Data Sheet

Cisco 10000 Series **Channelized OC-12/STM-4** Line Card

The Cisco 10000 Series Channelized OC-12/STM-4 line card provides service providers with a high density DS0 aggregation solution.

Designed for telcos and service providers (SPs), this line card supports one OC-12/STM-4 port with maximum DS3/DS1/DS0/64K flexibility in both a SONET and SDH environment.

Cisco 10000 Series channelized line cards integrate the channel service unit/data service unit (CSU/DSU) function on a per-port basis.

Key Features and Benefits

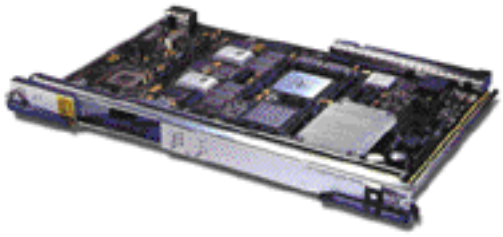
Designed for concentrating IP access over telco time-division multiplexing (TDM) networks, the Cisco 10000 Series channelized OC-12/STM-4 line card has the following key features and benefits.

- Provides industry-leading *density* per rack, enabling service providers to scale networks cost-effectively.
- Supports any combination of DS-0/64 kbps, fractional T-1/E-1, and DS-3 for *maximum flexibility.*
- Supports *service-transparent online insertion and removal* (OIR), allowing line cards to be removed without impacting traffic.
- Supports SONET automatic protection switching (APS) and SDH Multiplex Section Protection (MSP), valuable tools for supporting network resiliency, fault tolerance, and increased overall network availability. APS and MSP provide very fast Layer 1 switch over mechanism to support 1:1 redundant transmission circuits. They allow rapid switchover from one fiber connection to another in the event of a fiber cut, module failure, signal failure, or signal degradation. The result is increased network resiliency, minimal loss of data, and reduction in time-consuming data reroutes.

Hardware and Software Features

- Single-port channelized OC-12/STM-4 occupies a single slot without any slot dependency
- SC duplex connector, single-mode, intermediate-reach optics at 1330nm
- IP supported
- Online Insertion and Removal (OIR)
- 1:1 SONET Automatic Protection Switching (APS) and SDH Multiplex Section Protection (MSP)

Figure 1
Cisco 10000 Series Channelized OC-12/STM-4 Line Card



Channelization Features

- NxDS0 (Each DS1 and E1 may be further channelized into NxDS0 channels)
- Channelization to DS0 (56K or 64K), including multiple channel groupings per DS1 and fractional DS1
- DS1 clearchannel and fractional; Framed
- E1 clearchannel and fractional; Framed and unframed
- J1 support
- Unchannelized and channelized DS3 (28xDS1)
- DS3 Subrate & Scrambling; Interoperable with Kentrox, Digital Link, Larscom, Verilink and Adtran.
- Supports up to 768 channels per card with any mixture of DS3, nxDS1, or nxDS0 with the following restrictions:
  - 192 channels per STS-3/STM-1
  - Total number of channels does not exceed chassis scaling limits
- Channelization to DS1 (SONET)
  - Support for SONET Virtual Tributary 1.5 (VT1.5) mapping: STS-12 <-> STS-1 <-> VT1.5 <-> DS-1
  - Support for asynchronous DS3 channelized down to DS-1 (M13 and C-bit framing) mapped into: STS-12 <-> STS-1 <-> DS-3 <-> DS-1
- Channelization to DS1 (SDH)
  - STM-4 <-> AU-4 <-> TUG-3 <-> TUG-2 <-> TU-12 <-> DS-1
- Channelization to E1(SONET)
- Support for SDH Virtual Tributary 2 (VT2) mapping: STS-12 <-> STS-1 <-> VT2 <-> E-1
- Channelization to E1(SDH)
  - Support for ITU-T G.707 (SDH CEPT/ETSI) Virtual Container 12 (VC-12) mapping: STM-4 <-> AU-4 <-> TUG-3 <-> TUG-2 <-> TU-12 <-> VC-12 <-> E-1
- Channelization to J1
  - Support for ITU-T G.707 (SDH-ANSI) Virtual Container 11 (VC-11) mapping: STM-4 <-> AU-3 <-> TUG-2 <-> TU-11 <-> VC-11 <-> J1
- Channelization to DS3 (SONET)
  - STS-12 <-> STS-1 <-> DS-3
- Channelization to DS3 (SDH)
  - STM-4 <-> AU-3 <-> DS-3

