

# 6800 Series 10 Gigabit and Gigabit Ethernet Interface Modules for Cisco 6500 Series Switches

## Product Overview

The Cisco Catalyst® 6500 Series Switches offer a variety of 10 Gigabit and Gigabit Ethernet modules which work in conjunction with the new Catalyst 6500 Supervisor Engine 2T/2TXL (VS-S2T-10G & VS-S2T-10GXL) to serve different needs in the campus and data center for enterprise, commercial, and service provider customers. The modules in this family include the new 6800 Series 16-port 10 Gigabit Ethernet Fiber Module, 16-port 10 Gigabit Ethernet Copper Module, 48-port Gigabit Ethernet Copper Module, 48-port Gigabit Ethernet Fiber Module and 24-port Gigabit Ethernet Fiber Module. The 10 Gigabit Fiber Module supports 10GBASE-CX4, -SR, -LRM, -LX4, -LR, -ZR and -ER X2 fiber modules to provide operational distances up to 80 km over single-mode fiber. The 10 Gigabit Ethernet Copper Module supports RJ-45 connectors and operational distance of up to 55 m over Category 6 Unshielded Twisted Pair (UTP) copper cabling; 100 meters over Category 6 Shielded Twisted Pair (STP) copper cabling, 100 meters over Category 6A UTP & STP copper cabling, and 100 meters over Category 7 STP copper cabling. Similarly Gigabit Ethernet Copper Module supports RJ-45 connectors and provides operational distance of up to 100 meters over Category 5, 5E & 6 UTP copper cabling. The Gigabit Fiber Modules support pluggable optics and provide operational distances of up to 80 km over single-mode fiber and over multimode fiber.

## 6800 Series 16-Port 10 Gigabit Ethernet Fiber Module

The 6800 series 16-port 10 Gigabit Ethernet fiber module is suitable for deployment in access and aggregation network in Campus and Data Center:

- WS-X6816-10G-2T: 16-port 10 Gigabit Ethernet Fiber Module with DFC4 (Figure 1) and
- WS-X6816-10G-2TXL: 16-port 10 Gigabit Ethernet Fiber Module DFC4XL (Figure 1)
- **Backplane connection:** Connects to the switch fabric using dual full-duplex 20 Gbps switch fabric channels (40 Gbps total)
- **Chassis/slot support:** Can occupy any slot in Cisco Catalyst 6503E, 6504E, 6506E, 6509E, and 6509-V-E. Can occupy slots 1-6 and 9-13 in a Cisco Catalyst 6513-E
- **Supervisor engine:** Compatible with Supervisor Engine 2T and Supervisor Engine 2TXL
- **Distributed forwarding and performance:** Comes equipped with DFC4 or DFC4XL daughter cards, delivering optimal performance up to a sustained 60 Mpps for L2, IPv4 and MPLS forwarding and 30 Mpps for IPv6 forwarding

The 6800 Series 16-port 10 Gigabit Ethernet Fiber module (Figure 1) provides up to 176 10 Gigabit Ethernet Fiber ports in a single Cisco Catalyst 6513-E Switch chassis, 352 10 Gigabit Ethernet Fiber ports in a Cisco Catalyst 6500 Virtual Switching System (VSS) 2T.

**Figure 1.** 6800 Series 16-Port 10 Gigabit Ethernet Fiber Module



### 6800 Series 16-Port 10 Gigabit Ethernet Copper Module

The 6800 series 16-port 10 Gigabit Ethernet Copper module is suitable for Data center access and switch-to-switch connectivity. The primary use case for 10GBase-T is high-speed server connectivity. Other less common use case scenarios will leverage 10GBase-T for interconnecting distribution or core switches that reside within a 100m distance:

- **WS-X6816-10T-2T:** 16-port 10 Gigabit Ethernet Copper Module with DFC4 (Figure 1) and
- **WS-X6816-10T-2TXL:** 16-port 10 Gigabit Ethernet Copper Module DFC4XL (Figure 1)
- **Backplane connection:** Connects to the switch fabric using dual full-duplex 20 Gbps switch fabric channels (40 Gbps total)
- **Chassis/slot support:** Can occupy any slot in Cisco Catalyst 6503E, 6504E, 6506E, 6509E, and 6509-V-E. Can occupy slots 1-6 and 9-13 in a Cisco Catalyst 6513-E
- **Supervisor engine:** Compatible with Supervisor Engine 2T and Supervisor Engine 2TXL
- **Distributed forwarding and performance:** Comes equipped with DFC4 or DFC4XL daughter cards, delivering optimal performance up to a sustained 60 Mpps for L2, IPv4 and MPLS forwarding and 30 Mpps for IPv6 forwarding

The 6800 Series 16-port 10 Gigabit Ethernet Copper module (Figure 1) provides up to 176 10 Gigabit Ethernet Copper ports in a single Cisco Catalyst 6513-E Switch chassis, 352 10 Gigabit Ethernet Copper ports in a Cisco Catalyst 6500 Virtual Switching System (VSS) 2T and is primarily designed for data center access with a secondary use case for switch-to-switch connectivity.

**Figure 2.** 6800 Series 16-Port 10 Gigabit Ethernet Copper Module



## 6800 Series 10 Gigabit Ethernet Module Features

For more information, see the white paper discussing 10 Gigabit Ethernet switching for enterprises at [http://www.cisco.com/en/US/products/hw/switches/ps708/products\\_white\\_paper0900aecd802a648b.shtml](http://www.cisco.com/en/US/products/hw/switches/ps708/products_white_paper0900aecd802a648b.shtml).

