

Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Ethernet Interface Modules

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

The Cisco Catalyst® 6500 Series provides the broadest selection of 10/100 and 10/100/1000 Ethernet media, inline power options, densities, performance, interoperability, and chassis deployments. Equally suited for basic wiring closets, small campus distribution/core layers, and high performance data centers, Catalyst 6500 10/100 and 10/100/1000Mbps modules scale from 16-ports up to 576-ports in a single Catalyst 6500 chassis. Catalyst 6500 10/100 and 10/100/1000Mbps modules feature include:

- **Proven and widely deployed Cisco AVVID wiring closet solution**—Establish the Cisco Catalyst 6500 Series as the most widely deployed IP telephony port-enabled campus switch platform
- **Choice of media and connector types**—Available in copper unshielded twisted-pair (UTP), shielded twisted-pair (STP) using RJ-45 or RJ-21, multimode fiber (62.5/125 micron), and single-mode fiber using MT-RJ 100FX and 10FL
- **IP phone and wireless access point support**—Support inline power field upgrade (copper only), NIC/Phone auto-detection (phone discovery), and voice VLANs

- **Simplified network operation with cable fault detection**—Test cabling using Time Domain Reflectometer (TDR) that sends signals down the cable to identify faults in each twisted pair (available for 10/100/1000 copper)
- **Range of port densities**—Available with 16 up to 48 ports per module; with up to 576 10/100/1000Base-TX ports, 288 ports of 100-Base-FX, or 10BASE-FL (per 13-slot chassis configured with 12 interface modules)
- **Scalable and predictable performance**—Provide a selection of switch fabric connections and throughput: 32 Gbps bandwidth/15 Mpps (Classic interface modules), 256 Gbps bandwidth/30 Mpps (CEF256 interface modules) and 256 Gbps bandwidth/210 Mpps(dCEF256 interface modules)
- **IEEE 802.3 triple-speed autonegotiation**—Allow switches to negotiate speed (10, 100, and now 1000 Mbps) and duplex mode (half or full) with attached devices
- **Superior traffic management**—Available with large 1-MB-per-interface buffers and up to 8 transmit queues for traffic prioritization and policing



- **Operational consistency**—Supported in all Catalyst 6500 3-, 6-, 9-, and 13-slot chassis running Cisco 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
- **Extensive management tools**—Support 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)

The newest members of the Cisco Catalyst 6500 Series 10/100/1000 product family—the Classic interface module WS-X6148-GE-TX and the CEF256 interface module WS-X6548-GE-TX—provide 10/100/1000 Gigabit network access using standard RJ-45 connectors (Figure 1).

Figure 1
Cisco Catalyst 6500 Series 48-Port RJ-45 10/100/1000 Ethernet Interface Modules
WS-X6148-GE-TX



WS-X6548-GE-TX





Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Ethernet Applications

Ethernet and Fast Ethernet 10/100 and 10/100/1000 interface modules are used in both wiring closet and data center applications (Figure 2; Table 1).

Table 1 Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Copper Interface Module Applications

