



## DATA SHEET

# CISCO CATALYST 6500 SERIES 10- AND 100-MBPS ETHERNET FIBER-BASED INTERFACE MODULES

As the premier Cisco® modular multilayer switch, the Cisco Catalyst® 6500 Series delivers secure, converged services from the LAN access to the core, to the data center, and to the WAN edge.

## PRODUCT OVERVIEW

The Cisco Catalyst 6500 Series provides the broadest selection of 10- and 100-Mbps media, densities, interoperability, and chassis deployment options (refer to Table 1). The 100BASE-X, 100BASE-FX, and 10BASE-FL modules provide another alternative for the access and distribution layer and metropolitan (metro) access deployments. The 100BASE-X module offers customers flexibility to mix and match different optics, and maximize their investment protection by allowing pay-as-you-grow through support of modular, Small Form-Factor Pluggable (SFP) optics.

Cisco Catalyst 6500 10BASE-FL, 100BASE-FX, and 100BASE-X modules offer:

- Fiber to the desktop
- Choice of media and connector types—The 100BASE-X module supports multimode fiber (62.5- and 125-micron), and single-mode fiber using modular SFPs, enabling mix-and-match, pay-as-you-grow optic deployments. Fixed MT-RJ for 100BASE-FX and 10BASE-FL modules supports multimode fiber (62.5- and 125-micron) and single-mode fiber.
- Port densities—Up to 48 ports per 100BASE-X module are supported, enabling up to 576 100BASE-X ports per 13-slot chassis; up to 24 ports per 10BASE-FL module are supported, enabling up to 288 ports of 10BASE-FL per 13-slot chassis (configured with 12 interface modules).
- Scalable and predictable system performance—The modules provide 32-Gbps switching and throughput of 15 Mpps.
- Superior traffic management—The modules are available with large 256-MB buffers for 48 ports. Available with 4 transmit queues per port, with 1 strict priority queue for quality of service (QoS). Each port supports Weighted Random Early Detection (WRED) for congestion avoidance within each queue, and Deficit Weighted Round Robin (DWRR) as well as Weighted Round Robin (WRR) for scheduling between queues to aid in traffic prioritization. Up to 8 thresholds can be configured to manage differentiated levels of service.
- Operational consistency—Configurations are available for Cisco Catalyst 6500 3-, 6-, 9-, and 13-slot chassis running Cisco IOS® Software and Cisco Catalyst Operating System Software; they are interoperable with all other interfaces and services modules, and forward-compatible with all Cisco Catalyst 6500 supervisor engines.
- Maximum network uptime and resiliency—The modules support the Cisco Enhanced Per-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), Gateway Load Balancing Protocol (GLBP), Cisco EtherChannel®, and IEEE 802.3ad link aggregation for fault-tolerant connectivity.
- Extensive management tools—The modules support the CiscoWorks network management platform; Simple Network Management Protocol (SNMP) Versions 1, 2, and 3; and four Remote Monitoring (RMON) groups (statistics, history, alarms, and events).

**Table 1.** Cisco Catalyst 6500 Series 10- and 100-Mbps Ethernet Fiber-Based Interface Modules

Primary Applications	Product Number	Interface Module Class	Ports, Connectors, and Interface Media	Queues per Port (Tx = Transmit, Rx = Receive)*	Scheduler	Buffers per Port
Access, Metro Ethernet Access	WS-X6148-FE-SFP	Classic	48 ports, LC, SFP	Tx 1p3q8t per port Rx 1p1q2t per group of 8 front panel ports	Deficit Weighted Round Robin (DWRR) and Weighted Round Robin (WRR)	256 MB shared between 48 ports (5.4 MB per port)
Access, Server Farm	WS-X6524-100FX-MM	CEF256, Upgradeable to distributed CEF	24 ports, multimode MT-RJ, 100BASE-FX	Tx 1p3q1t, Rx 1p1q0t	DWRR	1.2 MB
Access	WS-X6324-100FX-MM	Classic	24 ports, multimode MT-RJ, 100BASE-FX	Tx 2q2t, Rx 1q4t	WRR	128 KB
Access	WS-X6324-100FX-SM	Classic	24 ports, single-mode MT-RJ, 100BASE-FX	Tx 2q2t, Rx 1q4t	WRR	128 KB
Access	WS-X6024-10FL-MT	Classic	24 ports, multimode MT-RJ, 10BASE-FL	Tx 2q2t, Rx 1q4t	WRR	64 KB

