm
Overload power (AVG) [dBm]	-9 dBm

9.7.13 SFP-10G-ER-SM1330-BIDI

Table 9-53 SFP-10G-ER-SM1330-BIDI specifications

Item	Value
Basic Information	
Module name	SFP-10G-ER-SM1330-BIDI
Part Number	02311BJB
Model	SFP-10G-ER-SM1330-BIDI

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Item	Value
Form factor	SFP+
Application standard/Type	10GBASE-BDER
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1270(RX)1330(TX)
Maximum Tx optical power (AVG) [dBm]	5 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-18 dBm
Overload power (AVG) [dBm]	-9 dBm

9.7.14 SFP-10G-iLR

Table 9-54 SFP-10G-iLR specifications

Item	Value
Basic Information	
Module name	SFP-10G-iLR
Part Number	02311BJJ
Model	SFP-10G-iLR
Form factor	SFP+

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Item	Value
Application standard/Type	10GBASE-iLR
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	-40°C to +85°C (-40°F to +185°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 1.4 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-14.4 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.15 SFP-10G-LR (02310QDJ)

Table 9-55 SFP-10G-LR specifications

Item	Value
Basic Information	
Module name	SFP-10G-LR
Part Number	02310QDJ
Model	SFP-10G-LR
Form factor	SFP+
Application standard/Type	10GBASE-LR

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Item	Value
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-12.6 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.16 SFP-10G-LR (02313URL)

Table 9-56 SFP-10G-LR specifications

Item	Value
Basic Information	
Module name	SFP-10G-LR
Part Number	02313URL
Model	SFP-10G-LR
Form factor	SFP+
Application standard/Type	10GBASE-LR
Connector type	LC/DLC

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Item	Value
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-12.6 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.17 SFP-10G-LR-MP

Table 9-57 SFP-10G-LR-MP specifications

Item	Value
Basic Information	
Module name	SFP-10G-LR-MP
Part Number	02313BJH
Model	SFP-10G-LR-MP
Form factor	SFP+
Application standard/Type	10GBASE-LR
Connector type	LC/DLC
Optical fiber type	SMF

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Item	Value
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-12.6 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.18 SFP-10G-SR1

Table 9-58 SFP-10G-SR1 specifications

Item	Value
Basic Information	
Module name	SFP-10G-SR1
Part Number	02314GDS
Model	SFP-10G-SR1
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC

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Item	Value
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Random failure rate (60% CL, 50°C case temperature)	300 FIT
Optical power diagnosis accuracy [dB]	2 dB
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

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9.7.19 SFP-10G-SR-MP

Table 9-59 SFP-10G-SR-MP specifications

Item	Value
Basic Information	
Module name	SFP-10G-SR-MP
Part Number	02313AMY
Model	SFP-10G-SR-MP
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.20 SFP-10G-SRV

Table 9-60 SFP-10G-SRV specifications

Item	Value
Basic Information	
Module name	SFP-10G-SRV
Part Number	02310STB
Model	SFP-10G-SRV
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s

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Item	Value
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.21 SFP-10G-SR-E

Table 9-61 SFP-10G-SR-E specifications

Item	Value
Basic Information	
Module name	SFP-10G-SR-E

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Item	Value
Part Number	02314JUU
Model	SFP-10G-SR-E
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB

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Item	Value
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.22 SFP-10G-SRV-MP

Table 9-62 SFP-10G-SRV-MP specifications

Item	Value
Basic Information	
Module name	SFP-10G-SRV-MP
Part Number	02313BJJ
Model	SFP-10G-SRV-MP
Form factor	SFP+
Application standard/Type	10GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (with diameter of 62.5 μm): 26 m Multimode fiber (OM1) (with diameter of 62.5 μm): 33 m Multimode fiber (with diameter of 50 μm): 66 m Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m

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Item	Value
Modal bandwidth [MHz*km]	Multimode fiber: 160 MHz*km Multimode fiber (OM1): 200 MHz*km Multimode fiber: 400 MHz*km Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	-1.0 dBm

9.7.23 SFP-10G-USR (02310MNW)

Table 9-63 SFP-10G-USR specifications

Item	Value
Basic Information	
Module name	SFP-10G-USR
Part Number	02310MNW
Model	SFP-10G-USR
Form factor	SFP+
Application standard/Type	10GBASE-USR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (OM2) (with diameter of 50 μm): 30 m Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.7 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.24 SFP-10G-USR (02313URN)

Table 9-64 SFP-10G-USR specifications

Item	Value
Basic Information	
Module name	SFP-10G-USR
Part Number	02313URN
Model	SFP-10G-USR
Form factor	SFP+
Application standard/Type	10GBASE-USR
Connector type	LC/DLC

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Item	Value
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (OM2) (with diameter of 50 μm): 30 m Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.7 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.7.25 SFP-10G-USR-MP

Table 9-65 SFP-10G-USR-MP specifications

Item	Value
Basic Information	
Module name	SFP-10G-USR-MP
Part Number	02313BJE

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Item	Value
Model	SFP-10G-USR-MP
Form factor	SFP+
Application standard/Type	10GBASE-USR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Multimode fiber (OM2) (with diameter of 50 μm): 30 m Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-1.0 dBm
Minimum Tx optical power (AVG) [dBm]	-7.3 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.7 dBm
Overload power (AVG) [dBm]	0.5 dBm

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9.7.26 SFP-10G-ZDWT-L

Table 9-66 SFP-10G-ZDWT-L specifications

Item	Value
Basic Information	
Module name	SFP-10G-ZDWT-L
Part Number	02312DAN
Model	SFP-10G-ZDWT-L
Form factor	SFP+
Application standard/Type	10GBASE-DWDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 60 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1529.16 nm - 1560.61 nm
Maximum Tx optical power (AVG) [dBm]	3 dBm
Minimum Tx optical power (AVG) [dBm]	-1 dBm
Minimum extinction ratio [dB]	8.2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-24 dBm
Overload power (AVG) [dBm]	-1 dBm

