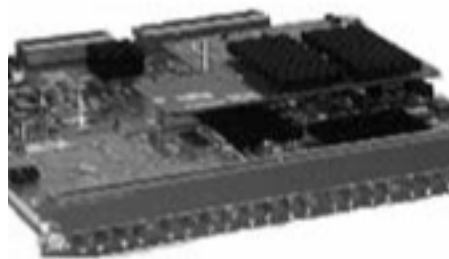


Cisco Catalyst 6500 Series Mixed Media Gigabit Ethernet Modules

The Cisco Catalyst® 6500 Series Switch—the premier modular multilayer switch—delivers secure converged services from the wiring closet to the core, to the data center, to the WAN edge.

availability) aCEF daughter card WS-F6700-AFC3



Designed to complement the many roles that the Cisco Catalyst 6500 Series plays in a network, Cisco Catalyst 6500 Series mixed media Gigabit Ethernet modules offer the broadest selection of media, densities, performance, interoperability, and chassis deployments for enterprises and service providers. These modules are ideal for gigabit Ethernet over fiber to the desktop, gigabit uplinks, aggregation of high-density 10/100 interfaces, Metro Ethernet, backbone and high-speed server farm or data center connections as well as mixed media

environments supporting both fiber and copper cable connections. The Cisco Catalyst 6500 Series Gigabit Ethernet modules offer:

- **Flexible configurations for any deployment**—Range of port densities, media choices, and performance speeds for any deployment requirement
- **Choice of media and connector type**—Available in multimode fiber or single-mode fiber using modular GBIC and SFP as well as MT-RJ optics supporting station-to-station distances up to 100 km

Note: For Gigabit Ethernet over Copper requirements please refer to the Catalyst 6500 series 10/100 and 10/100/1000 Ethernet interface module data sheet

- **High mixed media Gigabit Ethernet port densities**—From 8 up to 48 ports per module, and up to 410 mixed media / fiber Gigabit Ethernet ports per system
- **Scalable and predictable performance**—Provide a selection of switch fabric connections and throughput options: 32Gbps, 256Gbps and 720 Gbps bandwidth with system throughput of: 15 Mpps, 30Mpps, 210Mpps and up to 400Mpps
- **Operational consistency**—Configurations available for Catalyst 6500 3-, 6-, 9-, and 13-slot chassis running Cisco

Figure 1 Cisco Catalyst 6500 Series Gigabit Ethernet Interface Modules WS-X6724-SFP with optional (future



IOS[®] Software and Cisco Catalyst Operating System Software; interoperable with all other interfaces and services modules; and forward-compatible with all Catalyst 6500 supervisor engines

- **Maximum network uptime and resiliency**—Support Cisco enhanced Per-Virtual LAN (VLAN) Spanning Tree Plus (PVST+) protocol, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) and IEEE 802.1s Multiple Spanning Tree (MST) protocol, Per-VLAN Rapid Spanning Tree (PVRST) protocol, Hot Standby Router Protocol (HSRP), Virtual Router Redundancy Protocol (VRRP), Cisco EtherChannel[®], and IEEE 802.3ad link aggregation for fault-tolerant connectivity
- **Superior traffic management**—Available with large per-interface buffers and multiple-priority queues for traffic prioritization and policing, allowing for tight service-level agreement (SLA) enforcement
- **Extensive management tools**—Support CiscoWorks network management platform, Simple Network Management Protocol (SNMP) versions 1, 2, and 3 and four RMON groups (statistics, history, alarms, and events)

Gigabit Ethernet Applications and Key Features

Cisco Catalyst 6500 series mixed media/fiber-based gigabit Ethernet interface modules are used in distribution and core layers, data-center and Metro Ethernet applications. These gigabit Ethernet interface modules deliver wire-speed switched connectivity and support several switch fabric connections and traffic forwarding options, these include: Classic, CEF256, dCEF256 and CEF720. With a range of port densities and modular physical layer interfaces, these modules also offer a choice of packet buffer depths for traffic shaping, and QoS granularity with varying number of queues and drop threshold options. These key features are important aspects to in determining best module for a given network application. (Table 1).