### Main Features and Benefits

The 6800 Series 16-port 10 Gigabit Ethernet Fiber and Copper Module supports IEEE 802.3ad link aggregation and Cisco® distributed EtherChannel technology for fault-tolerant connectivity and bandwidth scalability of up to 80 Gbps per EtherChannel connection using any 8 ports in the same chassis. In addition, it supports hardware-based multicast replication, quality of service (QoS), access control lists (ACLs), jumbo frames, and low latency to enable secure and predictable performance for bandwidth-intensive applications. It consists of 4 port groups of 4 ports each. Users can operate each port group in either oversubscription mode (up to 4 ports used per port group) or performance mode (1 port used per port group), providing the flexibility to use some ports for connection to servers and other ports for interconnection of switches.

Table 1 summarizes the primary features and benefits of the 6800 Series 10 Gigabit Ethernet modules.

**Table 1.** 6800 Series 10 Gigabit Ethernet Module Primary Features

Feature	16-port 10GbE Fiber Module	16-Port 10GbE Copper Module
<b>Ports</b>	16	16
<b>Optics</b>	X2	Copper (RJ-45) connectors
<b>Switch fabric connection</b>	2 x 20 Gbps (40 Gbps total)	2 x 20 Gbps (40 Gbps total)
<b>Oversubscription</b>	4:1 16 ports (oversubscription mode) 1:1 4 ports (performance mode)	4:1 16 ports (oversubscription mode) 1:1 4 ports (performance mode)
<b>Forwarding engine</b>	<ul style="list-style-type: none"> <li>WS-X6816-10G-2T: comes equipped with DFC4 for distributed forwarding, supporting 256K forwarding entries, increased ACL entries to 64K, increased Netflow entries to 512K and increased IPv4 forwarding speed to 60 Mpps</li> <li>WS-X6816-10G-2TXL: equipped with DFC4XL for distributed forwarding, supporting 1 million forwarding entries, increased ACL entries to 256K, increased Netflow entries to 1024K and increased IPv4 forwarding speed to 60 Mpps</li> <li>Increased performance of up to 60Mpps for L2, IPv4 and MPLS forwarding and up to 30Mpps for IPv6 forwarding</li> <li>Support for 16K Bridge Domains, allowing the standard 4K VLANs to be reused across these bridge domains, effectively increasing the number of VLANs available in the system</li> <li>Increased MAC Address Table to 128K</li> <li>Increased multicast routes to 256K</li> <li>IGMPv3 snooping in hardware</li> <li>PIM registers in hardware</li> <li>IPv6 MLDv2 snooping in hardware</li> <li>IPv4 &amp; IPv6 in IPv6 tunnelling</li> <li>IPv6 in IPv4 tunneling ISATAP, 6to4, GRE)</li> <li>QoS support for uniform, short pipe and pipe mode tunnel</li> <li>Terminate the tunnel in the same loopback</li> </ul>	<ul style="list-style-type: none"> <li>WS-X6816-10T-2T: comes equipped with DFC4 for distributed forwarding, supporting 256K forwarding entries, increased ACL entries to 64K, increased Netflow entries to 512K and increased IPv4 forwarding speed to 60 Mpps</li> <li>WS-X6816-10T-2TXL: equipped with DFC4XL for distributed forwarding, supporting 1 million forwarding entries, increased ACL entries to 256K, increased Netflow entries to 1024K and increased IPv4 forwarding speed to 60 Mpps</li> <li>Increased performance of up to 60Mpps for L2, IPv4 and MPLS forwarding and up to 30Mpps for IPv6 forwarding</li> <li>Support for 16K Bridge Domains, allowing the standard 4K VLANs to be reused across these bridge domains, effectively increasing the number of VLANs available in the system</li> <li>Increased MAC Address Table to 128K</li> <li>Increased multicast routes to 256K</li> <li>IGMPv3 snooping in hardware</li> <li>PIM registers in hardware</li> <li>IPv6 MLDv2 snooping in hardware</li> <li>IPv4 &amp; IPv6 in IPv6 tunnelling</li> <li>IPv6 in IPv4 tunneling ISATAP, 6to4, GRE)</li> <li>QoS support for uniform, short pipe and pipe mode tunnel</li> <li>Terminate the tunnel in the same loopback</li> </ul>