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9.7.27 SFP-10G-ZR

Table 9-67 SFP-10G-ZR specifications

Item	Value
Basic Information	
Module name	SFP-10G-ZR
Part Number	02310SNN
Model	SFP-10G-ZR
Form factor	SFP+
Application standard/Type	10GBASE-ZR
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 80 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1550 nm
Maximum Tx optical power (AVG) [dBm]	4.0 dBm
Minimum Tx optical power (AVG) [dBm]	0 dBm
Minimum extinction ratio [dB]	9 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-24.0 dBm
Overload power (AVG) [dBm]	-7.0 dBm

9.8 25GE SFP28 Optical Modules

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9.8.1 SFP-25G-LR

Table 9-68 SFP-25G-LR specifications

Item	Value
Basic Information	
Module name	SFP-25G-LR
Part Number	02312LSE
Model	SFP-25G-LR
Form factor	SFP28
Application standard/Type	25GBASE-LR
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	-45°C to +85°C (-49°F to +185°F)
DDM options	Supported
Transmission rate [bit/s]	25Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	-7 dBm
Minimum Tx optical power (AVG) [dBm]	2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.3 dBm
Overload power (AVG) [dBm]	2 dBm

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9.8.2 SFP-25G-SR (02311KNR)

Table 9-69 SFP-25G-SR specifications

Item	Value
Basic Information	
Module name	SFP-25G-SR
Part Number	02311KNR
Model	SFP-25G-SR
Form factor	SFP28
Application standard/Type	25GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	25Gbit/s
Target transmission distance [km]	When the bit error rate (BER) is 10^-12: Multimode fiber (OM3) (with diameter of 50 μm): 30 m Multimode fiber (OM4) (with diameter of 50 μm): 40 m When the BER is 5*10^-5: Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum Tx optical power (AVG) [dBm]	2.4 dBm

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Item	Value
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.3 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.8.3 SFP-25G-SR (02313URP)

Table 9-70 SFP-25G-SR specifications

Item	Value
Basic Information	
Module name	SFP-25G-SR
Part Number	02313URP
Model	SFP-25G-SR
Form factor	SFP28
Application standard/Type	25GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	25Gbit/s
Target transmission distance [km]	When the bit error rate (BER) is 10^-12: Multimode fiber (OM3) (with diameter of 50 μm): 30 m Multimode fiber (OM4) (with diameter of 50 μm): 40 m When the BER is 5*10^-5: Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m

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Item	Value
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.3 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.8.4 SFP-25G-SR (02314GDT)

Table 9-71 SFP-25G-SR specifications

Item	Value
Basic Information	
Module name	SFP-25G-SR
Part Number	02314GDT
Model	SFP-25G-SR-E
Form factor	SFP28
Application standard/Type	25GBASE-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	25Gbit/s

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Item	Value
Target transmission distance [km]	When the bit error rate (BER) is 10^-12: Multimode fiber (OM3) (with diameter of 50 μm): 30 m Multimode fiber (OM4) (with diameter of 50 μm): 40 m When the BER is 5*10^-5: Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.3 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.8.5 SFP-25G-SR-MP

Table 9-72 SFP-25G-SR-MP specifications

Item	Value
Basic Information	
Module name	SFP-25G-SR-MP
Part Number	02313BJK
Model	SFP-25G-SR-MP
Form factor	SFP28
Application standard/Type	25GBASE-SR

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Item	Value
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	25Gbit/s
Target transmission distance [km]	When the bit error rate (BER) is 10^-12: Multimode fiber (OM3) (with diameter of 50 μm): 30 m Multimode fiber (OM4) (with diameter of 50 μm): 40 m When the BER is 5*10^-5: Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.3 dBm
Overload power (AVG) [dBm]	2.4 dBm

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9.8.6 SFP-25G/10G-SR

Table 9-73 SFP-25G/10G-SR specifications

Item	Value
Basic Information	
Module name	SFP-25G/10G-SR
Part Number	02313FCC
Model	SFP-25G/10G-SR
Form factor	SFP28
Application standard/Type	25Gbase-SR
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	10/25G
Target transmission distance [km]	25G with no FEC: Multimode fiber (OM3) (with diameter of 50 μm): 30 m Multimode fiber (OM4) (with diameter of 50 μm): 40 m 25G with FEC: Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m 10G: Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-8.4 dBm
Maximum Tx optical power (OMA) [dBm]	3 dBm
Minimum Tx optical power (OMA) [dBm]	-6.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.3 dBm
Overload power (AVG) [dBm]	2.4 dBm

NOTE

Only the CE6865-48S8CQ-EI, CE8861-4C-EI (CE88-D24S2CQ card), and CE8868-4C-EI (CE88-D24S2CQcard) switches support this optical module.