Encapsulation

- Frame Relay
- Point-to-Point Protocol (PPP)
- Cisco HDLC (support for shared flags, configurable IDLE pattern, and 16- or 32-bit cyclic redundancy check (CRC))

DS-1 Features

- Superframe (SF) and Extended Superframe (ESF) support
- Internal or line-derived (loop) clocking, independently selectable on each T-1 tributary
- Error and alarm detection: CRC errors, framing errors, loss of frame (red), AIS (blue), remote alarm indication (yellow)
- Alarm reporting-24-hour history maintained, 15-minute intervals on all errors
- BERT at DS-1 level
- Loopback capabilities: local, network line and network payload, remote network line and remote network payload at the T-1 level
- ANSI T1.403 facility data link (FDL) on ESF mode DS1s and ATT 54016 FDL mode, responses only
- Local and remote performance monitoring
- Response to embedded remote loopback commands - BOC (bit oriented commands)
- Detect and insert embedded remote loopback commands - BOC (bit oriented commands)
  - AIS
  - RDI
  - Loss of signal and loss of frame (near end and far end)
  - Loss of multiframe (LOMF)
  - Local and network line loopback

E1 Features

- Framing: CRC-4 and no-CRC-4 conformance with ITU-T G.704
- Internal or line-derived (loop) clocking, independently selectable on each E-1 tributary
- Error and alarm detection: CRC errors, framing errors, loss of frame, AIS, remote alarm indication
- Performance monitoring: 24-hour history retained; 15-minute intervals on all errors
- BERT at E-1 level
- Line and payload loopback capabilities-local and network line, and network payload at the E-1 level

DS-3 Features

- Channelized, clearchannel or subrate
- C-bit parity or M23 framing
- FEAC channel support
- * BERT at DS-3 level
- Internal or line-derived (loop) clocking
- Error and alarm detection: CRC errors, framing errors, loss of frame (red), AIS (blue), remote alarm indication (yellow)

- Alarm reporting-24-hour history maintained, 15-minute intervals on all errors
- Loopback capabilities: local, network line and network payload, remote network line and remote network payload
- Local and remote performance monitoring
- Response to embedded remote loopback commands - BOC (bit oriented commands)
- Detect and insert embedded remote loopback commands - BOC (bit oriented commands)
  - AIS
  - RDI
  - Loss of signal and loss of frame (near end and far end)
  - Loss of multiframe (LOMF)
  - Local and network line loopback

SONET and SDH Features

- Compliance with G.707, G.783, G.784, G.957, G.958, GR-253, as applicable
- Synchronization Local (internal) or loop timed (recovered from network)
- Local (diagnostic) and line (network) loopback
- Alarm processing-Receive and transmit alarm processing. See Table 1 for supported alarm and signal events.
- Statistics-Performance and error counts
- TX path trace
- RX path trace
- Payload scrambling
- Internal or line (as recovered from the network) clocking modes
- Local (diagnostic) and network (line) loopback modes
- SONET APS and SDH MSP, 1+1 unidirectional
- Detect and alarm
  - AIS
  - RDI
  - Remote failure indicator
  - Loss of signal and loss of frame
  - Loss of pointer

