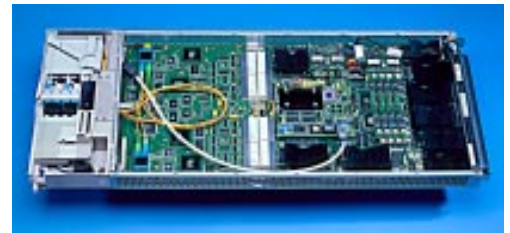
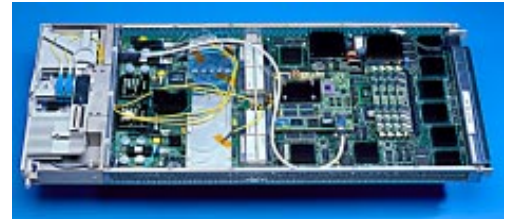


SONET/SDH Modules

Data Sheet

With the deployment of higher bandwidth edge services, metro to core network capacity continues to grow. Service providers require higher speed options to cost-effectively connect that bandwidth into the IP/MPLS core. Packet over SONET (POS) interfaces provide high-speed access for the provider edge to connect to the IP/MPLS core. Avici's TSR® and SSR™ carrier class routers support a range of high-density POS interfaces including OC-3c/STM-1, OC-12c/STM-4, OC-48c/STM-16 and OC-192c/STM-64. The POS modules utilize Avici's robust IPriori™ system software to provide carrier-class reliability, an industry leading MPLS implementation and a host of advanced services.



With POS interfaces the TSR and SSR can be used to scale provider edge access and Intra-POP bandwidth connectivity from OC-3c/STM-1 to OC-192c/STM-64. POS also provides an effective standards-based way of interconnecting IP/MPLS backbone routers to DWDM equipment in the optical core at OC-48c/STM-16 and OC-192c/STM-64 speeds. This helps drive IP/MPLS services and packet intelligence to the Optical Core.

Key Features and Benefits:

- Industry leading POS interface capacity per 7' Rack without expensive interconnection between chassis
- Distributed ASICs to handle packet policing, QoS, classification and forwarding per line card module for superior performance
- Hardware based QoS and MPLS processing with no performance degradation
- Distributed Velocity™ switch architecture allows for many generations of line cards to exist in the same chassis, providing forward/backward compatibility and true investment protection
- Composite Links™ provide in service trunk upgrades to OC-768 capacity and beyond

Interface Type	Ports per Module	Density per 7' Rack
OC-3c/STM-1	16	640
OC-12c/STM-4	4	160
OC-48c/STM-16	2	80
OC-192c/STM-64	1	20

Features

Protocols

- POS/SONET/SDH
- RFC 1619, PPP over SONET/SDH
- RFC 1662, PPP in HDLC-like framing
- RFC 2615 PPP over SONET/SDH
- BGP-4, IS-IS, OSPF
- MBGP, PIM-Sparse
- MPLS RSVP-TE, MPLS LDP
- OIF UNI (OIF2001.152.3)

SONET Functions

- SONET/SDH framing, termination (section, line and path) and loopback
- Monitoring section, line and path bit interleaved parity (B1, B2, B3)
- Accumulation of error counts at each level for performance monitoring
- SONET line and path Far End Block Error (FEBE) indications
- Payload descrambling (ingress) and scrambling (egress) based on 43 x +1

Packet Layer Processing

- Support for 5000 OSPF and 5000 IS-IS routes, 200 routers per area
- Support for 200 BGP-4 Peers and 1 million route instances
- BGP-4 Confederations, Route Dampening, Route Reflectors and Communities support

Protection

- MPLS Fast Reroute/Local Protection supporting both bypass and detour draft implementations

Quality of Service (QoS)

- Flexible packet classification based on IP Precedence, DiffServ codepoints and MPLS EXP bits
- Support for 8 QoS queues per physical interface
- ASIC based, Line Rate QoS processing
- Supports Weighted Fair Queuing (WFQ) and Weighted Random Early Detection (WRED)

Composite Links

- Aggregates up to 64 physical links into a single logical link
- Supports up to 4:1 bandwidth differential on member links
- Supports in-service migration to higher speed trunks
- Balances traffic across all link members and preserves packet ordering
- Protects failed links in under 45 msec

Operations and Management

- Secure Shell over Telnet remote user log-in session and Secure Copy file transfers
- Centralized TACACS+ remote user authentication and command line level authorization
- All SONET counters maintained at 15 minute intervals, for 24 hours with access through CLI
- User-Configurable Threshold Crossing Alerts (TCAs)
- Management Information Bases (MIBs)
 - IETF RFC 1595 SONET/SDH MIB
 - IETF RFC 1907 MIB-II