9.9 40GE QSFP+ Optical Modules

9.9.1 QSFP-40G-ER4

Table 9-74 QSFP-40G-ER4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-ER4
Part Number	02311BKT
Model	QSFP-40G-ER4
Form factor	QSFP+
Application standard/Type	40GBASE-ER4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC

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Item	Value
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	4.5 dBm
Minimum Tx optical power (AVG) [dBm]	-2.7 dBm
Minimum extinction ratio [dB]	5.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-19.5 dBm
Overload power (AVG) [dBm]	-4.5 dBm

9.9.2 QSFP-40G-eSM4

Table 9-75 QSFP-40G-eSM4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-eSM4
Part Number	02311DTR
Model	QSFP-40G-eSM4
Form factor	QSFP+
Application standard/Type	40GBASE-eSM4
Connector type	MPO
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC/UPC/APC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-12.6 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.9.3 QSFP-40G-eSR4 (02310RMB)

Table 9-76 QSFP-40G-eSR4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-eSR4
Part Number	02310RMB
Model	QSFP-40G-eSR4
Form factor	QSFP+
Application standard/Type	40GBASE-eSR4 10GBASE-SR (four lanes)
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-7.6 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.4 QSFP-40G-eSR4 (02313URU)

Table 9-77 QSFP-40G-eSR4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-eSR4
Part Number	02313URU
Model	QSFP-40G-eSR4
Form factor	QSFP+

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Item	Value
Application standard/Type	40GBASE-eSR4 10GBASE-SR (four lanes)
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-7.6 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	2.4 dBm

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9.9.5 QSFP-40G-eSR4-MP

Table 9-78 QSFP-40G-eSR4-MP specifications

Item	Value
Basic Information	
Module name	QSFP-40G-eSR4-MP
Part Number	02313GAA
Model	QSFP-40G-eSR4-MP
Form factor	QSFP+
Application standard/Type	40GBASE-eSR4 10GBASE-SR (four lanes)
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode fiber (OM2) (with diameter of 50 μm): 82 m Multimode fiber (OM3) (with diameter of 50 μm): 300 m Multimode fiber (OM4) (with diameter of 50 μm): 400 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-7.6 dBm
Minimum extinction ratio [dB]	3.0 dB

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Item	Value
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.1 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.6 QSFP-40G-iSM4

Table 9-79 QSFP-40G-iSM4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-iSM4
Part Number	02311DRW
Model	QSFP-40G-iSM4
Form factor	QSFP+
Application standard/Type	40GBASE-iSM4
Connector type	MPO 1×12
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	APC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Single-mode fiber (G.652) (with diameter of 9 μm): 1.4 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-8.2 dBm
Minimum extinction ratio [dB]	3.5 dB

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Item	Value
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.5 dBm
Overload power (AVG) [dBm]	0.5 dBm

9.9.7 QSFP-40G-iSR4 (02310MHR)

Table 9-80 QSFP-40G-iSR4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-iSR4
Part Number	02310MHR
Model	QSFP-40G-iSR4
Form factor	QSFP+
Application standard/Type	40GBASE-SR4 10GBASE-USR (four lanes)
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode fiber (OM2) (with diameter of 50 μm): 30 m Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km

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Item	Value
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-7.6 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-9.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.8 QSFP-40G-iSR4 (02313URW)

Table 9-81 QSFP-40G-iSR4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-iSR4
Part Number	02313URW
Model	QSFP-40G-iSR4
Form factor	QSFP+
Application standard/Type	40GBASE-SR4 10GBASE-USR (four lanes)
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s

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Item	Value
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode fiber (OM2) (with diameter of 50 μm): 30 m Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-7.6 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-9.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.9 QSFP-40G-iSR4-MP

Table 9-82 QSFP-40G-iSR4-MP specifications

Item	Value
Basic Information	
Module name	QSFP-40G-iSR4-MP
Part Number	02313FYY
Model	QSFP-40G-iSR4-MP
Form factor	QSFP+
Application standard/Type	40GBASE-SR4 10GBASE-USR (four lanes)
Connector type	MPO

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Item	Value
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode fiber (OM2) (with diameter of 50 μm): 30 m Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM2): 500 MHz*km Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	0.5 dBm
Minimum Tx optical power (AVG) [dBm]	-7.6 dBm
Minimum extinction ratio [dB]	3.0 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-9.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.10 QSFP-40G-LR4 (02310MHS)

Table 9-83 QSFP-40G-LR4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LR4

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Item	Value
Part Number	02310MHS
Model	QSFP-40G-LR4
Form factor	QSFP+
Application standard/Type	40GBASE-LR4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-7.0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.5 dBm
Overload power (AVG) [dBm]	3.3 dBm

9.9.11 QSFP-40G-LR4 (02313URY)

Table 9-84 QSFP-40G-LR4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LR4
Part Number	02313URY

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Item	Value
Model	QSFP-40G-LR4
Form factor	QSFP+
Application standard/Type	40GBASE-LR4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-7.0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.5 dBm
Overload power (AVG) [dBm]	3.3 dBm

9.9.12 QSFP-40G-LR4-Lite (02311YVB)

Table 9-85 QSFP-40G-LR4-Lite specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LR4-Lite
Part Number	02311YVB
Model	QSFP-40G-LR4-Lite

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Item	Value
Form factor	QSFP+
Application standard/Type	40GBASE-LR4 Lite
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 2 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-9 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.5 dBm
Overload power (AVG) [dBm]	2.3 dBm

9.9.13 QSFP-40G-LR4-Lite (02313URS)

Table 9-86 QSFP-40G-LR4-Lite specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LR4-Lite
Part Number	02313URS
Model	QSFP-40G-LR4-Lite
Form factor	QSFP+

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Item	Value
Application standard/Type	40GBASE-LR4 Lite
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 2 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-9 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.5 dBm
Overload power (AVG) [dBm]	2.3 dBm

9.9.14 QSFP-40G-LX4

Table 9-87 QSFP-40G-LX4 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LX4
Part Number	02311HNP
Model	QSFP-40G-LX4
Form factor	QSFP+
Application standard/Type	40GBASE-LX4

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Item	Value
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 150 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m Single-mode fiber (G.652) (with diameter of 9 μm): 2 km
Overfilled Launch Bandwidth [MHz*km]	Multimode (OM3) optical fiber: 500 MHz*km Multimode (OM4) optical fiber: 500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-7.0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.5 dBm
Overload power (AVG) [dBm]	2.3 dBm
NOTE Limitations: - In actual applications, the number of connectors in an optical fiber link cannot exceed 4. - This module is sensitive to fiber link contamination. During deployment, ensure that the fiber end face meets the fiber application standard. For details, refer to the requirements for single-mode connectors in the end face requirements for fiber ceramic ferrules under "Cables" > "Fiber Jumpers."	