Table 1

Supported SONET/SDH Alarm and Signal Events Alarm/Signa

	SONET Description	SDH Description
B1-TCA	B1 BER Threshold Crossing Alarm	B1 BER Threshold Crossing Alarm
B2-TCA	B2 BER Threshold Crossing Alarm	B2 BER Threshold Crossing Alarm
B3-TCA	B3 BER Threshold Crossing Alarm	B3 BER Threshold Crossing Alarm
LAIS	Line Alarm Indication Signal (AIS-L)	Multiplexer Section Alarm Indication Signal (MS-AIS)
LOM	Loss of Multiframe VT (LOM-V)	Loss of Multiframe (LOM)
LRDI	Line Remote Defect Indication (RDI-L)	Multiplexer Section Remote Defect Indication (MS-RDI)
PAIS	Path Alarm Indication Signal, or Alarm Indication Signal-Path (AIS-P)	Administrative Unit Alarm Indication Signal (AU-AIS)
PLM	Path Payload Label Mismatch, or Payload Label Mismatch-Path (PLM-P)	High Order Path Payload Label Mismatch (HP-PLM)
PLOP	Path Loss of Pointer, or Loss of Pointer-Path (LOP-P)	Administrative Unit Loss of Pointer (AU-LOP)
PRDI	Path Remote Defect Indication, or Remote Defect Indication-Path (RDI-P)	High Order Path Remote Defect Indication (HP-RDI)
PUNEQ	Path Unequipped (UNEQ-P)	High Order Path Unequipped (HP-UNEQ)
SD-BER	Line BIP BER in excess of the Signal Degrade (SD) threshold	Multiplexer Section BIP BER in excess of the Signal Degrade (SD) threshold
SF-BER	Line BIP BER in excess of the Signal Fail (SF) threshold	Multiplexer Section BIP BER in excess of the Signal Fail (SF) threshold
SLOF	Section Loss of Frame (LOF)	Regenerator Section Loss of Frame (LOF)
SLOS	Section Loss of Signal (LOS)	Regenerator Section Loss of Signal (LOS)

Other

- Bit error rate testing (BERT)
- Loopback capabilities: local and network at the OC-12/STM-4 level
- Dynamic Provisioning on each physical port.
- Scrambling and subrate can be independently or simultaneously enabled in each DSU mode.

Features Not Supported

- OC-12c, STM-4c, OC-3c, STM-1c
- Unframed DS-3 (HSSI)
- DS-2 loopbacks, alarms, performance monitoring, or Management Information Base (MIB) support
- DS-1 signaling
- E-1 time slot 16 (TS16) signaling multiframe
- E-1 Bit Oriented Protocol (BOP)
- E-1 remote loopback
- E-1 and DS-1 on the same port

Physical Specifications

- Weight: 4.75 lb (2.16 kg)
- Dimensions: 16.0 x 1.12 x 9.97 in. (40.64 x 2.83 x 25.32 cm) (H x W x D)

Environmental Specifications

- Storage temperature: -38 to 150 F (-40 to 70 C)
- Operating temperature, nominal: 41 to 104 F (5 to 40 C)
- Operating temperature, short term: 23 to 131 F (-5 to 55 C)
- Storage relative humidity: 5% to 95% relative humidity (RH)
- Operating humidity, nominal: 5% to 85% RH
- Operating humidity, short term: 5% to 90% RH
- Operating altitude: -60 m to 4000 m

Product Regulatory Compliance

Environmental Conditions

- Storage temperature: -38 to 150 F (-40 to 70 C)
- Operating temperature, nominal: 41 to 104 F (5 to 40 C)
- Operating temperature, short term: 23 to 131 F (-5 to 55 C)
- Storage relative humidity: 5 to 95% relative humidity (RH)
- Operating humidity, nominal: 5 to 85% RH
- Operating humidity, short term: 5 to 90% RH
- Operating altitude: -60 to 4000m

Product Regulatory Approvals

- UL60950/CAN/CSA-C22.2 No. 60950-00, third edition, dated December 1, 2000, with no deviation considered to be less stringent than IEC 60950
- EN60950 with Amendments 1-4, for CE Marking to the LVD directive
- IEC 60950 third edition with Amendments 1-4, including all national/group deviations
- AS/NZS 60950:2000
- AS/NZS 3260-1993 with Amendments 1-4
- ACA TS001-1997

Laser Safety

- 21 CRF 1040, Subchapter J
  - EN60825-1
  - EN60825-2

Electromagnetic Emissions Certification

- AS/NZ 3548:1995 (including Amd I + II) Class B
- EN55022:1998 Class B
- CISPR 22:1997
- EN55022:1994 (including Amd I+ II)
- 47 CFR Part 15:2000 (FCC) Class B
- VCCI V-3/01.4 Class 2
- CNS-13438:1997 Class B
- GR1089:1997 (including Rev1: 1999)