Feature	16-port 10GbE Fiber Module	16-Port 10GbE Copper Module
<b>Queues</b>	Oversubscription mode: <ul style="list-style-type: none"> <li>Receive: 1p7q2t per port</li> <li>Transmit: 1p7q4t per port group</li> </ul> Performance mode: <ul style="list-style-type: none"> <li>Receive: 8q4t per port</li> <li>Transmit: 1p7q4t per port</li> </ul>	Oversubscription mode: <ul style="list-style-type: none"> <li>Receive: 1p7q2t per port</li> <li>Transmit: 1p7q4t per port group</li> </ul> Performance mode: <ul style="list-style-type: none"> <li>Receive: 8q4t per port</li> <li>Transmit: 1p7q4t per port</li> </ul>
<b>Queuing mechanisms</b>	<ul style="list-style-type: none"> <li>Class of Service (CoS) based queue mapping</li> <li>(Differentiated Service Code Point (DSCP) based queue mapping</li> </ul>	<ul style="list-style-type: none"> <li>Class of Service (CoS) based queue mapping</li> <li>(Differentiated Service Code Point (DSCP) based queue mapping</li> </ul>
<b>Scheduler</b>	Oversubscription mode: <ul style="list-style-type: none"> <li>Deficit Weighted Round Robin (DWRR)</li> <li>Weighted Random Early Detection (WRED)</li> </ul> Performance mode: <ul style="list-style-type: none"> <li>DWRR</li> <li>WRED</li> <li>Shaped Round Robin (SRR) at egress</li> </ul>	Oversubscription mode: <ul style="list-style-type: none"> <li>Deficit Weighted Round Robin (DWRR)</li> <li>Weighted Random Early Detection (WRED)</li> </ul> Performance mode: <ul style="list-style-type: none"> <li>DWRR</li> <li>WRED</li> <li>Shaped Round Robin (SRR) at egress</li> </ul>
<b>Port buffers</b>	Oversubscription mode: <ul style="list-style-type: none"> <li>90 MB per port group</li> </ul> Performance mode: <ul style="list-style-type: none"> <li>256 MB per port (128 MB for ingress and 128 MB for egress)</li> </ul>	Oversubscription mode: <ul style="list-style-type: none"> <li>90 MB per port group</li> </ul> Performance mode: <ul style="list-style-type: none"> <li>256 MB per port (128 MB for ingress and 128 MB for egress)</li> </ul>
<b>Hardware-based multicast replication</b>	<ul style="list-style-type: none"> <li>Ingress and Egress replication-mode</li> <li>Approximately 20 Gbps per replication engine</li> <li>2 replication engines per module</li> </ul>	<ul style="list-style-type: none"> <li>Ingress and Egress replication-mode</li> <li>Approximately 20 Gbps per replication engine</li> <li>2 replication engines per module</li> </ul>
<b>Jumbo frame support for bridged and routed packets</b>	Up to 9216 bytes	Up to 9216 bytes
<b>Maximum port density per chassis</b>	176 ports (6513-E chassis) 128 ports (6509-E chassis)	176 ports (6513-E chassis) 128 ports (6509-E chassis)
<b>Maximum port density per VSS</b>	352 ports	352 ports
<b>Can be used to form virtual switch link</b>	<ul style="list-style-type: none"> <li>Performance mode: Yes               <ul style="list-style-type: none"> <li>Up to 4 10 Gigabit Ethernet ports can be used for virtual switch link</li> </ul> </li> <li>Oversubscription mode: No</li> </ul>	<ul style="list-style-type: none"> <li>Performance mode: Yes               <ul style="list-style-type: none"> <li>Up to 4 10 Gigabit Ethernet ports can be used for virtual switch link</li> </ul> </li> <li>Oversubscription mode: No</li> </ul>
<b>Supervisor engines supported</b>	Catalyst 6500 Supervisor Engine 2T and 2TXL	Catalyst 6500 Supervisor Engine 2T and 2TXL
<b>Chassis supported</b>	<ul style="list-style-type: none"> <li>Any Cisco Catalyst 6500 E-Series chassis, including 6503-E, 6504-E, 6506-E, 6509-E, 6509-V-E (NEBS compliant) and 6513-E chassis</li> <li>Not supported in non-E Series chassis</li> </ul>	<ul style="list-style-type: none"> <li>Any Cisco Catalyst 6500 E-Series chassis, including 6503-E, 6504-E, 6506-E, 6509-E, 6509-V-E (NEBS compliant) and 6513-E chassis</li> <li>Not supported in non-E Series chassis</li> </ul>
<b>Slot requirements</b>	<ul style="list-style-type: none"> <li>Can occupy any slot in any Cisco Catalyst 6503-E, 6504-E, 6506-E, 6509-E or 6509-V-E or chassis</li> <li>Can occupy slots 1-6 and 9-13 in a Cisco Catalyst 6513-E chassis</li> </ul>	<ul style="list-style-type: none"> <li>Can occupy any slot in any Cisco Catalyst 6503-E, 6504-E, 6506-E, 6509-E or 6509-V-E or chassis</li> <li>Can occupy slots 1-6 and 9-13 in a Cisco Catalyst 6513-E chassis</li> </ul>
<b>Onboard memory</b>	1 GB default	1 GB default
<b>Cabling Supported</b>	10GBASE-CX4, -SR, -LRM, -LX4, -LR, -ZR and -ER X2 fiber modules and 10GBASE-T	Category 6, 6A UTP & STP & Category 7 STP copper cabling

Table 2 summarizes pluggable optics supported on the Cisco Catalyst 6500 Series 10 Gigabit Ethernet modules.