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9.9.15 QSFP-40G-LX4-MM

Table 9-88 QSFP-40G-LX4-MM specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LX4-MM
Part Number	02313NUG
Model	QSFP-40G-LX4-MM
Form factor	QSFP+
Application standard/Type	40GBASE-LX4
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode OM3 optical fiber (diameter: 50 μm): 150 m Multimode OM4 optical fiber (diameter: 50 μm): 150 m
Overfilled Launch Bandwidth [MHz*km]	Multimode (OM3) optical fiber: 500 MHz*km Multimode (OM4) optical fiber: 500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-7.0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.5 dBm
Overload power (AVG) [dBm]	3.5 dBm

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Item	Value
NOTE Limitations: - In actual applications, the number of connectors in an optical fiber link cannot exceed 4. - This module is sensitive to fiber link contamination. During deployment, ensure that the fiber end face meets the fiber application standard. For details, refer to the requirements for single-mode connectors in the end face requirements for fiber ceramic ferrules under "Cables" > "Fiber Jumpers."	

9.9.16 QSFP-40G-LX4-MM-E

Table 9-89 QSFP-40G-LX4-MM-E specifications

Item	Value
Basic Information	
Module name	QSFP-40G-LX4-MM-E
Part Number	02314GDU
Model	QSFP-40G-LX4-MM-E
Form factor	QSFP+
Application standard/Type	40GBASE-LX4
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode OM3 optical fiber (diameter: 50 μm): 150 m Multimode OM4 optical fiber (diameter: 50 μm): 150 m
Overfilled Launch Bandwidth [MHz*km]	Multimode (OM3) optical fiber: 500 MHz*km Multimode (OM4) optical fiber: 500 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	2.3 dBm
Minimum Tx optical power (AVG) [dBm]	-7.0 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.5 dBm
Overload power (AVG) [dBm]	3.5 dBm
NOTE Limitations: - In actual applications, the number of connectors in an optical fiber link cannot exceed 4. - This module is sensitive to fiber link contamination. During deployment, ensure that the fiber end face meets the fiber application standard. For details, refer to the requirements for single-mode connectors in the end face requirements for fiber ceramic ferrules under "Cables" > "Fiber Jumpers."	

NOTE

Version support: V200R022C10 and later versions.

9.9.17 QSFP-40G-SR-BD

Table 9-90 QSFP-40G-SR-BD specifications

Item	Value
Basic Information	
Module name	QSFP-40G-SR-BD
Part Number	02311FPA
Model	QSFP-40G-SR-BD
Form factor	QSFP+
Application standard/Type	40GBASE-BIDI
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	10°C to 70°C (50°F to 158°F)
DDM options	Not Supported

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Item	Value
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm, 900 nm
Maximum Tx optical power (AVG) [dBm]	5 dBm
Minimum Tx optical power (AVG) [dBm]	-4 dBm
Minimum extinction ratio [dB]	4.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-4.5 dBm
Overload power (AVG) [dBm]	5 dBm

9.9.18 QSFP-40G-eSDLC-PAM

Table 9-91 QSFP-40G-eSDLC-PAM specifications

Item	Value
Basic Information	
Module name	QSFP-40G-eSDLC-PAM
Part Number	02311QTR
Model	QSFP-40G-eSDLC-PAM
Form factor	QSFP+
Application standard/Type	40GBase-eSDLC-PAM4
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC

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Item	Value
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 300 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-2 dBm
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.0 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.19 QSFP-40G-eSDLC-PAM-G2

Table 9-92 QSFP-40G-eSDLC-PAM-G2 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-eSDLC-PAM-G2
Part Number	02312ELG
Model	QSFP-40G-eSDLC-PAM-G2
Form factor	QSFP+
Application standard/Type	40GBase-eSDLC-PAM4
Connector type	LC/DLC
Optical fiber type	MMF

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Item	Value
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 300 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-2 dBm
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.0 dBm
Overload power (AVG) [dBm]	2.4 dBm
NOTE The QSFP-40G-eSDLC-PAM optical module cannot be connected to the QSFP-40G-eSDLC-PAM-G2 optical module.	

9.9.20 QSFP-40G-SDLC-PAM

Table 9-93 QSFP-40G-SDLC-PAM specifications

Item	Value
Basic Information	
Module name	QSFP-40G-SDLC-PAM
Part Number	02311PUU
Model	QSFP-40G-SDLC-PAM

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Item	Value
Form factor	QSFP+
Application standard/Type	40GBase-SDLC-PAM4
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-2.5 dBm
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.0 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.9.21 QSFP-40G-SDLC-PAM-G2

Table 9-94 QSFP-40G-SDLC-PAM-G2 specifications

Item	Value
Basic Information	
Module name	QSFP-40G-SDLC-PAM-G2

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Item	Value
Part Number	02312ELH
Model	QSFP-40G-SDLC-PAM-G2
Form factor	QSFP+
Application standard/Type	40GBase-SDLC-PAM4
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	40Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 100 m Multimode fiber (OM4) (with diameter of 50 μm): 150 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-2.5 dBm
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.0 dBm
Overload power (AVG) [dBm]	2.4 dBm
NOTE The QSFP-40G-SDLC-PAM optical module cannot be connected to the QSFP-40G-SDLC-PAM-G2 optical module.	