| Primary Applications | Product Number | Interface Module Class | Ports/ Connector/ Interface | Inline Power Support ¹ | Queues per Port (Tx = Transmit, Rx = Receive) ² | Buffer Size |
|-----------------------------|-----------------|--------------------------------|-----------------------------|-----------------------------------|--|------------------|
| Data Center and Server Farm | WS-X6516-GE-TX | CEF256 | 16, RJ-45, 10/100/1000 | No | Tx-1p2q2T, Rx-1p1q4T | 512 KB per port |
| Server Farm | WS-X6548-RJ-45 | CEF256 | 48, RJ-45, 10/100 | No | Tx-1p3q1t, Rx-1p1q0t | 1 MB per port |
| Server Farm | WS-X6548-RJ-21 | CEF256 | 48, RJ-21, 10/100 | No | Tx-1p3q1t, Rx-1p1q0t | 1 MB per port |
| Premier Wiring Closet | WS-X6548V-GE-TX | CEF256, Not Upgradable to dCEF | 48, RJ-45, 10/100/1000 | Both | Tx-1p2q2t (per 8 ports), Rx-1p2t (per port) | 1 MB per 8 ports |
| Premier Wiring Closet | WS-X6548-GE-TX | CEF256, Not Upgradable to dCEF | 48, RJ-45, 10/100/1000 | Both, Upgr | Tx-1p3q1t, Rx-1p1q4t | 1 MB per 8 ports |
| Wiring Closet | WS-X6148V-GE-TX | Classic | 48, RJ-45, 10/100/1000 | Both | Tx-1p2q2t, Rx-1q2t | 1 MB per 8 ports |
| Wiring Closet | WS-X6148-GE-TX | Classic | 48, RJ-45, 10/100/1000 | Both, Upgr | Tx-1p2q2t, Rx-1q2t | 1 MB per 8 ports |
| Base Wiring Closet | WS-X6148-RJ45V | Classic | 48, RJ-45, 10/100/1000 | Both | Tx-2q2t, Rx-1q4t | 128 KB per port |
| Base Wiring Closet | WS-X6148-RJ21V | Classic | 48, RJ-21, 10/100 | Both | Tx-2q2t, Rx-1q4t | 128 KB per port |
| Base Wiring Closet | WS-X6148-RJ-45 | Classic | 48, RJ-45, 10/100 | Both, Upgr | Tx-2q2t, Rx-1q4t | 128 KB per port |
| Base Wiring Closet | WS-X6148-RJ-21 | Classic | 48, RJ-21, 10/100 | Both, Upgr | Tx-2q2t, Rx-1q4t | 128 KB per port |
| Base Wiring Closet | WS-X6348-RJ45V | Classic | 48, RJ-45, 10/100 | Cisco | Tx 2q2t, Rx 1q4t | 128 KB per port |
| Base Wiring Closet | WS-X6348-RJ21V | Classic | 48, RJ-21, 10/100 | Cisco | Tx 2q2t, Rx 1q4t | 128 KB per port |

1. Inline Power Legend:

Both = Cisco inline power (available now) and IEEE 802.3af (via future field upgradable daughter card)

Cisco = Cisco inline power only

Upgr = shipped as data only but upgradable to the inline power type specified

No = inline power not supported

2. Queues Legend: 1p7q8t = 1 priority queue, 7 round robin queues, 8 thresholds



Table 2 Cisco Catalyst 6500 Series 100FX and 10FL Fiber Interface Module Applications

| Primary Applications | Product Number | Interface Module Class | Ports/ Connectors/ Interface Media | Queues per Port (Tx = Transmit, Rx = Receive) ¹ | Buffers |
|----------------------------|-------------------|----------------------------|------------------------------------|--|-----------------|
| Access, Server Farm | WS-X6524-100FX-MM | CEF256, Upgradable to dCEF | 24, MM MT-RJ, 100FX | Tx 1p3q1t, Rx 1p1q0t | 1 MB per port |
| Access, Server Farm | WS-X6324-100FX-MM | Classic | 24, MM, MT-RJ, 100FX | Tx 2q2t, Rx 1q4t | 128 KB per port |
| Access, Server Farm | WS-X6324-100FX-SM | Classic | 24, SM MT-RJ, 100FX | Tx 2q2t, Rx 1q4t | 128 KB per port |
| Access | WS-X6024-10FL-MT | Classic | 24, MM MT-RJ, 10FL | Tx 2q2t, Rx 1q4t | 64 KB per port |

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



Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Ethernet Interface Modules with Cisco Inline Power

The Cisco Catalyst 6500 Series delivered the first 10/100BASE-T Ethernet switching modules that provided inline power for converged data and voice traffic. Cisco Catalyst Classic interface modules support voice functionality on each interface port, allowing customers to build campus multiservice data and voice networks for wiring closets with the following features:

- **Inline power**—Provides 48-volt DC power (for Cisco Inline Power and IEEE 802.3af standard inline power when it becomes available) over standard Category 5 unshielded twisted-pair (UTP) cable up to 100 meters for IP phones and wireless access points
- **Phone discovery**—Detects the presence of an IP phone and supplies inline power automatically
- **Auxiliary VLAN using 802.1Q**—Segments IP phones and data endpoints into separate logical networks automatically
- **AutoQoS**

Cisco Catalyst Inline Power and IEEE 802.3af Inline Power

The Inline Power feature gives network administrators centralized power control. It works over existing Category 5 UTP installations and helps to ensure that building power outages will not affect network telephony connections, providing greater network availability—when Cisco Catalyst 6500 Series switches are configured with uninterruptible power supply (UPS) systems.

10/100 and 10/100/1000 Ethernet interface modules shipping today support the Cisco Inline Power feature or support the IEEE 802.3af standard, or both, allowing 802.3af capability to be added later through an upgrade. The Cisco Catalyst Inline Power feature implementation passes the required domestic and international safety regulations and compliance measures.