**Table 2.** Pluggable Optics for 6800 Series 10 Gigabit Ethernet Modules

X2 Part Number	Transceiver Type	Wavelength	IEEE Standard	Maximum Distance and Cable Type
<b>X2-10GB-LRM</b>	10GBASE-LRM	1310 nm serial	IEEE 802.3aq	220m over multimode fiber
<b>X2-10GB-SR</b>	10GBASE-SR	850 nm serial	IEEE 802.3ae	<ul style="list-style-type: none"> <li>• 26m over 62.5-micron FDDI-grade multimode fiber</li> <li>• 33m over 62.5-micron 200 MHz x km multimode fiber</li> <li>• 66m over 50-micron 400 MHz x km multimode fiber</li> <li>• 82m over 50-micron 500 MHz x km multimode fiber</li> <li>• 300m over 50-micron 2000 MHz x km multimode fiber</li> </ul>
<b>X2-10GB-LR</b>	10GBASE-LR	1310 nm serial	IEEE 802.3ae	10 km over single-mode fiber
<b>X2-10GB-ER</b>	10GBASE-ER	1550 nm serial	IEEE 802.3ae	40 km over single-mode fiber
<b>X2-10GB-LX4</b>	10GBASE-LX4	WWDM 1310 nm	IEEE 802.3ae	<ul style="list-style-type: none"> <li>• 300m over 62.5-micron FDDI grade multimode fiber</li> <li>• 240m over 50-micron 400 MHz x km multimode fiber</li> <li>• 300m over 50-micron 500 MHz x km multimode fiber</li> </ul>
<b>X2-10GB-CX4</b>	10GBASE-CX4	Copper	IEEE 802.3ak	15m over 8 pair 100-Ohm InfiniBand cable
<b>X2-10GB-ZR</b>	10GBASE-ZR	1550 nm serial	-	80 km over single-mode fiber
<b>X2-10G-DWDM</b>	DWDM	32 different wavelengths; C band	100 GHz ITU grid	32 wavelengths over single strand of single-mode fiber; 80 km
<b>X2-10GB-T</b>	10GBASE-T	Copper	IEEE 802.3an	100m over CAT6A/CAT7 (copper)
<b>CVR-X2-SFP10G</b>	SFP+ converter for X2 ports			
<b>SFP-H10GB-CU1M1 (With CVR-X2-SFP10G converter for X2 ports)</b>	Cisco 10GBASE-CU SFP+ cable	Copper	SFP+ MSA SFF-8431	1-m 10G SFP+ Twinax cable assembly, passive
<b>SFP-H10GB-CU3M1 (With CVR-X2-SFP10G converter for X2 ports)</b>	Cisco 10GBASE-CU SFP+ cable	Copper	SFP+ MSA SFF-8431	3-m 10G SFP+ Twinax cable assembly, passive
<b>SFP-H10GB-CU5M1 (With CVR-X2-SFP10G converter for X2 ports)</b>	Cisco 10GBASE-CU SFP+ cable	Copper	SFP+ MSA SFF-8431	5-m 10G SFP+ Twinax cable assembly, passive
<b>SFP-10G-SR (With CVR-X2-SFP10G converter for X2 ports)</b>	10GBASE-SR SFP+ transceiver module	850nm MMF	IEEE 802.3ae	<ul style="list-style-type: none"> <li>• 26m over 62.5-micron FDDI-grade multimode fiber</li> <li>• 33m over 62.5-micron 200 MHz x km multimode fiber</li> <li>• 66m over 50-micron 400 MHz x km multimode fiber</li> <li>• 82m over 50-micron 500 MHz x km multimode fiber</li> <li>• 300m over 50-micron 2000 MHz x km multimode fiber</li> </ul>
<b>SFP-10G-LRM (With CVR-X2-SFP10G converter for X2 ports)</b>	10GBASE-LRM SFP+ transceiver module	1310 nm MMF and SMF	IEEE 802.3aq	<ul style="list-style-type: none"> <li>• 220m on standard Fiber Distributed Data Interface (FDDI) grade MMF</li> </ul>

## Product Specifications

Table 3 lists product specification of the 6800 Series 10 Gigabit Ethernet modules.

**Table 3.** Product Specifications

Product	Specifications
<b>Standard protocols</b>	IEEE 802.1d, IEEE 802.1p, IEEE 802.1q, IEEE 802.1s, IEEE 802.1w, IEEE 802.3x, IEEE 802.3ad, IEEE 802.3ae, IEEE 802.3ak, IEEE 802.3aq, and IEEE 802.3an
<b>Physical specifications</b>	<ul style="list-style-type: none"> <li>• Occupies one slot in the Cisco Catalyst 6500 E-Series chassis</li> <li>• Dimensions (H x W x D): 1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)</li> <li>• Weight:               <ul style="list-style-type: none"> <li>◦ WS-X6816-10G-2T &amp; 2TXL, WS-X6816-10T-2T &amp; 2TXL: 13.6 pounds excluding X2 components; ¼ pound for each X2</li> </ul> </li> </ul>
<b>Environmental conditions</b>	<p>Operating temperature:</p> <ul style="list-style-type: none"> <li>• Agency-certified for operation: 32 to 104°F (0 to 40°C)</li> <li>• Design and tested for operation 32 to 130°F (0 to 55°C)</li> <li>• Storage temperature: -40 to 167°F (-40 to 75°C)</li> <li>• Relative humidity: 10 to 90 percent, noncondensing</li> </ul> <p>Operating altitude:</p> <ul style="list-style-type: none"> <li>• Agency-certified for operation: -500 to 6500 ft (-150 to 2000m)</li> <li>• Designed and tested for operation -500 to 10000 ft (-150 to 3000m)</li> </ul>
<b>Regulatory compliance</b>	<p>6800 Series 10 Gigabit Ethernet Copper module, when installed in a system, comply with the following EMC and safety standards:</p> <p>EMC Standards:</p> <ul style="list-style-type: none"> <li>• FCC Part 15 (CFR 47) Class A</li> <li>• ICES-003 Class A</li> <li>• VCCI Class A</li> <li>• EN55022 Class A</li> <li>• EN55024</li> <li>• CISPR24</li> <li>• CISPR 22 Class A</li> <li>• AS/NZS CISPR 22 Class A</li> <li>• ETS 300 386</li> <li>• KN 22 Class A</li> <li>• EN 50082-1</li> <li>• EN61000-3-2</li> <li>• EN61000-3-3</li> <li>• EN61000-6-1</li> <li>• CNS13438 Class A</li> <li>• KN6100 -4 Series</li> </ul> <p>Safety Standards:</p> <ul style="list-style-type: none"> <li>• UL 60950-1</li> <li>• CAN/CSA C22.2 No. 60950</li> <li>• EN 60950-1</li> <li>• IEC 60950-1</li> <li>• AS/NZS 60950-1</li> <li>• IEC 60825 Class 1</li> <li>• EN 60825 Class 1</li> <li>• 21CFR 1040</li> </ul>
<b>NEBS criteria levels</b>	SR-3580 Issue 3, June 2007 (GR-63-CORE, issue 3, and GR-1089-CORE, issue 4)
<b>ETSI</b>	<ul style="list-style-type: none"> <li>• ETS 300 019-2-1, Class 1.1 Storage</li> <li>• ETS 300 019-2-2, Class 2.1 and 2.2 Transportation</li> <li>• ETS 300 019-2-3, Class 3.1E Stationary Use</li> </ul>

