

## Quad OC-12/STM-4 Packet-over-SONET/SDH Line Card for the Cisco 12000 Series GSR

THE RAPID ACCEPTANCE AND ACCELERATED GROWTH OF THE INTERNET IS QUICKLY TRANSFORMING THE MIX OF TRAFFIC CROSSING PUBLIC NETWORKS. TO COMPETE EFFECTIVELY IN A DATA-DRIVEN ECONOMY, SERVICE PROVIDERS NEED AN OPTICAL TRANSPORT INFRASTRUCTURE OPTIMIZED FOR PACKETS COMBINED WITH THE SCALABILITY AND THE FLEXIBILITY TO SUPPORT UNIMAGINED IP-BASED APPLICATIONS.

Cisco Systems, Inc. has developed the Quad OC-12/STM-4 packet-over-SONET/SDH line card. This new high density interface card offers industry leading switching *performance* and *class-of-service (CoS)* features for delivering advanced end-to-end networking features. The high performance switching engine integrates WRED and our innovative ASIC-based queue scheduling algorithm Modified Deficit Round Robin (MDRR) in the core of the network. These allow service providers to offer differentiated services with deterministic traffic behavior in the core of the network. This unique combination of features provides a *versatile solution* allowing a service provider to deploy a single interface in either a core application or a high-capacity aggregation application. This level of flexibility helps improve protection of investment, which is ideal given the dynamic nature of an Internet-driven economy.

Figure 1 Quad OC-12/STM-4 Packet-over-SONET/SDH Line Card

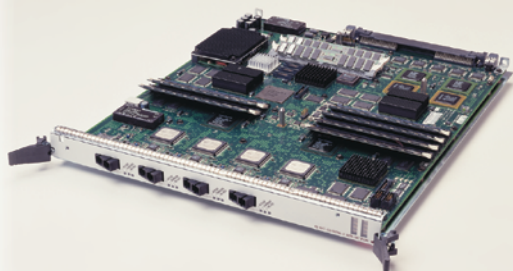


Table 1 Feature Highlights

Feature	Description
Port Density	4 concatenated OC-12/STM-4 ports
Switching Performance	4 Mpps for IP, Multiprotocol Label Switching (MPLS), and Frame Relay <sup>1</sup>
CoS	Differentiated CoS queues, weighted random early detection (WRED) and modified deficit round robin (MDRR) without performance degradation
Cisco IOS®	Rich software feature set and advanced networking features
Optics	Multimode and single-mode intermediate reach
Cost Per Bit	\$29.1 Mbit

1. Post initial First Customer Ship (FCS) release

### Layer 3 Feature Summary

- 4 Mpps forwarding rate for IP, Frame Relay Switching<sup>1</sup>, and Multiprotocol Label Switching (MPLS)
- IP and MPLS load balancing (6 paths)
- IP and MPLS CoS—32 CoS queues per destination line card (2056 CoS queues total)
- Random Early Detection (RED) and Weighted Random Early Detection (WRED)
- Modified Deficit Round Robin (MDRR)
- Packet/byte count, SONET/SDH errors, queue size, and WRED statistics without performance degradation.
- MPLS traffic engineering using Routing with Resource Reservation (RRR)
- MPLS Virtual Private Network (VPN)<sup>1</sup>
- Multicast forwarding

1. Post initial First Customer Ship (FCS) release

- Per Interface Rate Control (PIRC)<sup>2</sup>
- Extended access control list (EACLs)<sup>2</sup>
- A Cisco Express Forwarding (CEF) table that can accommodate up to one million forwarding entries
- Maximum transfer unit (MTU) 9188 bytes
- 64 MB of route table memory, expandable to 256 MB
- 128 MB of packet forwarding table memory (PSA)
- 256 MB of packet buffer memory, expandable to 512 MB

#### SONET/SDH Layer

- Standards-compliant SONET/SDH interface
- Alarm processing
  - Loss of Signal (LOS), Loss of Frame (LOF), Line Alarm Indicator Signal (LAIS), Path Alarm Indicator Signal (PAIS), Loss of Pointer (LOP), Line Remote Defect Indicator (LRDI), Path Remote Defect Indicator (PRDI), Signal Failure (SF), Signal Degrade (SD), Line Remote Error Indicator (Line FEBE), Path Remote Error Indicator (Path FEBE)
- Performance monitoring
  - Error counts for B1, B2, B3
  - Threshold crossing alerts (TCA) for B1, B2, B3 with settable threshold
- Synchronization
  - Local (internal) or loop timed (recovered from network)
  - 20 ppm clock accuracy over full operating temperature range
  - Pointer activity monitoring
- Protection switching
  - Support both SONET Automatic Protection Switching (APS) and SDH multiplex section protection (MSP) protocols
- Local (diagnostic) and line (network) loopback
- Payload mapping
  - IETF RFC 2615, Point-to-Point Protocol (PPP) over SONET/SDH
  - 1 + x<sup>43</sup> self-synchronous scrambler

