

The role of optical port program-controlled switches



Article Overview

Optical port program-controlled switches enable dynamic, low-latency, and energy-efficient routing of optical signals in data centers and high-performance networks, offering software-defined reconfigurability and high bandwidth scalability.

Function and Architecture

Optical port program-controlled switches, often implemented as optical circuit switches (OCS) or optical port switches (OPS), establish direct optical paths between network nodes without converting signals to electrical form, minimizing latency and power consumption . These switches can be software-controlled, allowing dynamic reconfiguration of optical paths to adapt to changing traffic patterns, workload demands, or maintenance schedules .

Modern implementations use programmable integrated photonics (PIP), which employ a mesh of waveguides, tunable beam couplers, and optical phase shifters to create versatile optical circuits on a chip . This enables a single device to perform multiple functions, such as circuit switching, multicasting, and signal processing, under software control .

Advantages

- **Low Latency and High Bandwidth:** By avoiding optical-electrical-optical (OEO) conversions, these switches transmit light directly, reducing queuing delays and supporting high data rates

Article Content

Apr 24, 2026

Optical Switches – types, electro-optic, acousto-optic, thermo-optic ...

Optical switches are photonic devices that control the flow of light. A wide range of switch technologies are used, with widely varying

Nov 02, 2025

Integrated Optical Switches | Springer Nature Link

Our discussion focuses on electro-optical switches since they were the most important type for integrated switches

Jan 12, 2026

High-port-count optical circuit switches for intra-datacenter networks ...

To handle the large volumes of traffic in a cost-effective manner, optical switches are expected to play a key role in

May 04, 2026

Optical Switching Basics: Types and Technologies

Explore the fundamentals of optical switching, including space, wavelength, time, and hybrid switching

Dec 04, 2025

(PDF) Liquid crystal optical switches

Liquid crystal optical switches The paper discusses the growing demand for bandwidth in telecommunications, necessitating the use

May 31, 2026

Optical Circuit Switches (OCS) Fundamentals

Optical Circuit Switches, or OCS, are network switches that route data by physically steering light from one optical

Jun 11, 2026

Evaluation of OPS, OCS and TOR switches'' prototypes and ...

document presents the implementation and experimental evaluation of the hybrid data plane prototypes developed in LIGHTNESS.

Dec 18, 2025

Commercial Optical Switches | Springer Nature Link

A commercial MEMS optical switch consists of MEMS arrays integrated on a single chip, driving circuits, control

Jun 28, 2026

Ultrafast optical circuit switching for data centers using integrated ...

Optical technologies could enable fast and power-efficient networks for data centers. Here, the authors report Si₃N₄

Nov 22, 2025

Optical Switches | How it works, Application & Advantages

Explore the world of optical switches, their workings, evolution, advantages, and limitations in modern network

Nov 24, 2025

The Transformative Role of Optical Circuit Switches in Modern Data

An Optical Circuit Switch operates on a fundamentally different principle. Instead of routing individual data packets, it

Apr 07, 2026

PipSwitch: A Circuit Switch Using Programmable Integrated Photonics

We present PipSwitch, an optical circuit switch using pro-grammable integrated photonics. PipSwitch uses model to correctly and

Nov 11, 2025

Optical Switches | part of Optical Switching: Device Technology and ...

Optical switches are of great importance for the development of the optical communication system and high data transfer speed in

Sep 10, 2025

A comparison of optically and electronically controlled optical ...

Electronically and optically controlled optical switches are compared with respect to switch energy requirements. Only

Sep 10, 2025

Optical Switches

Abstract After a detailed introductory discussion of general concepts, which apply to optical switches regardless of their

Jun 05, 2026

Prospects and challenges of optical switching technologies for intra ...

This paper explores how optical switching technologies can innovate future intra data center networks. The

Jul 16, 2026

Introduction to all-optical switching

What is an all-optical switch? An all optical switch is a device that allows one optical signal to control another optical signal, i.e.

Feb 02, 2026

Reconfigurable on-chip optical circuit switch for software-defined ...

We present a self-configuration and reconfigurable optical circuit switch using a programmable integrated photonic

Oct 22, 2025

High-Radix Optical Circuit Switch (OCS) Platform | Molex

The High-Radix OCS Platform from Molex supports up to 544 ports, enabling flatter architectures with fewer switches. See how

Apr 25, 2026

A Review of Silicon-Based Integrated Optical Switches

The optical switch is an essential part of optical integrated circuits, with broad applications in

Jul 13, 2026

The Transformative Role of Optical Circuit Switches in Modern Data

Discover how Optical Circuit Switch (OCS) is transforming data center networks by overcoming electrical switch

Jul 05, 2026

POLATIS® optical circuit switching

Conversion of these signals to run over lower-cost optical fiber together with optical circuit switches enables them to be handled

Nov 25, 2025

Optical Switches Principles Classifications and Applications-

Optical switches, pivotal components in modern photonics and optical communication systems, dynamically control the

Jun 18, 2026

Research on Design of Program

ZXJ10 digital program-controlled switching system is distributed between modules, module classification

Oct 06, 2025

Software-defined optical networking applications enabled by ...

In this section, we present the implementation of an on-chip software-defined switch that enables the dynamic control of optical

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