Product	Specifications
<b>Network management</b>	<ul style="list-style-type: none"> <li>• ETHERLIKE-MIB (RFC 1643)</li> <li>• IF-MIB (RFC 1573)</li> <li>• Bridge MIB (RFC 1493)</li> <li>• CISCO-STACK-MIB</li> <li>• CISCO-VTP-MIB</li> <li>• CISCO-CDP-MIB</li> <li>• RMON MIB (RFC 1757)</li> <li>• CISCO-PAGP-MIB</li> <li>• CISCO-STP-EXTENSIONS-MIB</li> <li>• CISCO-VLAN-BRIDGE-MIB</li> <li>• CISCO-VLAN-MEMBERSHIP-MIB</li> <li>• ENTITY-MIB (RFC 2037)</li> <li>• HC-RMON</li> <li>• RFC1213-MIB (MIB-II)</li> <li>• SMON-MIB</li> </ul>
<b>Power requirements</b>	<ul style="list-style-type: none"> <li>• WS-X6816-10G-2T: 488.5 Watts</li> <li>• WS-X6816-10G-2TXL: 503.5 Watts</li> <li>• WS-X6816-10T-2T: 514.96 Watts</li> <li>• WS-X6816-10T-2TXL: 529.96 Watts</li> <li>• Go to <a href="http://www.cisco.com/go/powercalculator">http://www.cisco.com/go/powercalculator</a> for easy power consumption calculation</li> </ul>
<b>Indicators</b>	<ul style="list-style-type: none"> <li>• Status: green (operational), red (faulty), and orange (module booting)</li> <li>• Link: green (port enabled and connected), orange (port disabled), and off (port enabled and not connected)</li> </ul>

## 6800 Series Gigabit Ethernet Fiber & Copper Modules

Designed for high performance Enterprise and Service Provider distribution, core layers, data-center, Web-hosting and Metro Ethernet applications, 6800 Series Fiber and Copper media interface modules provide Gigabit Ethernet forwarding using fiber optic or twisted pair cabling.

There are 3 different 1G modules which are supported with new Supervisor 2T and 2TXL:

- WS-X6824-SFP-2T and WS-X6824-SFP-2TXL: 24-port SFP fiber Gigabit Ethernet Module with DFC4 and DFC4XL (Figure 3)
- WS-X6848-SFP-2T and WS-X68248-SFP-2TXL: 48-port SFP fiber Gigabit Ethernet Module with DFC4 and DFC4XL (Figure 4)
- WS-X6848-TX-2T and WS-X6848-TX-2TXL: 48-port Copper Gigabit Ethernet Module with DFC4 and DFC4XL (Figure 5)
- **Backplane connection:** Connects to the switch fabric using dual full-duplex 20 Gbps switch fabric channels (40 Gbps total). The 6824 connects to the switch fabric using a single full-duplex 20Gbps switch fabric channel
- **Chassis/slot support:** Can occupy any slot in Cisco Catalyst 6503E, 6504E, 6506E, 6509E, and 6509-V-E. Can occupy slots 1-6 and 9-13 in a Cisco Catalyst 6513-E
- **Supervisor engine:** Compatible with Supervisor Engine 2T and Supervisor Engine 2TXL
- **Distributed forwarding and performance:** Come equipped with DFC4 or DFC4XL daughter cards, delivering optimal performance up to a sustained 60 Mpps for L2, IPv4 and MPLS forwarding and 30 Mpps for IPv6 forwarding

**Figure 3.** 6800 Series 24-Port Gigabit Ethernet Interface Module WS-X6824-SFP-2T/2TXL



**Figure 4.** 6800 Series 48-Port Gigabit Ethernet Interface Module WS-X6848-SFP-2T/2TXL



**Figure 5.** 6800 Series 48-Port 10/100/1000 Interface Copper Module WS-X6848-TX-2T/2TXL



## Main Features and Benefits

Table 4 summarizes the primary features and benefits of the 6800 Series Gigabit Ethernet Fiber and Copper modules