Table 1 Cisco Catalyst 6500 Series Gigabit Interface Module Applications and Key Features

Primary Applications	Product Number	Interface Module Class	Ports / Optics Interface Type	Queues per Port (Tx = Transmit, Rx = Receive) ¹	Scheduler	Buffer Size per port
High Performance distribution, core layer and data center	WS-X6748-SFP	CEF720	48, SFP	Tx-1p3q8T, Rx-1q8T, (2q8T when using dCEF)	Deficit Weighted Round Robin (DWRR)	Rx-166KB, Tx-1.17MB
High Performance distribution, core layer and data center	WS-X6724-SFP	CEF720	24, SFP	Tx-1p3q8T, Rx-1q8T, (2q8T when using dCEF)	DWRR	Rx-166KB, Tx-1.17MB
Data center and server farm	WS-X6816-GBIC	dCEF256	16, GBIC	Tx-1p2q2t Rx-1p1q4t	Weighted Round Robin (WRR)	512 KB
Data center and server farm	WS-X6516A-GBIC	CEF256	16, GBIC	Tx-1p2q2t Rx-1p1q4t	WRR	1 MB
Base server farm	WS-X6408A-GBIC	Classic	8, GBIC	Tx-1p2q2t Rx-1p1q4t	WRR	512 KB
Base server farm	WS-X6516-GBIC ¹	CEF256	16, GBIC	Tx-1p2q2t Rx-1p1q4t	WRR	512 KB
Base server farm	WS-X6416-GBIC	Classic	16, GBIC	Tx-1p2q2t Rx-1p1q4t	WRR	512 KB



Table 1 Cisco Catalyst 6500 Series Gigabit Interface Module Applications and Key Features

Primary Applications	Product Number	Interface Module Class	Ports / Optics Interface Type	Queues per Port (Tx = Transmit, Rx = Receive) ¹	Scheduler	Buffer Size per port
Base server farm	WS-X6416-GE-MT	Classic	16, MT-RJ, MM	Tx-1p2q2t Rx-1p1q4t	WRR	512 KB

1. **Queues Legend:** 1p2q2t = 1 priority queue, 2 round robin queues, 2 thresholds

Superior Traffic Management and Queuing Characteristics of Catalyst 6500 series Gigabit Ethernet Modules

The Cisco Catalyst 6500 Series Gigabit Ethernet modules support multiple queues per port for Quality of Service. Each port supports Weighted Random Early Detection (WRED) for congestion avoidance within each queue, and Weighted Round Robin (WRR) for scheduling between queues and a strict priority queue for voice traffic. Additionally, multiple thresholds can be configured to manage differentiated levels of service.

Ideal for handling mission-critical, bursty, or low latency traffic such as enterprise resource planning (ERP) or voice applications, these interface modules, including the CEF720-based WS-X6724-SFP, scale network performance and intelligent services. These modules also feature transmit and receive packet buffers and a strict priority transmit queue.

Cisco EtherChannel Technology - Increases Link Resiliency and provides scalable bandwidth aggregation

The Catalyst 6500 can aggregate up to eight physical Fast Ethernet, Gigabit Ethernet or 10Gigabit Ethernet links into a single virtual link using Cisco's Port Aggregation Protocol (PAgP) or IEEE 802.3ad technology. This provides network managers a reliable high-speed solution for the campus network backbone.

The Cisco Catalyst 6500 Series also supports multimodule channeling technology, providing even greater resiliency by creating channels across ports on separate modules in the same chassis. As a result, connectivity is maintained even if one module (and corresponding ports) fails. This is ideal for deployments requiring scalable, flexible bandwidth within the network. An additional benefit of Cisco EtherChannel capabilities include automatic recovery and redistribution of loads across remaining links; easing management; and making the technology transparent to network applications. The same Cisco EtherChannel technology can be used across Cisco Systems industry-leading 10-Gigabit Ethernet modules, providing increased aggregation as well as resiliency against link failure.



Gigabit Ethernet Interface Module Switch Fabric and Forwarding Characteristics

The Cisco Catalyst 6500 Classic, CEF256, dCEF256 and CEF720 interface modules provide Gigabit Ethernet with a choice of speeds and forwarding rates.