Phone Discovery

The Cisco phone discovery feature eases network management burdens by automating the Inline Power feature. With phone discovery, the Cisco Catalyst switch detects the presence of an IP phone and supplies inline power automatically, eliminating the need to manually enable ports for inline power. The phone discovery mechanism is intelligent enough to differentiate between an IP phone and a network interface card (NIC), and will not supply inline power to NICs or other devices not designed to use inline power. With this feature, network administrators can depend on automatic and centralized control of inline power that is safe to deploy and maintain.

Auxiliary VLAN

The unique Auxiliary VLAN feature offered by Cisco provides automatic VLAN configuration for IP phones. It places phones into their own VLANs automatically, simplifying the task of overlaying a voice topology onto a data network. It allows network administrators to easily segment phones into separate logical networks, even though the data and voice infrastructure is physically the same—greatly simplifying the task of managing a multiservice network and identifying and troubleshooting network problems.

The Auxiliary VLAN feature maintains VLAN assignments, even when phones are moved to new locations. When a user plugs a phone into the switch, the switch provides the phone with the necessary VLAN information.



AutoQoS

Network administrators can assign IP phones to separate IP subnets and VLANs to allow separate quality of service (QoS) or security policies for IP phones. By deploying AutoQoS that configures QoS on voice ports automatically, the administrative task of configuring QoS to establish end-to-end traffic prioritization is greatly simplified.

Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Modules

Two classes of Cisco Catalyst 6500 Series 10/100 and 10/100/1000 Ethernet interface modules—Classic and CEF256—provide a choice of speeds and forwarding rates (Table 4).

Classic 10/100 and 10/100/1000 Interface Modules

Suited for wiring closet applications, Classic 10/100 and 10/100/1000 modules use the supervisor’s centralized forwarding engine for Layer 3 forwarding, and forward packets up to 15 Mpps.

Capable of operating in the same chassis with Supervisor Engine 1A, Supervisor Engine 2, and Supervisor Engine 720, Classic Series modules do not support distributed forwarding and cannot be upgraded with a Distributed Forwarding Card (DFC).

CEF256 10/100 and 10/100/1000 Interface Modules

Suited for premier wiring closet, distribution and core layers, data-center, and Web-hosting applications, CEF256 10/100 and 10/100/1000 interface modules use the centralized CEF engine located on the supervisor engine’s policy feature card (PFC) and forward packets up to 30 Mpps.

Capable of operating in the same chassis with Supervisor Engine 1A, Supervisor Engine 2, and Supervisor Engine 720, CEF256 interface modules can also support distributed forwarding (Table 2).

Table 3 CEF256 10/100 and 10/100/1000 Switch Fabric DFC Upgrade Requirements

| Supervisor Engine | Switch Fabric | DFC |
|---|--|---|
| Supervisor Engine 2 MSFC2/PFC2 | Separate switch fabric module (SFM) | Requires WS-F6K-DFC upgrade |
| Supervisor Engine 720 | Supervisor Engine 720 contains a switch fabric | Requires WS-F6K-DFC3 upgrade; will not work with WS-F6K-DFC3, or WS-F6K-DFC |



Table 4 provides a comparison of the interface module classes available for 10/100 and 10/100/1000 Ethernet interface modules.

Table 4 Classic and CEF256 10/100 and 10/100/1000 Interface Module Comparison

| Feature | Classic Interface Modules | CEF256 Interface Modules |
|--|--|---|
| Performance/ Forwarding Rate (Mpps) | 32 Gbps; 15 Mpps per system | 256 Gbps; Up to 30 Mpps per system (15 Mpps per slot for slots upgraded with DFC to support distributed forwarding) |
| Forwarding Engine Architecture | Supervisor engine CPU makes forwarding decision | Centralized CEF engine located on supervisor's PFCx daughter card makes forwarding decision upgradeable to dCEF switching with optional WS-F6K-DFC or WS-F6K-DFC3 |
| Supervisor Engine Supported | Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 720 | Supervisor Engine 1A, Supervisor Engine 2, Supervisor Engine 720 |
| DFC Upgrade Requirements | Not supported | None integrated; Supervisor Engine 2—WS-F6K-DFC upgrade; SupervisorEngine 720—WS-F6K-DFC3 upgrade |
| Fabric Connections | 32 Gbps shared bus connection (on Supervisor Engine1A, 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 |
| Slot Requirements | Can occupy any slot in any chassis | Can occupy any slot in any chassis |
| Scheduler | Weighted Round Robin (WRR) | WRR |