9.10 100GE QSFP28 Optical Modules

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9.10.1 QSFP28-100G-BIDI

Table 9-95 QSFP28-100G-BIDI specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-BIDI
Part Number	02313EEK
Model	QSFP28-100G-BIDI
Form factor	QSFP28
Application standard/Type	100G PAM4 BiDi
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	10°C to 70°C (50°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Multi-mode (OM3) optical fiber (diameter: 50 μm): 70 m Multi-mode (OM4) optical fiber (diameter: 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode (OM3) optical fiber: 2000 MHz*km Multimode (OM4) optical fiber: 4700 MHz*km
Bit error ratio (BER)	1e-12
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm/910 nm
Maximum Tx optical power (AVG) [dBm]	4 dBm
Minimum Tx optical power (AVG) [dBm]	-4.4 dBm
Maximum Tx optical power (OMA) [dBm]	3 dBm
Minimum Tx optical power (OMA) [dBm]	-2.4 dBm

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Item	Value
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (AVG) [dBm]	-7.9 dBm
Rx sensitivity (OMA) [dBm]	-5.9 dBm
Overload power (AVG) [dBm]	3.5 dBm

NOTE

- Version support:
  - Supported by V200R002SPH032 and later patches in V200R002C50SPC800, and V200R005SPH026 and later patches in V200R005C10SPC800, and V200R005SPH026 and later patches in V200R005C20SPC800, and V200R019SPH007 and later patches in V200R019C10SPC800.
  - V200R020C10 and later versions.
- Before installing a QSFP28-100G-BIDI optical module on a port, you need to disable the FEC function on the port. For example, if the RS-FEC function is enabled on a port that has a QSFP28-100G-BIDI optical module installed, the port status will become Down (Transceiver type mismatch).

9.10.2 QSFP-100G-BIDI-G2

Table 9-96 QSFP-100G-BIDI-G2 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-BIDI-G2
Part Number	02314DBW
Model	QSFP-100G-BIDI-G2
Form factor	QSFP28
Application standard/Type	100G-BIDI
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s

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Item	Value
Target transmission distance [km]	Multi-mode (OM3) optical fiber (diameter: 50 μm): 70 m Multi-mode (OM4) optical fiber (diameter: 50 μm): 100 m
Transmitter Optical Characteristics	
Center wavelength [nm]	850,910 nm
Maximum Tx optical power (AVG) [dBm]	4 dBm
Minimum Tx optical power (AVG) [dBm]	-4.4 dBm
Maximum Tx optical power (OMA) [dBm]	3 dBm
Minimum Tx optical power (OMA) [dBm]	-2.4 dBm
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	max (-6.6, SECQ - 8)
Overload power (AVG) [dBm]	3.5 dBm

NOTE

Version support: V200R022C00 and later versions.

This optical module is available only for models with air flowing into the chassis from the port side.

9.10.3 QSFP28-100G-DR

Table 9-97 QSFP28-100G-DR specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-DR
Part Number	02312VSP
Model	QSFP28-100G-DR
Form factor	QSFP28
Application standard/Type	100GBase-DR

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Item	Value
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 500m
Transmitter Optical Characteristics	
Center wavelength [nm]	1311 nm
Maximum Tx optical power (AVG) [dBm]	4 dBm
Minimum Tx optical power (AVG) [dBm]	-2.9 dBm
Maximum Tx optical power (OMA) [dBm]	4.2 dBm
Minimum Tx optical power (OMA) [dBm]	-0.8 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (AVG) [dBm]	-5.9 dBm
Rx sensitivity (OMA) [dBm]	Max(-3.9,SECQ-5.3)
Overload power (AVG) [dBm]	4 dBm

NOTE

- Version support: V200R020C10 and later versions.
- A port that has a QSFP28-100G-DR optical module installed cannot be used for stack connection.
- Before installing a QSFP28-100G-DR optical module on a port, you need to disable the FEC function on the port. For example, if the RS-FEC function is enabled on a port that has a QSFP28-100G-DR optical module installed, the port status will become Down (Transceiver type mismatch).

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9.10.4 QSFP28-100G-LR4 (02311KNU)

Table 9-98 QSFP28-100G-LR4 specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-LR4
Part Number	02311KNU
Model	QSFP28-100G-LR4
Form factor	QSFP28
Application standard/Type	100GBASE-LR4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1295 nm, 1300 nm, 1304 nm, 1309 nm
Maximum Tx optical power (AVG) [dBm]	4.5 dBm
Minimum Tx optical power (AVG) [dBm]	-4.3 dBm
Minimum extinction ratio [dB]	4 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.6 dBm
Overload power (AVG) [dBm]	4.5 dBm

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9.10.5 QSFP28-100G-LR4 (02313URT)

Table 9-99 QSFP28-100G-LR4 specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-LR4
Part Number	02313URT
Model	QSFP28-100G-LR4
Form factor	QSFP28
Application standard/Type	100GBASE-LR4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1295 nm, 1300 nm, 1304 nm, 1309 nm
Maximum Tx optical power (AVG) [dBm]	4.5 dBm
Minimum Tx optical power (AVG) [dBm]	-4.3 dBm
Minimum extinction ratio [dB]	4 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.6 dBm
Overload power (AVG) [dBm]	4.5 dBm

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9.10.6 QSFP28-100G-PSM4

Table 9-100 QSFP28-100G-PSM4 specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-PSM4
Part Number	02311MNM
Model	QSFP28-100G-PSM4
Form factor	QSFP28
Application standard/Type	100GBASE-PSM4
Connector type	MPO 1×12
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	APC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Single-mode fiber (G.652) (with diameter of 9 μm): 500 m
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	2 dBm
Minimum Tx optical power (AVG) [dBm]	-9.4 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.35 dBm
Overload power (AVG) [dBm]	2.2 dBm