**Table 4.** 6800 Series Gigabit Ethernet Fiber and Copper Modules Primary Features

Product	Transceiver Type	Ports/Interface/Connectors	Port Density/Chassis Model	Maximum Frame Size	Queues per Port (Tx = Transmit, Rx = Receive),**	Scheduler	Buffer Size per Port	Onboard Memory
WS-X6848-TX-2T and WS-X6848-TX-2TXL	RJ-45	48-port, RJ-45, 100m, Category 5 cable	<ul style="list-style-type: none"> <li>• 528 ports/6513E</li> <li>• 384 ports/6509E</li> </ul>	Up to 9216 bytes/frame	<ul style="list-style-type: none"> <li>• Tx-1p3q8t;</li> <li>• Rx-2q8t</li> </ul>	DWRR	<ul style="list-style-type: none"> <li>• Rx-166KB</li> <li>• Tx-1.17MB</li> </ul>	1GB Default
WS-X6848-SFP-2T and WS-X6848-SFP-2TXL	Small Form-factor Pluggable (SFP)	48 port; 1000BASE-SX, LX/LH, -ZX, -T; 1000BASE-CWDM; LC connector	<ul style="list-style-type: none"> <li>• 528 ports/6513E</li> <li>• 384 ports/6509E</li> </ul>	Up to 9216 bytes/frame	<ul style="list-style-type: none"> <li>• Tx-1p3q8T</li> <li>• Rx-2q8T</li> </ul>	Deficit Weighted Round Robin (DWRR)	<ul style="list-style-type: none"> <li>• Rx-166KB</li> <li>• Tx-1.17MB</li> </ul>	1GB Default
WS-X6824-SFP-2T and WS-X6824-SFP-2TXL	Small Form-factor Pluggable (SFP)	24-port; 1000BASE-SX, LX/LH, -ZX, -T; 1000BASE-CWDM; LC connector	<ul style="list-style-type: none"> <li>• 264 ports/6513E</li> <li>• 192 ports/6509E</li> </ul>	Up to 9216 bytes/frame	<ul style="list-style-type: none"> <li>• Tx-1p3q8T</li> <li>• Rx-2q8T</li> </ul>	DWRR	<ul style="list-style-type: none"> <li>• Rx-166KB</li> <li>• Tx-1.17MB</li> </ul>	1GB Default

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

## Interface Distances

Table 5 summarizes the interfaces and distances supported by the 6800 Series Gigabit Ethernet Fiber modules

**Table 5.** 6800 Gigabit Ethernet Fiber Modules Supported Interfaces & Distances

Module	SFP	Wavelength (nm)	Fiber/Cable Type	CoreSize (micron)	Model Bandwidth (MHz/km)	Cable Distance
<b>WS-X6848-SFP-2T and WS-X6848-SFP-2TXL</b> <b>WS-X6824-SFP-2T and WS-X6824-SFP-2TXL</b>	1000BASE-SX	850	MMF	<ul style="list-style-type: none"> <li>62.5</li> <li>62.5</li> <li>50.0</li> <li>50.0</li> </ul>	<ul style="list-style-type: none"> <li>160</li> <li>200</li> <li>400</li> <li>500</li> </ul>	<ul style="list-style-type: none"> <li>220m (722 ft)</li> <li>275m (902 ft)</li> <li>500m (1640 ft)</li> <li>550m (1804 ft)</li> </ul>
<b>WS-X6848-SFP-2T and WS-X6848-SFP-2TXL</b> <b>WS-X6824-SFP-2T and WS-X6824-SFP-2TXL</b>	1000BASE-LX/LH	1300	<ul style="list-style-type: none"> <li>MMF*</li> <li>SMF</li> </ul>	<ul style="list-style-type: none"> <li>62.5</li> <li>50.0</li> <li>50.0</li> <li>9/10</li> </ul>	<ul style="list-style-type: none"> <li>500</li> <li>400</li> <li>500</li> </ul>	<ul style="list-style-type: none"> <li>550 m (1804 ft)</li> <li>550 m (1804 ft)</li> <li>550 m (1804 ft)</li> <li>10 km (32,810 ft)</li> </ul>
<b>WS-X6848-SFP-2T and WS-X6848-SFP-2TXL</b> <b>WS-X6824-SFP-2T and WS-X6824-SFP-2TXL</b>	1000BASE-ZX	1550	SMF	9/10	-	43.4 to 62 miles (70 to 100 km)*
<b>WS-X6848-SFP-2T and WS-X6848-SFP-2TXL</b> <b>WS-X6824-SFP-2T and WS-X6824-SFP-2TXL</b>	1000BASE-T	-	Category 5	-	-	100 m (328 ft)

## Product Specifications

Table 6 lists product specification of the 6800 Series Gigabit Ethernet Fiber and Copper Modules

**Table 6.** Product Specifications

Product	Specifications
<b>Standard protocols</b>	<ul style="list-style-type: none"> <li>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,</li> <li>1000BASE-T, 1000BASE-X (GBIC), 1000BASE-SX, 1000BASE-LX/LH, 1000BASE-ZX, CWDM</li> </ul>
<b>Physical specifications</b>	<ul style="list-style-type: none"> <li>Occupies one slot in the Cisco Catalyst 6500 E-Series chassis</li> <li>Dimensions (H x W x D): 1.2 x 14.4 x 16 in. (3.0 x 35.6 x 40.6 cm)</li> </ul>
<b>Environmental conditions</b>	Operating temperature: <ul style="list-style-type: none"> <li>Operating temperature: 32 to 104°F (0 to 40°C)</li> <li>Storage temperature: -40 to 167°F (-40 to 75°C)</li> <li>Relative humidity 10 to 90% non condensing</li> </ul> Operating altitude: <ul style="list-style-type: none"> <li>Agency-certified for operation: -500 to 6500 ft (-150 to 2000m)</li> <li>Designed and tested for operation -500 to 10000 ft (-150 to 3000m)</li> </ul>
<b>NEBS criteria levels</b>	SR-3580 Issue 3, June 2007 (GR-63-CORE, issue 3, and GR-1089-CORE, issue 4)
<b>ETSI</b>	<ul style="list-style-type: none"> <li>ETS 300 019-2-1, Class 1.1 Storage</li> <li>ETS 300 019-2-2, Class 2.1 and 2.2 Transportation</li> <li>ETS 300 019-2-3, Class 3.1E Stationary Use</li> </ul>