Cisco Catalyst Classic 10/100/1000 Voice Interface Modules

Suited for wiring closet applications, Cisco Catalyst Classic 10/100/1000 voice interface modules (Table 5) provide access to the desktop through standard RJ-45 connectors with the following operational advantages:

Forwarding architecture—Centralized CEF forwarding

Forwarding performance—Forward packets up to 15 Mpps per system

Fabric connection—Provide a 32-Gbps shared bus connection

Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, 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

Time Domain Reflectometer (TDR)—Tests cabling by sending signals down the cable to identify faults in each twisted pair

Transmit queue structure—1p2q2t = 1 strict priority queue, 2 round robin queues, 2 thresholds

Receive queue structure—1q2t = 1 round robin queue, 2 thresholds

Table 5 Classic 10/100/1000 Voice Interface Modules

| Product | Ports/ Interface/ Connectors | Port Density/ Chassis Model | Maximum Distance/ Cable Type | Inline Power for Voice Availability/ Upgrade Capability |
|------------------------|------------------------------------|--|------------------------------|---|
| WS-X6148-GE-TX | 48-port;10/100/1000BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; upgradable to 802.3af |
| WS-X6148V-GE-TX | 48-port; 10/100/1000BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; upgradable to 802.3af |

Figure 2

Classic 10/100/1000 Voice Interface Modules
WS-X6148V-GE-TX





Cisco Catalyst CEF256 10/100/1000 Voice Interface Modules

Suited for wiring closet applications, Cisco Catalyst CEF256 10/100/1000 voice interface modules provide access to the desktop through standard RJ-45 connectors and line-rate 10/100/1000 Ethernet forwarding (Table 6) with the following operational advantages:

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 if upgraded to support distributed forwarding

Fabric connection—Connect to the switch fabric through one 8-Gbps connection and the 32-Gbps shared bus

Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, or Supervisor Engine 720

Distributed forwarding upgrade—Optional; upgrade is required only to perform distributed forwarding; requires a WS-F6K-DFC3 upgrade to operate with a Supervisor Engine 720; requires a WS-F6K-DFC upgrade to operate with a Supervisor Engine 2/MFSC2 and a Switch Fabric Module

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

Time Domain Reflectometer (TDR)—Tests cabling by sending signals down the cable to identify faults in each twisted pair

Transmit queue structure—1p2q2t = 1 priority queue, 2 round robin queues, 1 threshold

Receive queue structure—1q2t = 1 round robin queue, 2 thresholds

Table 6 CEF256 10/100/1000 Voice Interface Modules

| Product | Ports/ Interface/ Connectors | Port Density/ Chassis Model | Maximum Distance/ Cable Type | Inline Power for Voice Availability/ Upgrade Capability |
|-----------------------|--|---|---------------------------------|---|
| WS-X6548-GE-TX | 48-port; 10/100/1000BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; upgradable to 802.3af |

Figure 3
CEF256 10/100/1000 Voice Interface Modules
WS-X6548-GE-TX





Cisco Catalyst Classic 10/100 Copper Voice Modules

Designed for deployment in wiring closets, high-density Cisco Catalyst Classic 10/100 interface modules come with a selection of inline power capabilities and provide line-rate 10/100 Ethernet forwarding with the following operational advantages:

- Voice-ready modules with Cisco Inline Power and upgradable to 802.3af—Available in 48-port RJ-45 and RJ-21 configurations (WS-X6148-RJ45V and WS-X6148-RJ21V)
- Voice-ready modules with Cisco Inline Power and not upgradable to 802.3af—Available in 48-port RJ-45 and RJ-21 configurations (WS-X6348-RJ45V and WS-X6348-RJ21V)
- Voice-capable modules upgradable to Cisco Inline Power or 802.3af—Available in 48-port RJ-45 and RJ-21 configurations (WS-X6148-RJ-45 and WS-X6148-RJ-21)

Note: These modules are designed to fully support future upgrades to the IEEE 802.3af inline power standard currently underway, providing maximum investment protection.