#### Operations and Management

- CiscoView
- SONET MIB RFC 1595 supported through SNMP
- IP manager
- MIB-II
- On-line insertion and removal (OIR)

#### System-Level Requirements

- A minimum of one clock scheduler card (CSC) and three switch fabric cards (SFCs) required for OC-48/STM-16 deployment
- 11.2(18)GS1 Cisco IOS<sup>®</sup> or higher
- 12.0(7)S1 Cisco IOS or higher

2. Post initial First Customer Ship (FCS) release

## Specifications

#### Physical

- Occupies a single slot
- Weight: 6 lb (2.7 kg)
- Height: 14 in. (35.6 cm)
- Depth: 18 in. (45.7 cm)

#### Environmental

- Operating temperature: 32 to 104 F (0 to 40 C)
- Storage temperature: -4 to 149 F (-20 to 65 C)

#### Regulatory Compliance

##### SONET/SDH

- Telcordia (Bellcore GR-253 as applicable)
- ITU-T G.957 as applicable
- ITU-T G.958 as applicable

#### Encapsulation

- IETF RFC 1490, Frame Relay Encapsulation
- IETF RFC 1661, PPP
- IETF RFC 1662, PPP in HDLC-like framing
- IETF RFC 2615, PPP over SONET/SDH

#### Safety

- UL 1950
- CSA 22.2-No. 950
- EN60950
- EN41003
- AUSTEL TS001
- AS/NZS 3260
- EN60825 laser safety (Class 1)

#### EMI

- FCC Class A
- AS 3548 Class A
- EN55022 Class B (up to 1GHz)
- VCCI Class B (up to 1GHz)

**Immunity**

- IEC-1000-4-2 ESD
- IEC-1000-4-3 radiated immunity
- IEC-1000-4-4 EFT
- IEC-1000-4-5 surge
- IEC-1000-4-6 low frequency common immunity
- IEC-1000-4-11 voltage dips and sags
- IEC-1000-3-2 power line harmonics

**NEBS**

- SR-3580—NEBS: criteria levels (Level 3 compliant)
- GR-63-Core—NEBS: physical protection
- GR-1089-Corn—NEBS: EMC and safety

**ETSI**

- ETS-300386-2

**LEDs**

- Enable
- Receive carrier
- Receive packets
- Alpha-numeric management display

**Optical Power Budget Packet-over-SONET/SDH Cisco 12000 OC-12/STM-4 Optics**

Table 2 Optical Power Budget

Parameter	Multimode Fiber 1270-1380nm	Intermediate Reach 1270-1380nm IR-1
Line Rate	622 Mbps	622 Mbps
Connector Type	SC	SC
Launch Power (Max.)	-14 dBm	-8 dBm
Launch Power (Min.)	-20 dBm	-15 dBm
Receiver Power (Max.)	-14 dBm	-8 dBm
Receiver Power (Min.)	-26 dBm	-28 dBm
Optical Path Power Penalty	1 dBm	1 dBm
Allowable Range	0-5 dBm	0-2 dBm
Maximum Distance <sup>1</sup>	1 km	13 km

1. Worst-case scenario considering fiber quality, connectors, patch panel, and splices.

Note: A typical single-mode optical cable has a transmission loss of 0.4-0.5 dB/km at the 1310nm region. The splicing loss will be 0.2-0.3 dB each, and splicing will be made at every one to three kilometers (conduit) or two to five kilometers (direct burial).

Table 3 Product Availability and Part Numbers

Product Descriptions	Part Number	Availability
4-Port OC-12/STM4 SONET/SDH Single-Mode IR with SC Connector	4OC12E/POS-IR-SC	November 1999
4-Port OC-12/STM4 SONET/SDH multimode with SC Connector	4OC12E/POS-MM-SC	November 1999

Table 4 Line Card Memory Options

Product Number	Description
MEM-DFT-LC-2X64 <sup>1</sup>	128 MB LC program/route memory (2x64 MB)
MEM-GRP/LC-128	128 MB GRP and LC program/route memory (1x128 MB)
MEM-GRP/LC-256	256 MB GRP and LC program/route memory (2x128 MB)
Default Memory <sup>1</sup>	Line-card buffer memory, 128 MB/128 MB (TX/RX)
MEM-PKT-512	Line-card buffer memory, 256 MB/256 MB (TX/RX)

1. Default Memory Configuration

**For More Information**

For additional information, please visit our Web site at [www.cisco.com/gsr](http://www.cisco.com/gsr)

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