Feature	Classic Interface Modules	CEF256 Interface Modules	dCEF256 Interface Modules	CEF720 Interface Modules
Supervisor Engine Supported	Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 720	Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 720	Supervisor Engine 2, with SFM or SFM2 or Supervisor Engine 720	Supervisor Engine 720
Performance/Forwarding Rate (Mpps)	32 Gbps; 15 Mpps per system	<ul style="list-style-type: none"> 256 Gbps using CEF: - Up to 30 Mpps per system Using dCEF upgrade: 15 Mpps <u>per slot</u> for slots equipped with DFC or DFC3 to support distributed forwarding) 	<ul style="list-style-type: none"> 256Gbps using dCEF: 24 Mpps <u>per slot</u> for slots equipped with DFC or DFC3 to support distributed forwarding) 	<ul style="list-style-type: none"> 720 Gbps using CEF; Up to 30 Mpps per system Using dCEF upgrade: up to 48 Mpps <u>sustained per slot</u> for modules equipped with DFC3 to support distributed forwarding¹ Using aCEF upgrade: up to 48 Mpps <u>peak per slot</u> for modules equipped with AFC3 to support accelerated local forwarding²
Forwarding Engine Architecture	Supervisor engine CPU makes forwarding decision	<ul style="list-style-type: none"> Centralized CEF engine located on supervisor's PFCx makes forwarding decision Upgradeable to dCEF switching with optional WS-F6K-DFC or WS-F6K-DFC3 	<ul style="list-style-type: none"> Installed dCEF using WS-F6K-DFC or WS-F6K-DFC3 	<ul style="list-style-type: none"> Centralized CEF engine located on supervisor's PFCx makes forwarding decision; Upgradeable to dCEF switching with optional WS-F6700-DFC3; Upgradeable to aCEF switching in the future with optional WS-F6700-AFC3
Optional DFC Upgrade Support	Not supported	<ul style="list-style-type: none"> Use WS-F6K-DFC with Supervisor Engine 2 and SFM(2); Use WS-F6K-DFC3 with Supervisor Engine 720 	Selection of: <ul style="list-style-type: none"> WS-F6K-DFC with Supervisor Engine 2 and SFM(2); Use WS-F6K-DFC3 with Supervisor Engine 720 	Use WS-F6700-DFC3 with Supervisor Engine 720
Optional AFC Upgrade Support	Not supported	Not supported	Not supported	Use WS-F6700-AFC3 with Supervisor Engine 720 (future availability)
Backplane/Switch Fabric Connections	32 Gbps shared bus connection (on Supervisor Engine 1A, Supervisor Engine 2, and Supervisor Engine 720)	Single 8-Gbps channel connection to switch fabric [on Supervisor Engine 720 or Supervisor Engine 2-MSFC2 with Switch Fabric Module (SFM)] and 32-Gbps shared bus connection	Dual 8-Gbps channel connection to switch fabric [on Supervisor Engine 720 or Supervisor Engine 2-MSFC2 with Switch Fabric Module (SFM)]	Dual 20-Gbps (40Gbps total) channel connection to switch fabric on Supervisor Engine 720 ³



Feature	Classic Interface Modules	CEF256 Interface Modules	dCEF256 Interface Modules	CEF720 Interface Modules
Chassis / Slot Support Requirements	any slot in any chassis	any slot in any chassis	any slot in 6503, 6506, 6509, 6509-NEBs slots 9 through 13 on 6513	any slot in the Catalyst 6506, 6509, 6509-NEB-A and 6513 chassis for the WS-X6724-SFP; 6503 not supported at current time

1. WS-X6724-SFP achieves 26Mpps sustained per slot for modules equipped with DFC3 to support distributed forwarding)
2. WS-X6724-SFP achieves 26Mpps peak throughput per slot for modules equipped with the future optional AFC3 daughter card to support accelerated local forwarding)
3. WS-X6724-SFP supports a single 20-Gbps channel connection to switch fabric on Supervisor Engine 720; all other 67xx interface modules feature dual 20-Gbps channel connections (40Gbps total) to the switch fabric

Legend: 1p2q2t = one strict priority queue, two round-robin queues, and two different thresholds

Figure 2 Cisco Catalyst 6500 Series Gigabit Ethernet Interface Module WS-X6748-SFP with future available aCEF daughter card WS-F6700-AFC3

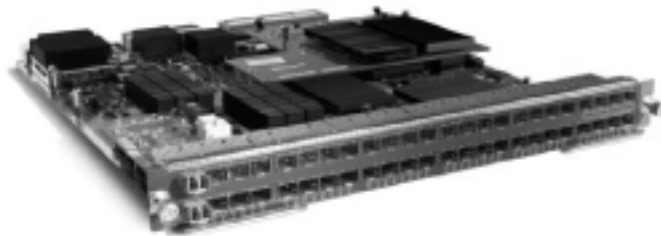
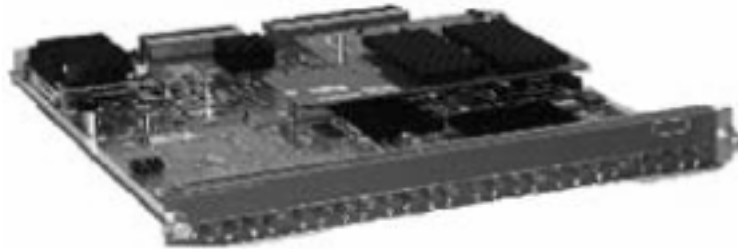


Figure 3 Cisco Catalyst 6500 Series Gigabit Ethernet Interface Modules WS-X6724-SFP with future available aCEF daughter card WS-F6700-AFC3





Cisco Catalyst 6500 Series CEF720 Gigabit Ethernet Mixed Media Modules

Designed for high performance Enterprise and Service Provider distribution, core layers, data-center, Web-hosting and Metro Ethernet applications, CEF720 mixed media interface modules provide line-rate gigabit Ethernet forwarding using twisted pair or fiber optic cabling with the following operational advantages:

Backplane connection—Connects to the switch fabric using dual full duplex 20-Gbps switch fabric channels (40Gbps total), a single 20Gbps channel is supported by the WS-X6724-SFP

