Computing Server Optical Module



Overview

As a core component connecting servers, switches, and storage systems, optical modules play a pivotal role in unlocking the performance of intelligent computing centers.

Key Takeaways

Server optical modules are pluggable transceivers that enable high-speed fiber or copper network connections, supporting data rates from 1Gbps to 400Gbps depending on the module type.

Overview and Function

Optical modules in servers serve as high-speed electro-optical converters, allowing servers to communicate with switches and other network devices via fiber or copper connections. They act as the “traffic hub” of data center networks, ensuring low-latency, high-bandwidth data transmission, which is critical for AI, cloud computing, and high-performance computing applications. These modules are typically inserted into network adapters (NICs), which then plug into the server's PCIe slots to enable fiber interconnection.

Common Types of Server Optical ModulesSFP (Small Form-factor Pluggable): Hot-swappable modules for 1Gbps connections, suitable for short-distance fiber links within server rooms. Supports single-mode and multi-mode fibers. SFP+: Enhanced version of SFP for 10Gbps connections, offering longer transmission distances and higher speeds, commonly used for server-to-switch connections.

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QSF

P (Quad SFP): High-density modules for 40Gbps and 100Gbps connections, capable of transmitting four independent optical signals simultaneously, ideal for high-performance computing and large-scale storage systems. QSFP28: Supports 100Gbps and above, providing higher data rates and density for cloud computing and data center networks. QSFP-DD and 400G OpenZR+: Advanced modules for next-generation data centers, supporting 400Gbps with high scalability, reduced power consumption, and simplified network architecture.

Compatibility and Selection

When selecting optical modules, it is essential to match the module type with the server's network adapter and ensure compatibility with the installed NICs. Different manufacturers, such as Intel, Broadcom, Mellanox, and QLogic, have specific requirements, and modules are often tested for compatibility before deployment. Factors to consider include data transmission speed, fiber type, transmission distance, and network requirements.

Thermal ManagementHigh-performance optical modules, especially in AI and cloud servers, generate significant heat. Solutions like optical module liquid cold plates are used to maintain optimal operating temperatures, prevent thermal throttling, and enhance reliability. These cooling solutions are designed for high-density server chassis and can support multiple modules simultaneously.

Applications

Server optical modules are widely used in: Data centers for high-speed interconnectivity between servers and switches. High-performance computing clusters requiring low-latency, high-bandwidth communication. Cloud computing and AI servers where 400G/800G interconnectivity is increasingly necessary.

Telecommunications and enterprise networks for secure, long-distance data transmission. In summary, computing server optical modules are critical components for modern data centers, enabling scalable, high-speed, and reliable network connectivity while requiring careful selection based on speed, compatibility, and thermal management considerations.

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Article Content

How To Choose Optical Modules For Servers

Therefore, when configuring optical modules for servers, it is necessary to select the type of optical modules and confirm their compatibility requirements based on the network adapters

Optical Modules in General-Purpose Computing Scenarios

Optical Modules in General-Purpose Computing Scenarios Huawei''s data center network leverages advanced optoelectronics technologies to establish high-performance connections, ensuring reliable

Application and Deployment of Optical Modules in Intelligent

As a core component connecting servers, switches, and storage systems, optical modules play a pivotal role in unlocking the performance of intelligent computing centers.

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What is a Server Optical Module? It is the core component responsible for high-speed data electro-optical conversion in servers, acting as

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What optical modules are usually equipped on network servers?

Servers are usually equipped with optical modules for network connectivity and data transmission. Different servers and application scenarios may require different types of optical modules.

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

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

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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

What Is StarryLink Optical Module? Why Do We Need It?

The StarryLink optical module is a core component developed by Huawei for data center networks. It delivers ultra-long-distance transmission, exceptional reliability, and enhanced security,

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OPTICAL MODULES FIRST If AI is the brain, optical modules are the nerves -- converting electrical signals to light and back at blinding speed, shuttling data between servers inside data

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