SONET/SDH Standards

- ANSI T1.105-1995, Synchronous Optical Network (SONET) - Basic Description including Multiplex Structure, Rates, and Formats
- ANSI T1.231-1997, Digital Hierarchy - Layer 1 In-Service Digital Transmission Performance Monitoring
- ANSI T1E1.2/93-020R1
- Bellcore, GR-253-Core, Synchronous Optical Network (SONET) Transport Systems Common Generic Criteria, Issue 3
- Bellcore, GR-2918-Core, DWDM Systems with Digital Tributaries Generic Criteria
- ITU-T G.691 Optical interfaces for single channel SDH systems with optical amplifiers, and STM-64 systems
- ITU-T Recommendation G.707, Network Node Interface for the Synchronous Digital Hierarchy (SDH)
- ITU-T Recommendation G.783, Characteristics of Synchronous Digital Hierarchy (SDH) equipment functional blocks
- ITU-T Recommendation G.957, Optical interfaces for equipments and systems relating to the synchronous digital hierarchy

Optical Interface Specifications



OC192c/STM-64

Optics Type

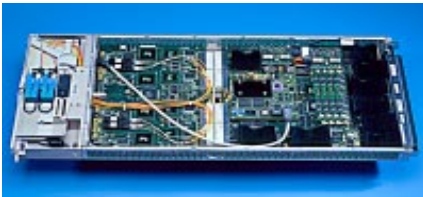
Operating Wavelength Range	SMF-SR-1 1290-1330nm
Maximum Distance	12km
Tx Maximum Launch Power	0dBm
Tx Minimum Launch Power	-4dBm
Minimum Extinction Ratio	7dB
Rx Minimum Sensitivity	-12dBm



OC48c/STM-16

Optics Type

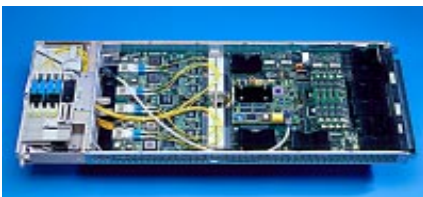
Operating Wavelength Range	SMSR 1266-1360nm
Maximum Distance	2km
Tx Maximum Launch Power	-3dBm
Tx Minimum Launch Power	-10dBm
Minimum Extinction Ratio	8.2dB
Rx Minimum Sensitivity	-21dBm



OC12c/STM-4

Optics Type

Operating Wavelength Range	SMIR 1274-1356nm	MM (62.5micron) 1261-1360nm
Maximum Distance	15 km	500m
Tx Maximum Launch Power	-8dBm	-14dBm
Tx Minimum Launch Power	-15dBm	-20dBm
Minimum Extinction Ratio	8.2dB	8.2dB
Rx Minimum Sensitivity	-35dBm	-26dBm



OC3c/STM-1

Optics Type

Operating Wavelength Range	SMIR 1261-1360nm	MM (62.5/125) 1270-1380nm
Maximum Distance	15 km	2 km
Tx Maximum Launch Power	-8dBm	-14dBm
Tx Minimum Launch Power	-15dBm	-19dBm
Minimum Extinction Ratio	8.2dB	0.2dB
Rx Minimum Sensitivity	-31.5dBm	-31dBm

Specifications

Safety

- CSA C22.2 No. 950 / UL 1950
- FDA 21 CFR Chapter 1, 1040.10
- EN 60950, Safety of Information Technology Equipment
- EN 60825-1 Safety of Laser Products - Part 1: Equipment Classification, Requirements
- EN 60825-2 Safety of Laser Products - Part 2: Safety of Optical Fibre Communication Systems

Immunity

- EN 61000-4-2 Electrostatic Discharge
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 Electrical Fast Transient
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity

NEBS Compliant

- GR-63-Core: NEBS, Physical Protection
- GR-1089-Core: EMC and Electrical Safety for Network Telecommunications Equipment
- SR-3580 NEBS Criteria Levels (Level 3 Compliance)

LEDs

- Green LED indicates module operational
- Red LED indicates module non-operational

Environmental

- Operating Temperature: 0 to 70 °C
- Relative Humidity: 5% to 85%

EMC

- AS/NZS 3548 Class A (Australia/New Zealand)
- EN 55022 Class A emissions (Europe)
- EN 50082-1 Immunity (Europe)
- FCC Class A (USA)

Power Test Specifications

- GR-499-CORE/DS-8171/ANSI T1.315 (North American Operating Voltage)
- GR-513-CORE (North American Operating Voltage)
- ETSI 300 132-2/FTZ 19PFL/BTR 2511 (Global Operating Voltage)

Ordering Information

Part Number

P1-S64O192c-SR
P2-S16O48-SR
P1-S16O48-SR
P4-S4O12-IR
P4-S4O12-MM
M16-S1O3-IR
M16-S1O3-MM

Description

1-Port OC-192c/STM-64 Packet over SONET/SDH
2-port OC-48c/STM-16 Packet over SONET/SDH
1-port OC-48c/STM-16 Packet over SONET/SDH - short reach
4-port OC-12c/STM-4 Packet over SONET/SDH, single mode, IR
4-port OC-12c/STM-4 Packet over SONET/SDH, multi mode
16-port OC-3c/STM-1 Packet over SONET/SDH, single mode, IR
16-port OC-3c/STM-1 Packet over SONET/SDH, multi mode, IR