Chassis / slot support—Can occupy any slot in Cisco Catalyst 6506, 6509, and 6509-NEB-A and slots 9 through 13 in Catalyst 6513; WS-X6724-SFP supported in all slots of Catalyst 6513; Catalyst 6503 support under consideration in a future s/w release, see release notes for details

Supervisor engine—Supported by all versions of Supervisor Engine 720

Base forwarding mode and performance—Uses the central CEF engine located on the supervisor engine to forward packets up to 30Mpps per system in its base configuration

Distributed forwarding upgrade option and performance—When equipped with the optional field-upgradable WS-F6700-DFC3 dCEF forwarding daughter cards, the interface module delivers optimal performance, up to a sustained 48 Mpps per slot (26Mpps per slot for WS-X6724-SFP)

Accelerated forwarding upgrade option (future availability) and performance—When equipped with the optional field-upgradable WS-F6700-AFC3 aCEF forwarding daughter cards (future availability), the interface module delivers peak throughput for some features up to 48 Mpps per slot (26Mpps peak for WS-X6724-SFP)

Optics—Support hot-pluggable modular small form-factor pluggable (SFP)

Note: Inline power support is not supported on mixed media Gigabit Ethernet interface modules.

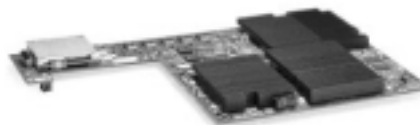
Table 2 CEF720 Copper 10/100/1000 Ethernet Interface Modules

Product	Transceiver Type	Ports/Interface/ Connectors	Port Density/ Chassis Model	Maximum Frame Size (Jumbo Frame) Support	Queues per Port (Tx = Transmit, Rx = Receive) ^{1,2}
WS-X6748-SFP	Small Form-factor Pluggable (SFP)	48-port; SFP; 1000BASE-SX,-LX/LH, -ZX, -T, CWDM; LC	240 ports (410GbE max) / 6513; 384 ports (386 GbE max) / 6509	up to 9216 bytes / frame	Tx-1p3q8T, Rx-1q8T (2q8T when using dCEF)
WS-X6724-SFP	Small Form-factor Pluggable (SFP)	24-port; SFP; LX/ LH, -ZX, -T, CWDM; LC	288 ports / 6513; 192 ports / 6509	up to 9216 bytes / frame	Tx-1p3q8T, Rx-1q8T (2q8T when using dCEF)

1. **Queues Legend:** 1p3q1t = 1 priority queue, 3 round robin queues, 1 threshold

2. **For optimal performance, Cisco recommends using a distributed forwarding card**

Figure 4 The optional field-upgradable WS-F6K-DFC3A for use with CEF720 class interface modules



Cisco Systems, Inc.



Cisco Catalyst 6500 Series dCEF256 Gigabit Ethernet Mixed Media Interface Modules

Designed for distribution and core layers and for data-center and Web-hosting applications, Cisco Catalyst 6500 series dCEF256 optical interface modules provide line-rate Gigabit Ethernet forwarding with the following operational advantages:

Backplane connection—Uses dual 8-Gbps (16Gbps) full-duplex serial channel connections to the switch fabric on a Supervisor Engine 720 or a SFM/SFM2 module

Slot requirements—Can occupy any slot in any Cisco Catalyst 6500 Series chassis except the 6513 chassis which requires installation in slots 9 through 13 (the only slots on the chassis with dual fabric connections)

Supervisor engine—Supports Supervisor Engine 2 with a SFM or all versions of Supervisor Engine 720

Distributed forwarding mode and performance—Equipped with the field-upgradable WS-F6K-DFC or WS-F6K-DFC3 dCEF forwarding daughter cards; the interface module delivers optimal performance, up to a sustained 24 Mpps per slot, by using the dCEF engine and dCEF tables located on the DFC/DFC3 daughter card

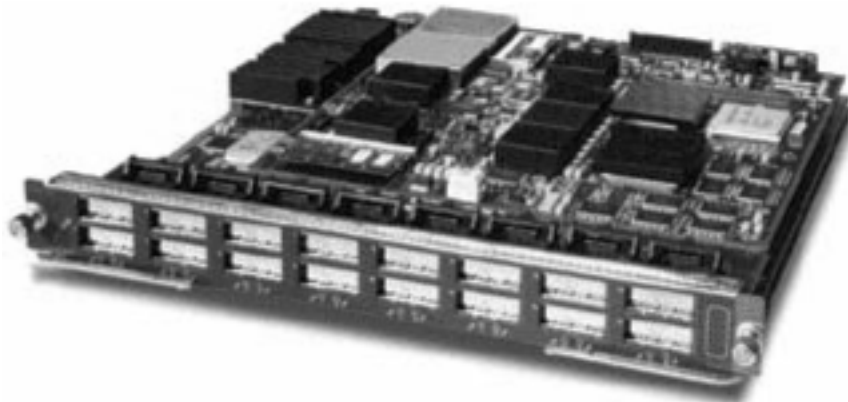
Optics—Supports hot-pluggable gigabit interface converters (GBICs)

