



# S-SERIES OPTICAL CIRCUIT SWITCH

## Features and Benefits

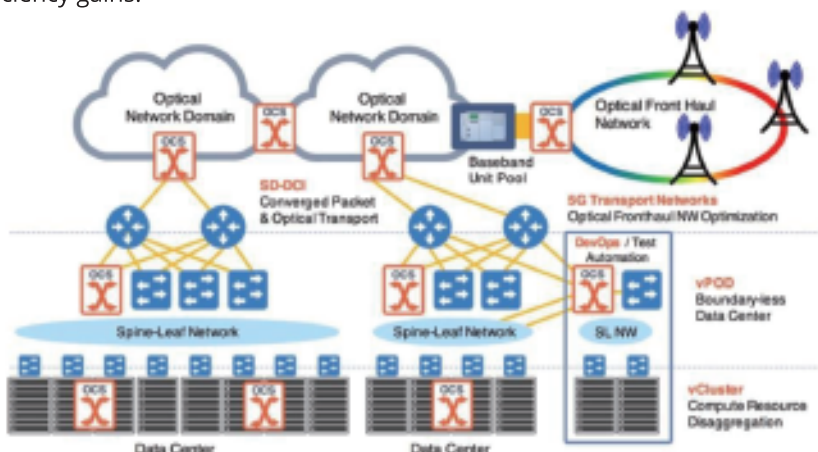
With the data surge driven by video, AR/VR, 5G, and next-generation AI applications, together with the rapid growth of large language models (LLMs) and hyperscale computing clusters, data centers are facing the major challenge of continuously scaling compute capacity while lowering power consumption, shortening deployment cycles, and reducing cost per bit. In AI model training in particular, tens of thousands of GPUs must operate in parallel through high-bandwidth, low-latency interconnects, a requirement that traditional electrical switching solutions can no longer meet.

Calient's S-Series Optical Circuit Switch (OCS) leverages advanced 3D MEMS optical technology to deliver protocol-agnostic, line-rate-independent all-optical connectivity. Whether supporting 100G, 200G, 400G, 800G, the upcoming 1.6T and beyond, or a wide range of interconnect protocols such as Ethernet, Ultra Ethernet, NVLINK, UALink, Broadcom SUE, UB-Mesh, and CXL, the OCS provides transparent support across all of them.

## Applications

Traditional fiber connections rely on manual operations, making it difficult to meet the rapid scheduling and scaling requirements of GPU supernodes in AI data centers. The OCS enables millisecond-level dynamic topology reconfiguration under controller-based management, flexibly adapting to large-scale parallel computing environments. For example, in large language model (LLM) training and other hyperscale parameter workloads, the OCS can quickly build cross-rack, fully interconnected GPU networks to support on-demand orchestration of compute resources.

Compared with electrical switches, the OCS provides direct interconnection through optical paths, eliminating the power and latency bottlenecks associated with optical-electrical-optical conversion. This makes the OCS an excellent solution for applications requiring reliable high-bandwidth connectivity, ultra-low latency, and low power consumption. Leading hyperscalers have already adopted Calient's OCS solutions to replace portions of traditional electrical switching, achieving significant cost savings and energy efficiency gains.



Selected S-Series OCS Applications

## At A Glance

- **High bandwidth and ultra-low latency:** Delivers the performance needed for demanding AI workloads.
- **Flexible scalability:** Supports both Scale-Up and Scale-Out data center architectures.
- **Low insertion loss and high reliability:** Ensures robust, consistent performance at scale.
- **Proven in hyperscaler deployments:** Validated by leading hyperscalers in real-world environments.
- **Foundation for future intelligent networks:** Establishes the core fabric for next-generation AI data centers.
- **Small Size:** 320 or 160 ports (TX/RX pairs) in 7RU chassis (LC Connectors).
- **Low Power Operation:** 45 W typical.
- **Low Cost:** Supports deployment in data center, service provider, and government networks.
- **Ultra-Low Latency:** All-optical connectivity adds negligible latency.
- **Scalable:** Supports all data rates to 200G/400G/800G/1.6T Gbps and beyond.
- **Reliable:** Based on proven 3D MEMS design deployed in over 750,000 fiber terminations worldwide.
- **Simple to Install, Integrate, and Use:** GUI-driven, comprehensive set of northbound APIs.
- **Low Loss:** 3.0 dB maximum insertion loss.
- **Built-In Power Monitoring:** Every in/out fiber is monitored, providing powerful network diagnostic capabilities.