\* Queues legend: 1p3q8t = 1 priority queue, 3 round-robin queues, and 8 thresholds

## APPLICATIONS

### Enterprise and Federal

High-density fiber-based 10- and 100-Mbps Ethernet modules offer enterprises and military operations the ability to deploy fiber to the desktop to maximize security of their network. The Cisco Catalyst 6500 100BASE-X and 100BASE-FX modules also can be deployed in areas where customers need long-distance (greater than 550m and up to 2 km) connection over existing multimode fiber where Gigabit Ethernet is not an option. Through the support of modular SFPs optics, the 48-port 100BASE-X module offers flexibility by allowing mix and match of different optics types, allowing smaller branches to use 100BASE-FX over multimode fiber to the desktop and 100BASE-LX over single-mode fiber to the main campus building. For all these applications, the Cisco Catalyst 6500 100BASE-X module maximizes customers' investment protection by allowing them to purchase and deploy SFP optics as they grow their network.

## Service Providers

For service providers, the 100BASE-X module is targeted for the metro Ethernet access layer as well as cable distribution hubs (DHUBs) or headends for cable companies. The Cisco Catalyst 6500 100BASE-X module offers superior traffic management with support of 4 transmit queues per port with 1 strict priority queue for QoS. Each port supports Weighted Random Early Detection (WRED) for congestion avoidance within each queue, and DWRR for scheduling between queues to aid in traffic prioritization. Up to 8 thresholds can be configured to manage differentiated levels of service. The 100BASE-X module is also hardware-capable to support per-port VLAN ID translation (8 subports share a translation table with 64 entries) and the ability to map the inner class of service (CoS) to the outer CoS (CoS mutation) for 802.1Q-in-802.1Q (QinQ) deployments.

## FEATURES AND BENEFITS

### Cisco Catalyst 6500 Series Fiber-Based Classic 100BASE-X, 100BASE-FX, and 10BASE-FL Ethernet Interface Modules

Designed for deployment in LAN access where optical interfaces are required and for metro Ethernet access, the Cisco Catalyst 6500 Series Classic 10- and 100-Mbps Ethernet fiber-based interface modules provide 10- or 100-Mbps Ethernet forwarding with the following operational advantages and characteristics (refer to Table 2):

- Forwarding architecture—Use centralized Cisco Express Forwarding (CEF)
- Forwarding performance—Forward packets up to 15 Mpps per system
- Bus connection—Connect using a 32-Gbps shared bus connection
- Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 32, or Supervisor Engine 720
- Distributed forwarding upgrade—None; Classic interface modules cannot be upgraded for distributed forwarding
- Slot requirements—Can occupy any slot in any Cisco Catalyst 6500 Series chassis.
- Maximum port density per chassis—up to 576 ports per Cisco Catalyst 6513 chassis, and up to 384 ports per Cisco Catalyst 6509 chassis.

**Note:** No inline power support for voice is available for 100BASE-X, 100BASE-FX, and 10BASE-FL fiber modules.

**Table 2.** Classic 100BASE-X, 100BASE-FX, and 10BASE-FL Fiber Interface Modules

Product	Ports, Interfaces, and Connectors	Maximum Distance per Cable Type	Maximum Frame Size (jumbo frame) Support
WS-X6148-FE-SFP	48-port; SFP; LC	Depends on SFPs deployed; refer to Table 3	Up to 9216 bytes per frame
WS-X6324-100FX-MM	24-port; 100BASE-FX; MT-RJ	2-km full duplex, 400m half duplex; 62.5- and 125-micron multimode fiber	Up to 9216 bytes per frame
WS-X6324-100FX-SM	24-port; 100BASE-FX; MT-RJ	10-km full or half duplex; standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber	Up to 9216 bytes per frame
WS-X6024-10FL-MT	24-port; 10BASE-FL; MT-RJ	2-km full or half duplex; 62.5- and 125-micron multimode fiber	Up to 9216 bytes per frame