Table 3 dCEF256 Gigabit Ethernet Optical Interface Modules

Product	Transceiver Type	Ports/Interface/ Connectors	Port Density/ Chassis Model	Maximum Frame Size (Jumbo Frame) Support	Queues per Port (Tx = Transmit, Rx = Receive) ¹
WS-X6816-GBIC	GBIC	16 ports; 1000BASE-SX,- LX/LH, -ZX, -T, -CWDM, -DWDM; SC	90 ports / 6513; 128 ports / 6509	up to 9216 bytes / frame	Tx-1p2q2t Rx-1p1q4t

1. **Queues Legend:** 1p3q1t = 1 priority queue, 3 round robin queues, 1 threshold

Figure 5 dCEF256 Gigabit Ethernet Optical Interface Modules
WS-X6816-GBIC





Cisco Catalyst 6500 Series CEF256 Gigabit Ethernet Mixed Media Interface Modules

Designed for data center and server farm applications, Cisco Catalyst CEF256 optical interface modules provide line-rate Gigabit Ethernet forwarding with the following operational advantages:

Backplane connection—Connects to the switch fabric using one 8-Gbps full-duplex connection as well as supporting a connection to the 32-Gbps shared bus

Slot requirements—Can occupy any slot in any Catalyst 6500 Series chassis

Supervisor engine—Supported by the Supervisor Engine 1A, Supervisor Engine 2, or Supervisor Engine 720

Base forwarding mode and performance—Uses the central CEF engine located on the supervisor engine to forward packets up to 30Mpps per system in the interface module's base configuration

Distributed forwarding upgrade option and performance—When equipped with the optional field-upgradable WS-F6K-DFC or WS-F6K-DFC3 dCEF forwarding daughter cards, the interface module delivers optimal performance, up to a sustained 15 Mpps per slot; requires a switch fabric equipped chassis using either the SFM/SFM2 with a Supervisor Engine 2 with MSFC2 or the Supervisor Engine 720

Optics—Supports hot-pluggable gigabit interface converters (GBICs)

Note: Supervisor Engine 720 communicates with a CEF256 interface module in 256-Gbps mode. The SFM is not required when using the Supervisor Engine 720.

Table 4 CEF256 Gigabit Ethernet Optical Interface Modules

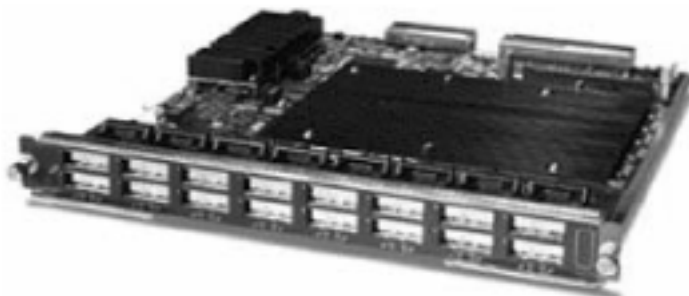
Product	Transceiver Type	Ports/Interface/Connectors	Port Density/ Chassis Model	Maximum Frame Size (Jumbo Frame) Support	Queues per Port (Tx = Transmit, Rx = Receive) ¹
WS-X6516-GBIC	GBIC	16 ports; 1000BASE-SX,-LX/LH, -ZX, -T, -CWDM, -DWDM; SC	192 ports / 6513; 128 ports / 6509	up to 9216 bytes / frame	Tx-1p2q2t Rx-1p1q4t
WS-X6516A-GBIC	GBIC	16 ports; 1000BASE-SX,-LX/LH, -ZX, -T, -CWDM, -DWDM; SC	192 ports / 6513; 128 ports / 6509	up to 9216 bytes / frame	Tx-1p2q2t Rx-1p1q4t

1. **Queues Legend:** 1p3q1t = 1 priority queue, 3 round robin queues, 1 threshold

Figure 6

CEF256 Gigabit Ethernet Optical Interface Modules

WS-X6516A-GBIC and optional field-upgradable WS-F6K-DFC distributed forwarding daughter card (right)





Cisco Catalyst 6500 Series Classic Gigabit Ethernet Optical / Mixed Media Interface Modules

Designed for distribution and core layers and for data-center and Web-hosting applications, Cisco Catalyst 6500 series Classic Gigabit Ethernet interface modules provide line-rate forwarding with the following operational advantages and characteristics:

Backplane connection—Provide a 32-Gbps shared bus connection

Slot requirements—Can occupy any slot in any Cisco Catalyst 6500 Series chassis

Supervisor engine—Supported by the Supervisor Engine 1A, Supervisor Engine 2, or Supervisor Engine 720

Forwarding mode and performance—Uses the central CEF engine located on the supervisor engine to forward packets up to 15Mpps per system in the interface module's base configuration

Distributed forwarding upgrade—None; Classic interface modules cannot be upgraded for distributed forwarding

Optics—Supports hot-pluggable gigabit interface converters (GBICs)

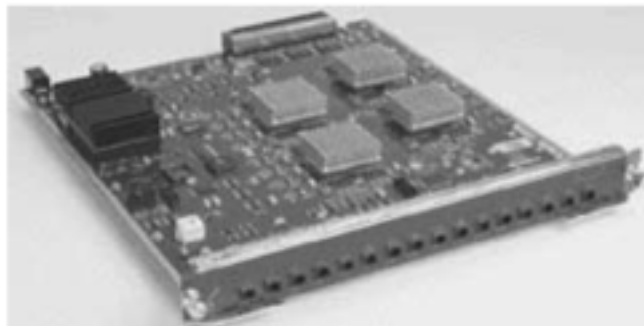
Table 5 Classic Gigabit Ethernet Optical Interface Modules

Product	Transceiver Type	Ports/Interface/Connectors	Port Density/ Cisco Catalyst Chassis Model	Maximum Frame Size (Jumbo Frame) Support	Queues per Port (Tx = Transmit, Rx = Receive) ¹
WS-X6408A-GBIC	GBIC	8 ports; 1000BASE-SX,- LX/LH, -ZX, -T, -CWDM, -DWDM; SC	96 ports / 6513 64 ports / 6509	up to 9216 bytes / frame	Tx-1p2q2t Rx-1p1q4t
WS-X6416-GBIC	GBIC	16 ports; 1000BASE-SX,- LX/LH, -ZX, -T, -CWDM, -DWDM; SC	192 ports / 6513 128 ports / 6509	up to 9216 bytes / frame	Tx-1p2q2t Rx-1p1q4t
WS-X6416-GE-MT	MT-RJ	16 ports; 1000BASE-SX; MT-RJ	192 ports / 6513 128 ports / 6509	up to 9216 bytes / frame	Tx-1p2q2t Rx-1p1q4t

1. **Queues Legend:** 1p3q1t = 1 priority queue, 3 round robin queues, 1 threshold

Figure 7

Classic Gigabit Ethernet Optical Interface Modules
WS-X6416-GE-MT





Interface Distances

Table 8 summarizes the interfaces and distances supported by all the Gigabit Ethernet modules in the Cisco Catalyst 6500 Series. For more information refer to Cisco GBICs and SFP datasheets.

Table 6 Interfaces and Distances Supported by Gigabit Ethernet Modules in the Cisco Catalyst 6500 Series

Module	Interface/Fiber Core	62.5	um MM 160/500 MHz-km	62.5 um MM 200/500 MHz-km	50 um MM 400/400 MHz-km	50 um MM 500/500 MHz-km	9/10 um Single Mode	Dispersion Shifted	Category 5 UTP
WS-X6748-SFP	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6724-SFP	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6416-GE-MT	MT-RJ	220 m	275 m	500 m	550 m				
WS-X6408-GBIC	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6408A-GBIC	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6416-GBIC	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6516-GBIC	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6816-GBIC	1000BASE-SX	220 m	275 m	500 m	550 m				
WS-X6408A-GBIC	1000BASE-LX/LH	550 m	550 m	550 m	550 m		10 km		
WS-X6416-GBIC	1000BASE-LX/LH	550 m	550 m	550 m	550 m		10 km		
WS-X6516-GBIC	1000BASE-LX/LH	550 m	550 m	550 m	550 m		10 km		
WS-X6816-GBIC	1000BASE-LX/LH	550 m	550 m	550 m	550 m		10 km		
WS-X6724-SFP	1000BASE-LX/LH	550 m	550 m	550 m	550 m		10 km		
WS-X6724-SFP	1000BASE-ZX						70 km	100 km	
WS-X6408-GBIC	1000BASE-ZX						70 km	100 km	
WS-X6408A-GBIC	1000BASE-ZX						70 km	100 km	
WS-X6416-GBIC	1000BASE-ZX						70 km	100 km	
WS-X6516-GBIC	1000BASE-ZX						70 km	100 km	
WS-X6816-GBIC	1000BASE-ZX						70 km	100 km	
WS-X6316-GE-TX	RJ-45								100 m



Ordering Information.