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9.10.7 QSFP28-100G-SR4 (02311GBW)

Table 9-101 QSFP28-100G-SR4 specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-SR4
Part Number	02311GBW
Model	QSFP28-100G-SR4
Form factor	QSFP28
Application standard/Type	100GBASE-SR4
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode (OM3) optical fiber (diameter: 50 μm): 70 m Multimode (OM4) optical fiber (diameter: 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode (OM3) optical fiber: 2000 MHz*km Multimode (OM4) optical fiber: 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	

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Item	Value
Rx sensitivity (OMA) [dBm]	-8.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.10.8 QSFP28-100G-SR4 (02313URQ)

Table 9-102 QSFP28-100G-SR4 specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-SR4
Part Number	02313URQ
Model	QSFP28-100G-SR4
Form factor	QSFP28
Application standard/Type	100GBASE-SR4
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode optical fiber (OM3) (with a diameter of 50 μm): 70 m Multimode optical fiber (OM4) (with a diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode optical fiber (OM3): 2000 MHz*km Multimode optical fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.10.9 QSFP28-100G-SR4-MP

Table 9-103 QSFP28-100G-SR4-MP specifications

Item	Value
Basic Information	
Module name	QSFP28-100G-SR4-MP
Part Number	02313FYX
Model	QSFP28-100G-SR4-MP
Form factor	QSFP28
Application standard/Type	100GBASE-SR4
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	8-strand or 12-strand, type B, female connector Multimode (OM3) optical fiber (diameter: 50 μm): 70 m Multimode (OM4) optical fiber (diameter: 50 μm): 100 m

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Item	Value
Modal bandwidth [MHz*km]	Multimode (OM3) optical fiber: 2000 MHz*km Multimode (OM4) optical fiber: 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-8.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

9.10.10 QSFP-100G-4WDM-40

Table 9-104 QSFP-100G-4WDM-40 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-4WDM-40
Part Number	02312QTL
Model	QSFP-100G-4WDM-40
Form factor	QSFP28
Application standard/Type	100GBASE-4WDM
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s

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Item	Value
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	6.5 dBm
Minimum Tx optical power (AVG) [dBm]	-2.5 dBm
Minimum extinction ratio [dB]	4.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-18.5 dBm
Overload power (AVG) [dBm]	-3.5 dBm

9.10.11 QSFP-100G-CLR4

Table 9-105 QSFP-100G-CLR4 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-CLR4
Part Number	02311MNP
Model	QSFP-100G-CLR4
Form factor	QSFP28
Application standard/Type	100GBASE-CLR4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 2 km

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Item	Value
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.5 dBm
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.7 dBm
Overload power (AVG) [dBm]	2.5 dBm

9.10.12 QSFP-100G-CWDM4

Table 9-106 QSFP-100G-CWDM4 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-CWDM4
Part Number	02311MNN
Model	QSFP-100G-CWDM4
Form factor	QSFP28
Application standard/Type	100GBASE-CWDM4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 2 km
Transmitter Optical Characteristics	

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Item	Value
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.5 dBm
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-9.8 dBm
Overload power (AVG) [dBm]	2.5 dBm

9.10.13 QSFP-100G-CWDM4-Lite

Table 9-107 QSFP-100G-CWDM4-Lite specifications

Item	Value
Basic Information	
Module name	QSFP-100G-CWDM4-Lite
Part Number	02312UJN
Model	QSFP-100G-CWDM4-Lite
Form factor	QSFP28
Application standard/Type	100GBASE-CWDM4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 0.5 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	2.5 dBm
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-9.8 dBm
Overload power (AVG) [dBm]	2.5 dBm

9.10.14 QSFP-100G-C4-Lite-E

Table 9-108 QSFP-100G-C4-Lite-E specifications

Item	Value
Basic Information	
Module name	QSFP-100G-C4-Lite-E
Part Number	02314GDV
Model	QSFP-100G-C4-Lite-E
Form factor	QSFP28
Application standard/Type	100G-CWDM4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 0.5 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1310 nm
Maximum Tx optical power (AVG) [dBm]	2.5 dBm

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Item	Value
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-9.8 dBm
Overload power (AVG) [dBm]	2.5 dBm

NOTE

Version support: V200R022C10 and later versions.

9.10.15 QSFP-100G-ER4

Table 9-109 QSFP-100G-ER4 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-ER4
Part Number	02314HES
Model	QSFP-100G-ER4
Form factor	QSFP28
Application standard/Type	100GBASE-ER4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 40 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1295 nm, 1300 nm, 1304 nm, 1309 nm

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Item	Value
Maximum Tx optical power (AVG) [dBm]	2.9 dBm
Minimum Tx optical power (AVG) [dBm]	-2.9 dBm
Maximum Tx optical power (OMA) [dBm]	4.5 dBm
Minimum Tx optical power (OMA) [dBm]	0.1 dBm
Minimum extinction ratio [dB]	8 dB
Receiver Optical Characteristics	
Rx sensitivity (AVG) [dBm]	-20.9 dBm
Overload power (AVG) [dBm]	-3.5 dBm

NOTE

Version support: V200R022C00 and later versions.

This optical module is available only for models with air flowing into the chassis from the port side.