**Table 3.** SFPs for 48-port 100BASE-X Module

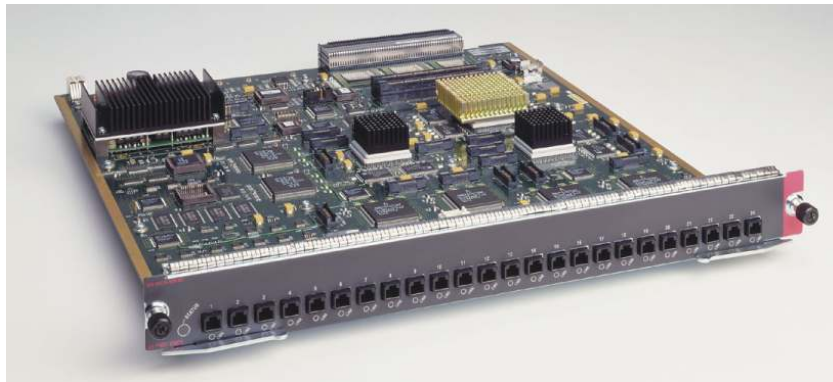
Product ID	Transceiver Type	Connector	Maximum Distance per Cable Type	Interoperable with
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GLC-FE-100FX	100BASE-FX	LC	2-km full duplex, 400m half duplex; 62.5- and 125-micron multimode fiber	WS-X6324-100FX-MM WS-X6524-100FX-MM
GLC-FE-100LX	100BASE-LX	LC	10-km full or half duplex; standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber	WS-X6324-100FX-SM
GLC-FE-100BX-D	100BASE-BX10-D	LC	10 km over single strand of single-mode fiber; standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber	
GLC-FE-100BX-U	100BASE-BX10-U	LC	10 km over single strand of single-mode fiber; standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber	

**Figure 1.** Classic 48 Port 100BASE-X Fiber Interface Module (part number WS-X6148-FE-SFP)



**Figure 2.** Classic 24 Port 100BASE-FX Fiber Interface Module (part number WS-X6324-100FX-MM)



### Cisco Catalyst 6500 Series Fiber-Based CEF256 100BASE-FX Ethernet Modules

Designed for small campus distribution and core layers and for data-center and Web-hosting applications, Cisco Catalyst 6500 Series CEF256 100BASE-FX Ethernet fiber-optic interface modules provide line-rate forwarding with the following operational advantages and characteristics:

- Forwarding architecture—Use the central CEF engine located on the supervisor engine
- Forwarding performance—Forward packets up to 30 Mpps per system and up to 15 Mpps per slot for slots upgraded to support distributed forwarding

- Fabric connection—Connect to the switch fabric using one 8-Gbps connection and the 32-Gbps shared bus
- Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, Supervisor 32, or Supervisor Engine 720
- Distributed forwarding upgrade—Optional, field upgradeable to support distributed forwarding: DFC3 (part number WS-F6K-DFC3A or WS-F6K-DFC3B or WS-F6K-DFC3BXL) upgrade to operate with Supervisor Engine 720, DFC (part number WS-F6K-DFC) upgrade to operate with Supervisor Engine 2/MFSC2 and a Switch Fabric Module
- Slot requirements—Can occupy any slot in any Cisco Catalyst 6500 Series chassis.
- Maximum port density per chassis—up to 288 ports per Cisco Catalyst 6513 chassis, and up to 192 ports per Cisco Catalyst 6509 chassis.

**Note:** No inline power support for voice is available for 100BASE-FX fiber modules.

**Table 4.** CEF256 100BASE-FX Fiber Interface Module

Product	Ports, Interfaces, and Connectors	Maximum Distance per Cable Type	Maximum Frame Size (jumbo frame) Support
WS-X6524-100FX-MM	24-port; 100BASE-FX; MT-RJ	2-km full duplex, 400m half duplex; 62.5- and 125-micron multimode fiber	Up to 9216 bytes

**Figure 3.** CEF256-Based 100BASE-FX Fiber Interface Module (part number WS-X6524-100FX-MM)



## ORDERING INFORMATION

Table 5 provides ordering information for Cisco Catalyst 6500 Series 10- and 100-Mbps Ethernet fiber-based interface modules.