Table 7 Catalyst 6500 Series Chassis Part Numbers

Product Number	Description
WS-X6748-SFP	48-port High Performance Mixed Media Gigabit Ethernet interface module, Requires SFP; CEF720
WS-X6724-SFP	24-port High Performance Mixed Media Gigabit Ethernet interface module, Requires SFP; CEF720
WS-F6700-DFC3A	Distributed forwarding daughter card (DFC3A) for CEF720 interface modules
WS-X6316-GE-TX	16-port Classic Gigabit Ethernet interface module for the Cisco Catalyst 6000 Series switches; RJ-45
WS-X6408-GBIC	8-port Classic Gigabit Ethernet interface module for the Cisco Catalyst 6000 Series switches; requires GBICs
WS-X6408A-GBIC	8-port Classic Gigabit Ethernet interface module for the Cisco Catalyst 6000 Series switches with enhanced QoS; requires GBICs
WS-X6416-GBIC	16-port Classic Gigabit Ethernet interface module for the Cisco Catalyst 6000 Series switches; requires GBICs
WS-X6416-GE-MT	16-port Classic Gigabit Ethernet interface module for the Cisco Catalyst 6000 Series switches; MT-RJ
WS-X6516-GBIC	16-port CEF256 Gigabit Ethernet interface module for the Cisco Catalyst 6500 Series switches with single fabric channel interface; requires GBICs; upgradable to support distributed forwarding through the addition of the distributed forwarding daughter card (WS-F6K-DFC)
WS-F6K-DFC	Distributed forwarding daughter card for CEF26 interface modules
WS-X6816-GBIC	16-port dCEF256 Gigabit Ethernet interface module for the Cisco Catalyst 6500 Series switches with dual fabric channel interfaces and distributed forwarding; requires GBICs
WS-X6816A-GBIC	16-port dCEF256 Gigabit Ethernet interface module for the Cisco Catalyst 6500 Series switches with dual fabric channel interfaces and distributed forwarding; requires GBICs
CWDM-SFP-1470= ¹	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC
CWDM-GBIC-1470= ²	Cisco 1000BASE-CWDM GBIC 1470 nm
GLC-SX-MM	1000BASE-SX SFP (multimode only) Dual LC connector
GLC-ZX-SM	1000BASE-ZX SFP (single mode only) Dual LC connector
GLC-LH-SM	1000BASE-LX SFP (single mode only) Dual LC connector
GLC-T	1000BASE-T T SFP (copper twisted pair) RJ-45 connector
WS-G5484	1000BASE-SX GBIC (multimode only)
WS-G5486	1000BASE-LX/LH GBIC (single mode or multimode)
WS-G5487	11000BASE-ZX GBIC (single mode only)
DWDM-GBIC-60.61 ³	1000BASE-DWDM 1560.61 Nm GBIC (100 GHz ITU grid)

1. Also offered in 1490, 1510, 1530, 1550, 1570, 1590, 1610Nm wavelengths. Specify desired wavelength by replacing 1470 with other wavelength, e.g. CWDM-SFP-1590= is the part number for the CWDM SFP module supporting 1590Nm wavelength.

2. Also offered in 1490, 1510, 1530, 1550, 1570, 1590, 1610Nm wavelengths. Specify desired wavelength by replacing 1470 with other wavelength, e.g. CWDM-GBIC-1590= is the part number for the CWDM GBIC module supporting 1590Nm wavelength.

3. Also offered in a wide range of other wavelengths. Specify desired wavelength by replacing 60.61 with other wavelength, e.g. DWDM-GBIC-30.33 = is the part number for the DWDM GBIC module supporting 1530.33 Nm wavelength. See DWDM GBIC datasheet for additional information

Specifications

Standard Protocols

- IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, IEEE 802.1s, IEEE 802.1w, IEEE 802.3x, IEEE 802.3z, IEEE 802.3ab, and

IEEE 802.3ad,

- 1000BASE-T, 1000BASE-X (GBIC), 1000BASE-SX, 1000BASE-LX/LH, 1000BASE-ZX, CWDM

Physical Specification

- Occupies one slot in the Cisco Catalyst 6500 Series chassis
- Dimensions (H x W x D): 1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)

Environmental Conditions

- Operating temperature: 32 to 104 F (0 to 40 C)
- Storage temperature: -40 to 167 F (-40 to 75 C)
- Relative humidity: 10 to 90%, noncondensing
- Operating altitude: -60 to 4000 m
- Mean time between failure (MTBF): seven years for system configuration

Safety Compliance

Cisco Catalyst 6500 Series Gigabit Ethernet interface modules, when installed in a system, comply with the following compliance and safety standards:

- UL 1950
- CSA C22.2 No.950
- EN 60950
- EN 60825-1
- IEC 60950
- IEC 60825-1
- TS 001
- CE marking
- AS/NZS 3260
- 21CFR1040

EMC Compliance

Cisco Catalyst 6500 Series Gigabit Ethernet modules, when installed in a system, comply with the following EMI standards:

- FCC Part 15 (CFR 47) Class A
- VCCI
- EN55022
- EN55024
- CISPR 22
- CE marking
- AS/NZS 3548

