# Uses of Server Optical Modules



## Overview

Different servers and application scenarios may require different types of optical modules. The following are several common types of optical modules and their applicable scenarios.

## Key Takeaways

Optical modules enable high-speed, low-latency, and long-distance data transmission between servers, switches, and storage systems in modern data centers and AI clusters.

### Core Functions in Servers

Optical modules serve as optoelectronic conversion devices, converting electrical signals from servers into optical signals for transmission over fiber and then back into electrical signals at the receiving end, enabling high-speed communication between servers, switches, and storage devices. They are typically installed in standard interfaces such as SFP, QSFP, QSFP-DD, and OSFP, connecting server NICs to network switches and facilitating data exchange in large-scale computing environments. Key ApplicationsServer-to-Switch Connections: Optical modules provide high-bandwidth links between servers and switches, supporting transmission rates from 100G to 800G, which is critical for cloud computing and AI workloads.

Server Cluster Interconnection: In large data centers, thousands of servers are interconnected via optical modules, enabling distributed computing, real-time data sharing, and synchronized operations across nodes.

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## AI and GP

U Clusters: High-performance GPU servers, such as NVIDIA DGX H100 clusters, rely on 400G OSFP DR4/VR4 modules to connect to 800G switch ports, ensuring low-latency, high-bandwidth communication for multi-GPU training and AI model synchronization. Storage Network Integration: Optical modules support protocols like RoCE (RDMA over Converged Ethernet) and Fibre Channel, connecting servers to SAN/NAS storage networks for efficient, high-speed data access.

## Technical Considerations

Optical modules contain multiple semiconductor chips, including DSP chips for signal modulation and error correction, driver ICs for laser control, transimpedance amplifiers (TIA) for signal amplification, and control chips for module management.

## The PC

B inside the module provides mechanical support, electrical interconnection, and signal integrity, which is crucial for high-speed operation in AI data centers.

## Deployment in Data Centers

Optical modules are used for: Internal data center communication: Connecting servers, storage, and switches for high-speed internal data exchange. Cross-data center interconnection: Single-mode modules enable long-distance links (100m to 10km), supporting distributed computing and multi-site AI training. 5G and mobile networks: Optical modules facilitate high-speed interconnection between base stations and network infrastructure.

## Benefits

High bandwidth and low latency for server communication. Scalability for large server clusters and AI workloads. Long-distance transmission without signal degradation.

Protocol flexibility, supporting Ethernet, InfiniBand, and Fibre Channel. In summary, optical modules are essential components in modern server architectures, enabling high-speed, reliable, and scalable interconnections for data centers, AI clusters, and storage networks, while supporting advanced computing and communication protocols.

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## Article Content

What optical modules are usually equipped on network servers?

Different servers and application scenarios may require different types of optical modules. The following are several common types of optical modules and their applicable scenarios.

Is the optical module intended for use in servers or chips?

Therefore, optical modules are a critical optical communication component linking server systems and chip-level communication, playing a key role in data centers, cloud computing, and AI

Optical Module Guide: Demystifying Optical Modules and Their Uses

Optical modules are essential components in modern communication networks, enabling high-speed data transmission over fiber optic cables. As the demand for faster and more reliable

The Most Comprehensive Guide Of Optical Modules

Explore the ultimate guide to optical modules. Learn types, functions, performance metrics & how to choose the right module for your fiber network.

Where Are Optical Modules Used? Key Applications in Modern

To ensure high-speed, reliable interconnections between servers and switches, optical modules—alongside direct attach copper cables, active optical cables, and fiber patch cords—are

What Is an SFP Module? — Complete Guide to SFP, SFP+ & SFP28

Learn what an SFP module is, how it works, its types, specifications, compatibility, and use cases in modern networks, including updated standards and trends for 2026.

Applications of Fiber SFP Modules in Modern Networks

Learn how Optical SFP modules are used in data centers, enterprise, ISP, industrial, cloud, and storage networks, with practical selection considerations.

Optical Module Guide: Demystifying Optical Modules

Understanding optical modules and their uses is key to building and maintaining efficient communication networks. From basic concepts to advanced

Understanding the Application Scenarios of Optical Modules

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The diverse interconnection scenarios in data centers and the personalized needs of customers have spawned different types of network equipment and transmission media (active

Optical module

The main trade show for the large optical module industry is the Optical Fiber Conference (OFC), that is held annually in southern California. Other prominent shows for the industry include ECOC in Europe

Optical Distribution Frame (ODF) in Telecom: Types & Uses

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How To Choose Optical Modules For Servers

So how are optical modules used on servers to achieve fiber interconnection with switches? Here we need to introduce another device—the network adapter, also known as a network

What optical modules are usually equipped on network servers?

Compared with QSFP, the QSFP28 module adopts higher data transmission rates and higher densities, making it suitable for high-performance computing, cloud computing, and data center networks. It

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Optical Module Guide: Demystifying Optical Modules

Optical modules are compact devices that convert electrical signals into optical signals and vice versa. They are used in fiber optic communication

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