# Applications (Continued)

- **AI supercomputing and GPU supernode interconnects:** In large language model (LLM) training and other hyperscale parameter workloads, the OCS enables cross-rack, fully interconnected GPU networks, delivering low-latency, protocol-transparent high-speed connectivity to meet the demands of both Scale-Up and Scale-Out architectures.
- **Cloud and data center expansion:** In large-scale parallel computing and dynamic network topology scenarios, the OCS provides non-blocking, low-power optical interconnects, becoming a key foundational fabric for next-generation intelligent data centers.
- **5G and high-speed networks:** Supports dynamic allocation of fronthaul and backhaul bandwidth while adapting to a wide range of data rates and protocol convergence.
- **Disaster recovery and high availability:** Enables millisecond-level rapid reconfiguration of fiber connections, reducing downtime and losses caused by hardware failures in large AI clusters.
- **Fiber-to-the-premises (FTTP) and security protection:** Supports automated provisioning and testing, while providing highly reliable isolation and protection in critical infrastructure.
- **DevOps / test automation:** Facilitates the sharing and management of high-value test, compute, and network resources, improving resource utilization and operational efficiency.

# Description


The S-Series Optical Circuit Switch is an all-optical (OOO) switch that establishes, monitors, and changes connections between single-mode optical fibers using Micro-Electro-Mechanical Systems (MEMS) optical switching. Connections are made between fibers carrying signals with any data rate or protocol. Any input fiber can be connected to any output fiber.

Based on field-proven 3D Optical MEMS technology, which CALIENT has deployed in more than 750,000 optical connections worldwide, S-Series switches deliver the high reliability, small form factor, low power consumption, low cost, and ease of use that make the significant benefits of true all-optical switching readily available to a variety of applications.

320-port (S320) and 160-port (S160) versions of the switch are offered, with each port representing a TX/RX fiber pair. Both feature low insertion loss (3 dB max) and ultra-low latency (30 ns worst case). 100-to-240 VAC and -48 VDC powered versions are available, with dual feeds (A and B) for maximum redundancy.

Users manage and communicate with S-Series switches by means of redundant, high-reliability Control Processors. TL1 command sets and SNMPv3 are supported in addition to a CORBA interface and a Web-based Graphical User Interface. REST, OpenFlow, and other APIs are also available.

# ABOUT CALIENT

 **Calient.AI** CALIENT Technologies is the industry leader in optical-layer virtualization, providing systems that enable dynamic resource sharing, optimization, and automation for optical transport networks, next-generation data centers, high-performance computing facilities, and DevOps test automation. Originating from research at UC Santa Barbara and Cornell University, CALIENT's 3D MEMS switches are deployed at scale in Tier 1 Cloud and Communication Service Provider networks worldwide, with many years of demonstrated reliability.



# Specifications

## OPTICAL

320 Ports or 160 Ports (each port is TX/RX pair)  
Insertion loss (EoL): 0.8 dB min, 1.8 dB typical, 3.0 dB max (O, S, C Bands)  
Single-mode fiber, wavelength range: 1260-1630 nm  
Latency: < 50 ns  
Channel setup time: < 50 ms  
Switch reconfiguration time (all ports): < 200 ms  
Input dynamic range: + 5 dBm to - 20 dBm  
Switching cycles: 10^12  
Optical cross-talk: - 60 dB  
Return loss (EoL): 41 dB typical, 35 dB min

## ENVIRONMENTAL

Operating:  
Temperature: 5° to 55° C (41° to 130° F)  
Humidity: 10% to 90%, non-condensing  
Altitude: < 4000 meters  
Non-operating:  
Temperature: - 40° to + 70° C (- 40° to 158° F)  
Humidity: 5% to 93%, non-condensing  
Altitude: < 12,000 meters

## POWER

DC variants are equipped with dual (A and B) - 48 VDC power modules  
AC variants are equipped with dual (A and B) 100 to 240 VAC power modules  
Optional Front or Rear mounting of A and B power feeds  
Field-replaceable power modules  
Power dissipation: 45 W typical

## MECHANICAL

Size: 17.5" w x 12.2" h x 19" d (445 x 310 x 483 mm)  
Weight: 45 lbs. (20.5 kg)  
Shipping weight: 95 lbs. (43.2 kg)

## REGULATORY COMPLIANCE

Safety: UL 60950, EN 60950-1, CSA 69950  
EMI/EMC: FCC Part 15 Subpart B, GR-1089-CORE, EN 55022, Class A, EN 55024  
Environmental: GR-63-CORE (NEBS), EN 300019  
Eye safety: CFR Title 21 Part 1040 Class 1  
I/P voltage: ANSI T1.315-2001  
Directive 2011/65/EU

## MANAGEMENT

Physical Interfaces: Dual Gigabit Ethernet Ports, Serial Console Port, External Alarm Contacts  
User Interfaces: Web GUI, TL1 Command Set, SNMPv3, CORBA, OpenFlow and REST APIs