Network Management

- ETHERLIKE-MIB (RFC 1643)
- IF-MIB (RFC 1573)
- Bridge MIB (RFC 1493)

- CISCO-STACK-MIB
- CISCO-VTP-MIB
- CISCO-CDP-MIB
- RMON MIB (RFC 1757)
- CISCO-PAGP-MIB
- CISCO-STP-EXTENSIONS-MIB
- CISCO-VLAN-BRIDGE-MIB
- CISCO-VLAN-MEMBERSHIP-MIB
- ENTITY-MIB (RFC 2037)
- HC-RMON
- RFC1213-MIB (MIB-II)
- SMON-MIB

Maximum Station-to-Station Cabling Distance

- 1000BASE-SX: 62.5 um multimode fiber: up to 275 m
- 1000BASE-SX: 50 um multimode fiber: up to 550 m
- 1000BASE-LX: 62.5 um multimode fiber: up to 550 m
- 1000BASE-LX: 50 um multimode fiber: up to 550 m
- 1000BASE-LX: 9/10 um single-mode fiber: up to 5 km¹
- 1000BASE-LH: 62.5 um multimode fiber: up to 550 m
- 1000BASE-LH: 50 um multimode fiber: up to 550 m
- 1000BASE-LH: 9/10 um single-mode fiber: up to 10 km
- 1000BASE-ZX: 9/10 um single-mode fiber: up to 70 km
- 1000BASE-ZX: dispersion shifted fiber: up to 100 km
- 1000BASE-T: Category 5 cable: up to 100 m
- 10/100/1000BASE-T: Category 5 cable: up to 100 m

Indicators and Interfaces

- Status: green (operational); red (faulty); orange (module booting or running diagnostics)
- Link good: green (port active); orange (disabled); off (not active or not connected); blinking orange (failed diagnostic and disabled)
- 1000BASE-SX: GBIC (female, multimode)
- 1000BASE-LX/LH: GBIC (female, multimode)
- 1000BASE-LX/LH: GBIC (female, single mode)
- 1000BASE-ZX: GBIC (female, single mode)
- 1000BASE-ZX: GBIC (female, dispersion shifted)
- 1000BASE-SX: MT-RJ (female, multimode)
- 1000BASE-T: RJ-45
- 10/100/1000BASE-T: RJ-45

¹ Cisco 1000BASE-LX/LH interfaces fully comply with the IEEE 802.3z 1000BASE-LX standard. However, their higher quality allows them to reach 10 km over single-mode fiber versus the 5 km specified in the standard.

Technical Support Services

Whether your company is a large organization, a commercial business, or a service provider, Cisco is committed to maximizing the return on your network investment. Cisco offers a portfolio of technical support services to help ensure that your Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software.

The Cisco Technical Support Services organization offers the following features, providing network investment protection and minimal downtime for systems running mission-critical applications:

- Provides Cisco networking expertise online and on the telephone
- Creates a proactive support environment with software updates and upgrades as an ongoing integral part of your network operations, not merely a remedy when a failure or problem occurs
- Makes Cisco technical knowledge and resources available to you on demand
- Augments the resources of your technical staff to increase productivity
- Complements remote technical support with onsite hardware replacement

Cisco Technical Support Services include:

- Cisco SMARTnet™ support
- Cisco SMARTnet Onsite support
- Cisco Software Application Services, including Software Application Support and Software Application Support plus Upgrades

For more information, visit:

http://www.cisco.com/en/US/products/svcs/ps3034/serv_category_home.html

Additional Cisco Catalyst 6500 Series Information

Visit this link for to view the following data sheets:

http://www.cisco.com/en/US/products/hw/switches/ps708/products_data_sheets_list.html

- Cisco Catalyst 6500 Series Data Sheet
- Cisco Catalyst 6500 Series Supervisor Engine 1A/Supervisor Engine 2 Data Sheet
- Cisco Catalyst 6500 Series Supervisor Engine 720 Data Sheet
- Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Ethernet Data Sheet
- Cisco Catalyst 6500 Series 10-Gigabit Ethernet Interface Modules Data Sheet
- Cisco Catalyst 6500 Series FlexWAN Interface Modules Data Sheet
- Cisco Catalyst 6500 Series Switch Fabric Interface Modules Data Sheet
- Cisco Catalyst 6500 Series Content Services Module (CSM) Data Sheet
- Cisco Catalyst 6500 Series Firewall Services Module Data Sheet
- Cisco Catalyst 6500 Series Network Application Module (NAM) Data Sheet
- Cisco Catalyst 6500 Series Intrusion Detection (IDS) Module Data Sheet
- Cisco Catalyst 6500 Series IPsec/VPN Services Module Data Sheet
- Cisco Catalyst 6500 Series SSL Services Module Data Sheet



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