Forwarding architecture—Use centralized CEF forwarding

Forwarding performance—Forwards packets up to 15 Mpps per system

Fabric connection—Connect to the switch fabric using a 32-Gbps shared bus connection

Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, 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

Transmit queue structure—2q2t = two round robin queues and two thresholds

Receive queue structure—1q4t = one round robin queue and four thresholds



Table 7 Classic 10/100 Copper Voice Interface Modules

| Product | Ports/ Interface/ Connectors | Port Density/ Chassis Model/ | Maximum Distance/Cable Type | Inline Power for Voice Availability/ Capability |
|-----------------------|-------------------------------------|---|---------------------------------|---|
| WS-X6148-RJ45 | 48-port; 10/100BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; upgradable to 802.3af |
| WS-X6148-RJ21V | 48-port; 10/100BASE-TX; RJ-21 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; upgradable to 802.3af |
| WS-X6348-RJ45V | 48-port; 10/100BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; cannot upgrade to 802.3af |
| WS-X6348-RJ21V | 48-port; 10/100BASE-TX; RJ-21 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | Cisco Inline Power; cannot upgrade to 802.3af |
| WS-X6148-RJ-45 | 48-port; 10/100BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | None provided; can upgrade to Cisco Inline Power or 802.3af |
| WS-X6148-RJ-21 | 48-port; 10/100BASE-TX; RJ-21 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable | None provided; can upgrade to Cisco Inline Power or 802.3af |

Figure 4
Classic 10/100 Copper Voice Interface Modules
WS-X6148-RJ45

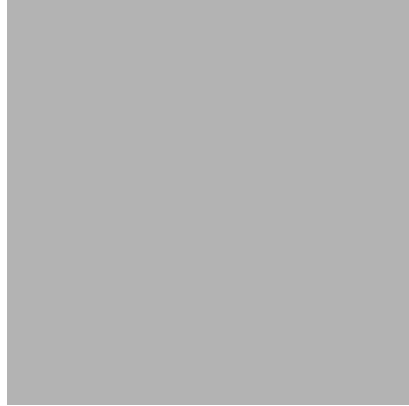


WS-X6148-RJ21V





WS-X6348-RJ21V



WS-X6148-RJ-45



WS-X6148-RJ-21





Cisco Catalyst CEF256 10/100 Copper Modules

Designed for small campus distribution and core layers and for data-center and Web-hosting applications where voice capability is not required, Cisco Catalyst CEF256 twisted-pair interface modules provide line-rate 10/100 Ethernet forwarding with the following operational advantages:

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 a single 8-Gbps switch fabric channel and a 32-Gbps shared bus

Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, or Supervisor Engine 720

Distributed forwarding upgrade—Only required to perform distributed forwarding; require a WS-F6K-DFC3 upgrade to operate with Supervisor Engine 720; require a WS-F6K-DFC upgrade to operate with Supervisor Engine 2/ MFSC2 and an SFM

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

Transmit queue structure—1p3q1t = 1 priority queue, 3 round robin queues, 1 threshold

Receive queue structure—1p1q4t = 1 priority queue, 1 round robin queue, 4 thresholds

Table 8 CEF256 Copper 10/100 Interface Modules

| Product | Ports/Interface/ Connectors | Port Density/Chassis Model | Maximum Distance/ Cable Type |
|-----------------------|----------------------------------|---|---------------------------------|
| WS-X6548-RJ-45 | 48-port; 10/100BASE-TX; RJ-45 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable |
| WS-X6548-RJ-21 | 48-port; 10/100BASE-TX; RJ-21 | 576 ports (Cisco Catalyst 6513); 384 ports (Cisco Catalyst 6509) | 100 meters; Category 5 cable |



Figure 5 shows high-density Cisco Catalyst CEF256 copper interface modules designed for distribution and core layers.

Figure 5
CEF256 Copper 10/100 Interface Modules
WS-X6548-RJ-45



WS-X6548-RJ-21





Catalyst Classic 100FX and 10FL Fiber Interface Modules

Designed for deployment in wiring closets where optical interfaces are required, the Cisco Catalyst Classic fiber interface modules provide 10/100 Ethernet forwarding with the following operational advantages:

Forwarding architecture—Use centralized CEF forwarding

Forwarding performance—Forward packets up to 15 Mpps per system

Fabric connection—Connect to the switch fabric using a 32-Gbps shared bus connection

Supervisor engine—Work with Supervisor Engine 1A, Supervisor Engine 2, 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

Transmit queue structure—2q2t = 2 round robin queues, 2 thresholds

Receive queue structure—1q4t = 1 round robin queue, 4 thresholds

Note: No inline power support for voice is available for 100FX/10FL fiber modules.