Product	Specifications
<b>Network management</b>	<ul style="list-style-type: none"> <li>• ETHERLIKE-MIB (RFC 1643)</li> <li>• IF-MIB (RFC 1573)</li> <li>• Bridge MIB (RFC 1493)</li> <li>• CISCO-STACK-MIB</li> <li>• CISCO-VTP-MIB</li> <li>• CISCO-CDP-MIB</li> <li>• RMON MIB (RFC 1757)</li> <li>• CISCO-PAGP-MIB</li> <li>• CISCO-STP-EXTENSIONS-MIB</li> <li>• CISCO-VLAN-BRIDGE-MIB</li> <li>• CISCO-VLAN-MEMBERSHIP-MIB</li> <li>• ENTITY-MIB (RFC 2037)</li> <li>• HC-RMON</li> <li>• RFC1213-MIB (MIB-II)</li> <li>• SMON-MIB</li> </ul>
<b>Power Requirements</b>	<ul style="list-style-type: none"> <li>• WS-X6824-SFP-2T and WS-X6824-SFP-2TXL: 204.66 and 209.66 Watts respectively</li> <li>• WS-X6848-SFP-2T and WS-X6848-SFP-2TXL: 334.44 and 339.44 Watts respectively</li> <li>• WS-X6848-TX-2T and WS-X6848-TX-2TXL: 405 and 410 Watts respectively</li> <li>• Go to <a href="http://www.cisco.com/go/powercalculator">http://www.cisco.com/go/powercalculator</a> for easy power consumption calculation</li> </ul>
<b>Indicators</b>	<ul style="list-style-type: none"> <li>• Status: green (operational), red (faulty), and orange (module booting)</li> <li>• Link: green (port enabled and connected), orange (port disabled), and off (port enabled and not connected)</li> </ul>
<b>Regulatory compliance</b>	<p>6800 Series 1 Gigabit Ethernet Copper module, when installed in a system, comply with the following EMC standards:</p> <p>EMC Standards:</p> <ul style="list-style-type: none"> <li>• FCC Part 15 (CFR 47) Class A</li> <li>• ICES-003 Class A</li> <li>• VCCI Class A</li> <li>• EN55022 Class A</li> <li>• EN55024</li> <li>• CISPR24</li> <li>• CISPR 22 Class A</li> <li>• AS/NZS CISPR 22 Class A</li> <li>• ETS 300 386</li> <li>• KN 22 Class A</li> <li>• EN 50082-1</li> <li>• EN61000-3-2</li> <li>• EN61000-3-3</li> <li>• EN61000-6-1</li> <li>• CNS13438 Class A</li> <li>• KN6100-4 Series</li> </ul>

## Ordering Information

Table 7 gives ordering information.

**Table 7.** Part Numbers for Ordering

Part Numbers	Description
<b>6800 Series 10 Gigabit Fiber, Copper, Gigabit Fiber and Gigabit Copper Modules</b>	
<b>WS-X6816-10T-2T &amp; 2TXL</b>	6800 Series 16-Port 10 Gigabit Ethernet Copper Module with DFC4 & DFC4XL
<b>WS-X6816-10G-2T &amp; 2TXL</b>	6800 Series 16-Port 10 Gigabit Ethernet Fiber Module with DFC4 & DFC4XL
<b>WS-X6824-SFP-2T &amp; 2TXL</b>	6800 Series 24-Port 1 Gigabit SFP Fiber Ethernet Module with DFC4 & DFC4XL
<b>WS-X6848-SFP-2T &amp; 2TXL</b>	6800 Series 48-Port 1 Gigabit SFP Fiber Ethernet Module with DFC4 & DFC4XL
<b>WS-X6848-TX-2T &amp; 2TXL</b>	6800 Series 48-Port 1 Gigabit Copper Ethernet Module with DFC4 & DFC4XL

Part Numbers	Description
<b>WS-F6K-DFC4-EXL=</b>	Cisco Catalyst 6500 Dist Fwd Card- DFC4XL Spare for WS-X6816-10G-2T & WS-X6816-10T-2T
<b>WS-F6K-DFC4-AXL=</b>	Cisco Catalyst 6500 Dist Fwd Card- DFC4XL Spare for WS-X6824-SFP-2T, WS-X6848-SFP-2T and WS-X6848-TX-2T
<b>X2 Optics</b>	
<b>X2-10GB-LRM</b>	10GBASE-LRM X2 (multimode fiber)
<b>X2-10GB-SR</b>	10GBASE-SR X2 (multimode fiber)
<b>X2-10GB-LR</b>	10GBASE-LR X2 (single-mode fiber)
<b>X2-10GB-ER</b>	10GBASE-ER X2 (single-mode fiber)
<b>X2-10GB-ZR</b>	10GBASE-ZR X2 (single-mode fiber)
<b>X2-10GB-LX4</b>	10GBASE-LX4 X2 (multimode fiber)
<b>X2-10GB-CX4</b>	10GBASE-CX4 X2 (copper InfiniBand cable)
<b>X2-10G-DWDM</b>	32 wavelengths over single strand of single-mode fiber; 80 km
<b>CVR-X2-SFP10G</b>	SFP+ converter for X2 ports
<b>SFP-10G-SR</b>	10GBASE-SR SFP+ transceiver module
<b>SFP-10G-LR</b>	10GBASE-LR SFP+ transceiver module
<b>SFP-H10GB-CU1M1</b>	1-m 10G SFP+ Twinax cable assembly, passive
<b>SFP-H10GB-CU3M1</b>	3-m 10G SFP+ Twinax cable assembly, passive
<b>SFP-H10GB-CU5M1</b>	5-m 10G SFP+ Twinax cable assembly, passive
<b>SFP</b>	
<b>GLC-SX-MM</b>	1000BASE-SX SFP (multimode only) Dual LC connector
<b>GLC-ZX-SM</b>	1000BASE-ZX SFP (single mode only) Dual LC connector
<b>GLC-LH-SM</b>	1000BASE-LX SFP (single mode only) Dual LC connector
<b>GLC-T</b>	1000BASE-T SFP (copper twisted pair) RJ-45 connector
<b>CWDM-SFP-1470=*</b>	Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC

**Note:**

- 6800 Series 16-port 10 Gigabit Ethernet fiber module:
  - WS-X6816-10G-2T ships with WS-X6816-10G and WS-F6K-DFC4-E
  - WS-X6816-10G-2TXL ships with WS-X6816-10G and WS-F6K-DFC4-EXL
  - The front panel of these modules is labeled
    - WS-X6816-10G-2T or
    - WS-X6816-10G-2TXL if it is XL version
  - Cisco IOS® Software commands display WS-X6816-10G with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL
- 6800 Series 16-port 10 Gigabit Ethernet copper RJ45:
  - WS-X6816-10T-2T ships with WS-X6816-10T and WS-F6K-DFC4-E
  - WS-X6816-10T-2TXL ships with WS-X6816-10T and WS-F6K-DFC4-EXL
  - The front panel of these modules is labeled
    - WS-X6816-10T-2T or
    - WS-X6816-10T-2TXL if it is XL version

- Cisco IOS Software commands display WS-X6816-10T with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL.
- 6800 Series Gigabit Ethernet fiber and copper modules:
  - WS-X6824-SFP-2T ships with WS-X6824-SFP and WS-F6K-DFC4-E
  - WS-X6824-SFP-2TXL ships with WS-X6824-SFP and WS-F6K-DFC4-EXL
  - The front panel of these modules is labeled
    - WS-X6824-SFP-2T or
    - WS-X6824-SFP-2TXL if it is XL version
  - Cisco IOS Software commands display WS-X6824-SFP with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL
  - WS-X6848-SFP-2T ships with WS-X6848-SFP and WS-F6K-DFC4-E
  - WS-X6848-SFP-2TXL ships with WS-X6848-SFP and WS-F6K-DFC4-EXL
  - The front panel of these modules is labeled WS-X6824-SFP
  - Cisco IOS Software commands display WS-X6848-SFP with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL
  - WS-X6848-TX-2T ships with WS-X6848-TX and WS-F6K-DFC4-E
  - WS-X6848-TX-2TXL ships with WS-X6824-SFP and WS-F6K-DFC4-EXL
  - The front panel of these modules is labeled
    - WS-X6848-TX-2T or
    - WS-X6848-TX-2TXL if it is XL version
  - Cisco IOS Software commands display WS-X6848-TX with either WS-F6K-DFC4-E or WS-F6K-DFC4-EXL

## Cisco and Partner Services

Enable the innovative, secure, intelligent edge in the Borderless Network Architecture using personalized services from Cisco and our partners. Through a discovery process that begins with understanding your business objectives, we help you integrate the new Cisco Catalyst 6500-C4 System into your architecture and incorporate network services onto that platform. Sharing knowledge and leading practices, we support your success every step of the way as you deploy, absorb, manage, and scale new technology. Choose from a flexible suite of support services designed to meet your business needs and help you maintain high-quality network performance while controlling operational costs. For additional information about Cisco services, visit <http://www.cisco.com/go/services>.

## Warranty Coverage and Technical Service Options

The Cisco Catalyst 6500 C4 System comes with a Cisco 90-day hardware warranty. Adding a contract for a technical service offering such as Cisco SMARTnet<sup>®</sup> Service to your device coverage provides access to the Cisco Technical Assistance Center (TAC) and can provide a variety of hardware replacement options to meet critical business needs, updates for licensed OS software, and registered access to the extensive Cisco.com knowledge base and support tools.

For more information about Cisco warranties, go to <http://www.cisco.com/go/warranty>.

For information about Cisco Technical Services, go to <http://www.cisco.com/go/ts>.

Table 8 shows the Cisco technical services available for the Cisco Catalyst 6500 C4 System.

**Table 8.** Cisco Technical Services for Cisco Catalyst 6500 C4 System

Technical Services
<b>Cisco SMARTnet Service</b> <ul style="list-style-type: none"><li>• Around-the-clock, global access to the Cisco Technical Assistance Center (TAC)</li><li>• Unrestricted access to the extensive Cisco.com resources, communities, and tools</li><li>• Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement<sup>2</sup> and onsite parts replacement and installation available</li><li>• Ongoing operating system software updates within the licensed feature set<sup>1</sup></li><li>• Proactive diagnostics and real-time alerts on Smart Call Home enabled devices</li></ul>
<b>Cisco Focused Technical Support Services</b> <p>3 levels of premium, high-touch services are available:</p> <ul style="list-style-type: none"><li>• Cisco High-Touch Operations Management Service</li><li>• Cisco High-Touch Technical Support Service</li><li>• Cisco High-Touch Engineering Service</li></ul> <p>Valid Cisco SMARTnet or SP Base contracts on all network equipment are required.</p>

**Footnotes:**

<sup>1</sup> Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.

<sup>2</sup> Advance hardware replacement is available in various service-level combinations. For example, 8x5xNBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with next business day (NBD) delivery. Where NBD is not available, same day ship is provided. Restrictions apply; please review the appropriate service descriptions for details.

## Cisco Capital

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### For More Information

For more information about Cisco Catalyst 6500 Series Switches, visit <http://www.cisco.com/en/US/products/hw/switches/ps708/index.html> or contact your local account representative.



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