9.10.16 QSFP-100G-ER4-Lite

Table 9-110 QSFP-100G-ER4-Lite specifications

Item	Value
Basic Information	
Module name	QSFP-100G-ER4-Lite
Part Number	02311YXR
Model	QSFP-100G-ER4-Lite
Form factor	QSFP28
Application standard/Type	100GBASE-ER4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 30 km (FEC OFF)/40 km (FEC ON)
Transmitter Optical Characteristics	
Center wavelength [nm]	1295 nm, 1300 nm, 1304 nm, 1309 nm
Maximum Tx optical power (AVG) [dBm]	2.9 dBm
Minimum Tx optical power (AVG) [dBm]	-2.5 dBm
Minimum extinction ratio [dB]	8 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-18.4 dBm
Overload power (AVG) [dBm]	-3.5 dBm

9.10.17 QSFP-100G-FR1

Table 9-111 QSFP-100G-FR1 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-FR1
Part Number	02314BDE
Model	QSFP-100G-FR1
Form factor	QSFP28
Application standard/Type	100GBASE-FR1
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported

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Item	Value
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode (G.652) optical fiber (diameter: 9 μm): 2 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1311 nm
Maximum Tx optical power (AVG) [dBm]	4 dBm
Minimum Tx optical power (AVG) [dBm]	-3.1 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	Max(-4.5,TECQ-5.9)
Overload power (AVG) [dBm]	4 dBm

NOTE

- Version support: V200R022C00 and later versions.
- A port that has a QSFP-100G-FR1 optical module installed cannot be used for stack connection.
- Before installing a QSFP-100G-FR1 optical module on a port, you need to disable the FEC function on the port. For example, if the RS-FEC function is enabled on a port that has a QSFP-100G-FR1 optical module installed, the port status will become Down (Transceiver type mismatch).
- This optical module is available only for models with air flowing into the chassis from the port side.

9.10.18 QSFP-100G-LR4-Lite

Table 9-112 QSFP-100G-LR4-Lite specifications

Item	Value
Basic Information	
Module name	QSFP-100G-LR4-Lite
Part Number	02311UPS
Model	QSFP-100G-LR4-Lite
Form factor	QSFP28
Application standard/Type	100GBASE-LR4

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Item	Value
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 2 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1295 nm, 1300 nm, 1304 nm, 1309 nm
Maximum Tx optical power (AVG) [dBm]	4.5 dBm
Minimum Tx optical power (AVG) [dBm]	-4.3 dBm
Minimum extinction ratio [dB]	4 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-8.6 dBm
Overload power (AVG) [dBm]	4.5 dBm

9.10.19 QSFP-100G-LX4-MM

Table 9-113 QSFP-100G-LX4-MM specifications

Item	Value
Basic Information	
Module name	QSFP-100G-LX4-MM
Part Number	02314DBX
Model	QSFP-100G-LX4-MM
Form factor	QSFP28
Application standard/Type	100G-LX4
Connector type	LC/DLC

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Item	Value
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Multimode (OM3) optical fiber (diameter: 50 μm): 100 m Multimode (OM4) optical fiber (diameter: 50 μm): 100 m
Overfilled Launch Bandwidth [MHz*km]	Multimode (OM3) optical fiber: 510 MHz*km Multimode (OM4) optical fiber: 510 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	4.5 dBm
Minimum Tx optical power (AVG) [dBm]	-3 dBm
Maximum Tx optical power (OMA) [dBm]	4.5 dBm
Minimum Tx optical power (OMA) [dBm]	-3 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-11.5 dBm
Overload power (AVG) [dBm]	4.5 dBm
NOTE Limitations: - In actual applications, the number of connectors in an optical fiber link cannot exceed 4. - This module is sensitive to fiber link contamination. During deployment, ensure that the fiber end face meets the fiber application standard. For details, refer to the requirements for single-mode connectors in the end face requirements for fiber ceramic ferrules under "Cables" > "Fiber Jumpers."	

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NOTE

Version support: V200R022C00 and later versions

9.10.20 QSFP-100G-eCWDM4

Table 9-114 QSFP-100G-eCWDM4 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-eCWDM4
Part Number	02312DAT
Model	QSFP-100G-eCWDM4
Form factor	QSFP28
Application standard/Type	100GBASE-eCWDM4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	2.5 dBm
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-13 dBm
Overload power (AVG) [dBm]	2.5 dBm

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9.10.21 QSFP-100G-SWDM4

Table 9-115 QSFP-100G-SWDM4 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-SWDM4
Part Number	02311QUK
Model	QSFP-100G-SWDM4
Form factor	QSFP28
Application standard/Type	100G-SWDM4
Connector type	LC/DLC
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 75 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	3.4 dBm
Minimum Tx optical power (AVG) [dBm]	-7.5 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	-10.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

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9.10.22 QSFP-100G/40G-SR4

Table 9-116 QSFP-100G/40G-SR4 specifications

Item	Value
Basic Information	
Module name	QSFP-100G/40G-SR4
Part Number	02313FCH
Model	QSFP-100G/40G-SR4
Form factor	QSFP28
Application standard/Type	100Gbase-SR4
Connector type	MPO
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	-10°C to +75°C (14°F to 167°F)
DDM options	Supported
Transmission rate [bit/s]	40/100G
Target transmission distance [km]	Multimode fiber (OM3) (with diameter of 50 μm): 70 m Multimode fiber (OM4) (with diameter of 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode fiber (OM3): 2000 MHz*km Multimode fiber (OM4): 4700 MHz*km
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	2.4 dBm
Minimum Tx optical power (AVG) [dBm]	-8.4 dBm
Maximum Tx optical power (OMA) [dBm]	3 dBm
Minimum Tx optical power (OMA) [dBm]	-6.4 dBm
Minimum extinction ratio [dB]	2 dB
Receiver Optical Characteristics	

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Item	Value
Rx sensitivity (OMA) [dBm]	-8.5 dBm
Overload power (AVG) [dBm]	2.4 dBm

NOTE

- Only the CE8850-64CQ-EI and CE8861-4C-EI switches support this optical module.
- Version support: V200R020C10 and later versions.