**Table 5.** Cisco Catalyst 6500 Series 10- and 100-Mbps Ethernet Fiber-Based Interface Modules

Product Number	Description
WS-X6148-FE-SFP	Cisco Catalyst 6500 48-port 100BASE-X Classic Interface Module (requires SFPs)
GLC-FE-100FX	100BASE-FX SFP for WS-X6148-FE-SFP, multimode fiber, LC connector
GLC-FE-100LX	100BASE-LX SFP for WS-X6148-FE-SFP, single-mode fiber, LC connector
GLC-FE-100BX-D	100BASE-BX10-D SFP for WS-X6148-FE-SFP, single strand of single-mode fiber, LC connector
GLC-FE-100BX-U	100BASE-BX10-U SFP for WS-X6148-FE-SFP, single strand of single-mode fiber, LC connector
WS-X6524-100FX-MM	Cisco Catalyst 6500 24-port, CEF256 100BASE-FX Interface Module, multimode fiber, MT-RJ; field-upgradable to support distributed forwarding with the addition of the distributed forwarding daughter card (part number WS-F6K-DFC= or WS-F6K-DFC3A= or WS-F6K-DFC3B= or WS-F6K-DFC3BXL=)
WS-X6324-100FX-MM	Cisco Catalyst 6500 24-port 100BASE-FX Classic Interface Module, multimode fiber, MT-RJ
WS-X6324-100FX-SM	Cisco Catalyst 6500 24-port, 100BASE-FX Classic Interface Module, single-mode fiber, MT-RJ
WS-X6024-10FL-MT	Cisco Catalyst 6500 24-port 10BASE-FL Classic Interface Module, multimode fiber, MT-RJ

## SPECIFICATIONS

### Standard Network Protocols

- Ethernet: IEEE 802.3
- Fast Ethernet: IEEE 802.3 and 100BASE-FX
- IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, IEEE 802.1s, IEEE 802.1w, IEEE 802.3x, IEEE 802.3z, IEEE 802.3ab, IEEE 802.3ad, and IEEE 802.3ah

### Physical Specification

- Occupies one slot in a 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 percent, noncondensing
- Operating altitude: Sea level to 6500 ft (1981m)

### Safety Compliance

- UL 60950
- CSA-C22.2 No. 60950
- EN 60950

- IEC 60950
- AS/NZS 60950/TS001

### **EMC Compliance**

- FCC Part 15 (CFR 47) Class A
- VCCI Class A
- EN55022 Class A
- CISPR 22 Class A
- CE marking
- AS/NZS 3548 Class A
- ETS300 386
- EN55024
- EN61000-6-1
- EN50082-1

### **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
- CISCO-UDLD-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-COPS-CLIENT-MIB
- ENTITY-MIB (RFC 2037)
- HC-RMON
- RFC1213-MIB (MIB-II)
- SMON-MIB

### **Maximum Cabling Distance**

- 100BASE-FX multimode Fast Ethernet: 62.5- and 125-micron multimode fiber: 400m half duplex, 2-km full duplex
- 100BASE-FX single-mode Fast Ethernet: standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber: 10-km half or full duplex
- 100BASE-LX Fast Ethernet: standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber: 10-km half or full duplex
- 100BASE-BX10 Fast Ethernet: standard ITU-T G.652 (IEC 60793-2 B1.1/B1.3) single-mode fiber: 10 km over single strand of fiber
- 10BASE-FL Ethernet: 62.5- and 125-micron multimode fiber: 2-km half or full duplex

### **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)

- 100BASE-X: SFPs, LC connector (female)
- 100BASE-FX multimode: MT-RJ (female, multimode)
- 100BASE-FX single-mode: MT-RJ (female, single mode)
- 10BASE-FL: MT-RJ (female, multimode)

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## **FOR MORE INFORMATION**

Visit the following link to view the following data sheets:

[http://www.cisco.com/en/US/products/hw/switches/ps708/products\\_data\\_sheets\\_list.html](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 and Supervisor Engine 2 Data Sheet
- Cisco Catalyst 6500 Series Supervisor Engine 720 Data Sheet
- Cisco Catalyst 6500 Series Gigabit Ethernet Interface Modules 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



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