Immunity

- EN300386:2000—TNE EMC requirements; product family standard; high priority of service; central office and non-central office locations
- EN50082-1:1992/1997
- EN50082-2:1995—Generic Immunity Standard, Heavy Industrial
- CISPR24:1997
- EN55024:1998—Generic ITE Immunity Standard
- EN61000-4-2:1995+AMD I + II—ESD, Level 4, 8-kV contact,15-kV air
- IEC-1000-4-3:1995+AMD 1—Radiated Immunity, 10 V/m
- IEC-1000-4-4:1995—Electrical Fast Transients, Level 4, 4 kV/B
- IEC-1000-4-5:1995+AMD 1—DC Surge Class 3; AC surge Class 4
- EN61000-4-6:1996+AMD 1—RF Conducted Immunity, 10V rms
- EN61000-4-11:1995—Voltage Dips and Sags
- ETS300 132-2:1996+corregendum, Dec. 1996
- GR1089:1997 (including Rev1: 1999)

Network Equipment Building Systems

- Level 3 compliant
- Telcordia SR-3580 Criteria Levels, issued November 1995
- GR1089-Core: Electromagnetic Compatibility & Electrical Safety, issued February 1999
- GR63-Core: Physical Protection Requirements, issued April 2002
- SBC equipment requirements: TP76200 MP and TP76400 MP
- Verizon equipment requirements: SIT.NEBS.TE.NPI.2002.010

LEDs

- L*ine card fail (Fail)*—A single yellow LED that is set OFF when the board is working properly

- *Carrier detected (CA)*—A green LED turned on when a carrier is detected on the port; it is the logical inverse of loss of signal (LOS)
- *Alarm (Alarm)*—A yellow LED; during normal operation, this LED is on to indicate the presence of any alarm condition on any provisioned controller/interface at OC-12/STM-4, DS3, E1, or DS1 levels
- *Loopback active (LOOP)*—A yellow loopback active LED used as an external indication that any portion of the data path is in a loopback state and not enabled for normal data traffic

Connector

- SC duplex connector, single-mode, intermediate-reach optics

Network Management

- Network Management via
  - Telnet (CLI)
  - Console port (CLI)
  - Simple Network Management Protocol (SNMP)
- DS3 Management Information Base (MIB) (RFC 1407)
- DS1 MIB (RFC 1406)]
- MIB-II (RFC 1213)
- SONET MIB (RFC 1595)

Power Budget

- Component: Channelized OC-12/STM-4 line card
- Unit Power: 85W max, 50W typ

Optical Power Budget

- Power budget: 12db
- Transmit power: -15 to -8 dBm
- Receive power: -28 to -8 dBm
- Typical maximum distance: 9.3 miles (15 km)

Hardware Requirements

- *Chassis*—The 1-port CHOC12 line card is supported on all Cisco 10000 Series chassis
- *Performance routing engines (PREs)*—The 4-port CHSTM-1 line card is supported on all PREs available on the Cisco 10000 Series

Software Requirements

Initial IOS Releases (PRE1): The 1-port CHOC12 line card is supported in 12.0(9)SL, 12.0(17)ST, 12.0(22)S, 12.2(8)BZ and later Cisco IOS® releases for SONET mode only. For both SONET and SDH mode, the 1-port CHOC12 line card is supported in 12.0(23)S and later Cisco IOS releases.

Initial IOS Releases (PRE2): For both SONET and SDH mode, the 1-port CHOC12 line card is supported in 12.2(15)BX and later Cisco IOS releases.

For the latest IOS release information, refer to:

http://www.cisco.com/cgi-bin/front.x/Support/HWSWmatrix/hwswmatrix.cgi

Ordering Information

Product Number	Product Description
ESR-1COC12-SMI	One-port Channelized OC-12/STM-4 (STS-12) Line Card, Single Mode, Intermediate Reach
ESR-1COC12-SMI=	One-port Channelized OC-12/STM-4 (STS-12) Line Card, Single Mode, Intermediate Reach, SPARE

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http://www.cisco.com/en/US/support/

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