Table 9 Classic 100FX/10FL Fiber Interface Modules

| Product | Ports/ Interface/ Connectors | Port Density/Chassis Model | Maximum Distance/Cable Type |
|--------------------------|----------------------------------|---|---|
| WS-X6324-100FX-MM | 24-port; 100BASE-FX; MT-RJ | 288 ports (Cisco Catalyst 6513); 192 ports (Cisco Catalyst 6509) | 2 km; -62.5/125-micron multimode fiber; full or half duplex |
| WS-X6324-100FX-SM | 24-port; 100BASE-FX; MT-RJ | 288 ports (Cisco Catalyst 6513); 192 ports (Cisco Catalyst 6509) | 2 km; -62.5/125-micron multimode fiber; full or half duplex |
| WS-X6024-10FL-MT | 24-port; 10FL; MT-RJ | 288 ports (Cisco Catalyst 6513); 192 ports (Cisco Catalyst 6509) | 2 km; -62.5/125-micron multimode fiber; full or half duplex |

Figure 6
Classic 100FX/10FL Fiber Interface Modules
WS-X6024-10FL-MT





Cisco Catalyst CEF256 100FX Fiber Modules

Designed for small campus distribution and core layers and for data-center and Web-hosting applications, Cisco Catalyst dCEF256 fiber interface modules provide line-rate 100FX Ethernet forwarding with the following operational advantages:

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, or Supervisor Engine 720

Distributed forwarding upgrade—Only required to perform distributed forwarding; require a WS-F6K-DFC3 upgrade to operate with Supervisor Engine 720; require a 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

Transmit queue structure—1p3q1t = 1 priority queue, 3 round robin queues, 1 threshold

Receive queue structure—1p1q2t = 1 priority queue, 1 round robin queue, 2 thresholds

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

Table 10 CEF256 100FX Fiber Interface Modules

| Product | Ports/Interface/Connectors | Port Density/Chassis Model | Maximum Distance/Cable Type |
|--------------------------|-----------------------------------|---|---|
| WS-X6524-100FX-MM | 24-port; 100BASE-FX; MT- RJ | 288 ports (Cisco Catalyst 6513); 192 ports (Cisco Catalyst 6509) | 2 km; -62.5/125-micron multimode fiber; full or half duplex |

Figure 7
CEF256 100FX Fiber Interface Modules
WS-X6524-100FX-MM





Ordering Information

Table 11 provides part number information for Catalyst 6500 Series 10/100 and 100/1000 Ethernet interface modules.

Table 11 Catalyst 6500 Series 10/100 and 100/1000 Ethernet Interface Modules

| Product Number | Description |
|--------------------------|---|
| WS-X6024-10FL-MT | Catalyst 6500 24-port 10FL Classic interface module, multimode fiber, MT-RJ |
| WS-X6148-GE-TX | Catalyst 6500 48-port 10/100/1000 RJ-45 Classic interface module; field-upgradable to support Cisco Inline Power through voice daughter card (WS-F6K-VPWR=) |
| WS-X6148-VGE-TX | Catalyst 6500 48-port 10/100/1000 RJ-45 Classic interface module; with Cisco Inline Power through voice daughter card (WS-F6K-VPWR=) |
| WS-X6148-RJ-21 | Catalyst 6500 48-port 10/100 RJ-21 Classic interface module; field-upgradable to support Cisco Inline Power through voice daughter card (WS-F6K-VPWR=) |
| WS-X6148-RJ21V | Catalyst 6500 48-port 10/100 Telco RJ-21 Classic interface module with Cisco Inline Power |
| WS-X6148-RJ-45 | Catalyst 6500 48-port 10/100 RJ-45 Classic interface module; field-upgradable to support Cisco Inline Power through voice daughter card (WS-F6K-VPWR=) |
| WS-X6148-RJ45V | Catalyst 6500 48-port 10/100 RJ-45 Classic interface module with Cisco Inline Power |
| WS-X6348-RJ21V | Catalyst 6500 48-port 10/100 Telco RJ-21 Classic interface module with Cisco Inline Power |
| WS-X6348-RJ45 | Catalyst 6500 48-port 10/100 RJ-45 Classic interface module; field-upgradable to provide Cisco Inline Power through voice daughter card (WS-F6K-VPWR=) |
| WS-X6348-RJ45V | Catalyst 6500 48-port 10/100 RJ-45 Classic interface module with Cisco Inline Power |
| WS-F6K-VPWR= | Inline power daughter card to support Cisco Inline Power for Cisco Catalyst 6500 Series switches |
| WS-X6324-100FX-MM | Catalyst 6500 24-port 100FX Classic interface module, multimode fiber, MT-RJ |
| WS-X6324-100FX-SM | Catalyst 6500 24-port, 100FX Classic interface module, single-mode fiber, MT-RJ, with enhanced QoS |
| WS-X6548-RJ-45 | Catalyst 6500 48-port, CEF256 10/100 RJ-45 interface module; field-upgradable to support distributed forwarding with the addition of the Distributed Forwarding daughter card (WS-F6K-DFC= or DFC3) |
| WS-X6548-RJ-21 | Catalyst 6500 48-port, CEF256 10/100 RJ-21 interface module; field-upgradable to support distributed forwarding with the addition of the Distributed Forwarding daughter card (WS-F6K-DFC= or DFC3) |
| WS-X6524-100FX-MM | Catalyst 6500 24-port, CEF256 100FX interface module; field-upgradable to support distributed forwarding with the addition of the Distributed Forwarding daughter card (WS-F6K-DFC= or DFC3) |
| WS-F6K-DFC= | Distributed forwarding daughter card for interface modules running with Supervisor Engine 2 and a Switch Fabric Module |
| WS-F6K-DFC3= | Distributed forwarding daughter card for CEF256, dCEF256, and dCEF720 interface modules running with Supervisor Engine 720 |