9.10.23 QSFP-100G-LR1

Table 9-117 QSFP-100G-LR1 specifications

Item	Value
Basic Information	
Module name	QSFP-100G-LR1
Part Number	02314GYT
Model	QSFP-100G-LR1
Form factor	QSFP28
Application standard/Type	100GBASE-FR1
Connector type	LC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
Transmission rate [bit/s]	100Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Transmitter Optical Characteristics	
Center wavelength [nm]	1311 nm
Maximum Tx optical power (AVG) [dBm]	4.8 dBm
Minimum Tx optical power (AVG) [dBm]	-1.9 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	

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Item	Value
Rx sensitivity (OMA) [dBm]	Max(-6.1,TECQ-7.5)
Overload power (AVG) [dBm]	4.8 dBm

9.11 400GE QSFP-DD Optical Modules

9.11.1 QSFP-DD-400G-SR8

Table 9-118 QSFP-DD-400G-SR8 specifications

Item	Value
Basic Information	
Module name	QSFP-DD-400G-SR8
Part Number	02312NPG
Model	QSFP-DD-400G-SR8
Form factor	QSFP-DD
Application standard/Type	400GBASE-SR8
Connector type	MPO 1×16
Optical fiber type	MMF
Type of the end face of the fiber ceramic ferrule	APC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	400Gbit/s
Target transmission distance [km]	16-strand, type B, female connector, APC Multimode (OM3) optical fiber (diameter: 50 μm): 70 m Multimode (OM4) optical fiber (diameter: 50 μm): 100 m
Modal bandwidth [MHz*km]	Multimode (OM3) optical fiber: 2000 MHz*km Multimode (OM4) optical fiber: 4700 MHz*km
Bit error ratio (BER)	2.4e-4

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Item	Value
Transmitter Optical Characteristics	
Center wavelength [nm]	850 nm
Maximum Tx optical power (AVG) [dBm]	4 dBm
Minimum Tx optical power (AVG) [dBm]	-6.5 dBm
Minimum extinction ratio [dB]	3 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	max(–6.5, SECQ-7.9)
Overload power (AVG) [dBm]	4 dBm

NOTE

- Version support: V200R021C00 and later versions.

9.11.2 QSFP-DD-400G-FR4

Table 9-119 QSFP-DD-400G-FR4 specifications

Item	Value
Basic Information	
Module name	QSFP-DD-400G-FR4
Part Number	02312NPJ
Model	QSFP-DD-400G-FR4
Form factor	QSFP-DD
Application standard/Type	400Gbase-FR4
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	400Gbit/s

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Item	Value
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 2km
Bit error ratio (BER)	2.4e-4
Transmitter Optical Characteristics	
Center wavelength [nm]	1271 nm, 1291 nm, 1311 nm, 1331 nm
Maximum Tx optical power (AVG) [dBm]	3.5 dBm
Minimum Tx optical power (AVG) [dBm]	-3.3 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	max(-4.6, SECQ-6)
Overload power (AVG) [dBm]	3.5 dBm

NOTE

- Version support: V200R021C00 and later versions.

9.11.3 QSFP-DD-400G-LR8

Table 9-120 QSFP-DD-400G-LR8 specifications

Item	Value
Basic Information	
Module name	QSFP-DD-400G-LR8
Part Number	02312NPK
Model	QSFP-DD-400G-LR8
Form factor	QSFP-DD
Application standard/Type	400GBase-LR8
Connector type	LC/DLC
Optical fiber type	SMF
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)

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Item	Value
DDM options	Supported
Transmission rate [bit/s]	400Gbit/s
Target transmission distance [km]	Single-mode fiber (G.652) (with diameter of 9 μm): 10 km
Bit error ratio (BER)	2.4e-4
Transmitter Optical Characteristics	
Center wavelength [nm]	1273.55 nm, 1277.89 nm, 1282.26 nm, 1286.67 nm, 1295.56 nm, 1300.06 nm, 1304.59 nm, 1309.14 nm
Maximum Tx optical power (AVG) [dBm]	5.3 dBm
Minimum Tx optical power (AVG) [dBm]	-2.8 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (OMA) [dBm]	max(-6.6, SECQ-8)
Overload power (AVG) [dBm]	5.3 dBm

NOTE

- Version support: V200R021C00 and later versions.

9.11.4 QSFP-DD-400G-ZR

Table 9-121 QSFP-DD-400G-ZR specifications

Item	Value
Basic Information	
Module name	QSFP-DD-400G-ZR
Part Number	02313FHD
Model	QSFP-DD-400G-ZR
Form factor	QSFP-DD
Application standard/Type	400ZR,Single Wavelength
Connector type	LC/DLC
Optical fiber type	SMF

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Item	Value
Type of the end face of the fiber ceramic ferrule	PC or UPC
Working case temperature [°C (°F)]	0°C to 70°C (32°F to 158°F)
DDM options	Supported
Transmission rate [bit/s]	400Gbit/s
Target transmission distance [km]	Single-mode (G.652) optical fiber (diameter: 9 μm): 40 km (no optical amplifier connected. The actual transmission distance depends on the optical link quality.) 80 km (connected to an external optical amplifier)
Bit error ratio (BER)	<1E-15(after FEC) <1.25E-2(before FEC)
Transmitter Optical Characteristics	
Center wavelength [nm]	1547.715 nm
Maximum Tx optical power (AVG) [dBm]	-6 dBm
Minimum Tx optical power (AVG) [dBm]	-10 dBm
Minimum extinction ratio [dB]	3.5 dB
Receiver Optical Characteristics	
Rx sensitivity (AVG) [dBm]	-20 dBm
Overload power (AVG) [dBm]	5.3 dBm

NOTE

Version support: V200R021C10 and later versions

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