Ordering Information—DFC Daughter Cards

Table 12 provides part number information for Catalyst 6500 Series 10/100 and 100/1000 Ethernet interface modules.

Table 12 Catalyst 6500 Series 10/100 and 100/1000 Distributed Forwarding Cards

| Part Number | Description |
|-----------------------|------------------------------------|
| WS-F6K-DFC | Distributed forwarding card |
| WS-F6K-DFC= | Distributed forwarding card, spare |
| MEM-DFC-256MB | 256-MB DRAM option for DFC |
| MEM-DFC-256MB= | 256-MB DRAM spare option for DFC |
| MEM-DFC-512MB | 512-MB DRAM option for DFC |
| MEM-DFC-512MB= | 512-MB DRAM spare option for DFC |

Specifications

Standard Network Protocols

- Ethernet: IEEE 802.3, 10BASE-T
- Fast Ethernet: IEEE 802.3, 100BASE-TX, and 100BASE-FX
- Gigabit Ethernet: 1000BASE-TX
- 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

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%, noncondensing
- Operating altitude: -60 to 4000 m

Safety Compliance

- UL 1950
- CSA-C22.2 No. 950
- EN 60950
- IEC 950
- AS/NZS 3260
- IEC 825



- EN 60825
- 21CFR1040

EMC Compliance

- FCC Part 15 (CFR 47) Class A
- VCCI Class A with UTP, Class B with STP
- EN55022 Class A with UTP, Class B with STP
- CISPR 22 Class A with UTP, Class B with STP
- CE marking
- AS/NZS 3548 Class A with UTP, Class B with STP

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

Inline Power Specifications

- Output power per port: 48V DC power
- Pin assignment: 1, 2, 3, 6

Maximum Station-to-Station Cabling Distance

- 10/100BASE-TX, 100BASE-TX Fast Ethernet, and 10/100/1000: Category 5, 5e, and 6 UTP: 328 ft. (100 m), 100-ohm STP: 328 ft. (100 m); half or full duplex
- 100BASE-FX Fast Ethernet: 62.5/125-micron multimode fiber: 400-m half duplex, 2-km half or full duplex



- 100BASE-FX Fast Ethernet: 8/125-micron single-mode fiber: 10-km half or full duplex
- 10BASE-FL Ethernet: 62.5/125-micron multimode fiber: 2-km half or full duplex
- Maximum power: off (maximum power condition not reached); on (maximum power condition reached; no more phones will receive inline power from this module)

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)
- 10/100/1000: RJ-45 (female)
- 10/100BASE-TX and 100BASE-TX: RJ-45 (female)
- 100BASE-FX: MT-RJ (female, multimode)
- 100BASE-FX: MT-RJ (female, single mode)
- 10BASE-FL: MT-RJ (female, multimode)

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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.

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- 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

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- 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 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
- 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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