

Article Overview

QSFP-DD (Quad Small Form-factor Pluggable Double Density) modules are high-density, high-speed optical transceivers designed for 400G and 800G networking, offering backward compatibility with earlier QSFP modules and supporting advanced modulation techniques like PAM4.

Overview

QSFP-DD modules are an evolution of the traditional QSFP form factor, doubling the number of electrical lanes from four to eight, which allows significantly higher aggregate bandwidth without increasing the module size. They are widely used in data centers, cloud networks, and high-performance computing environments to meet the growing demand for high-speed, dense networking. QSFP-DD supports 200G, 400G, and 800G optical transmission, with 400G typically using 8x50Gbps PAM4 lanes and 800G using 8x100Gbps PAM4 lanes.

Key Features

- o High Bandwidth Density: Eight electrical lanes enable higher throughput compared to traditional QSFP modules.
- o Backward Compatibility: Supports QSFP+, QSFP28, and QSFP56 modules, facilitating network upgrades without replacing existing infrastructure.
- o Advanced Modulation: Uses PAM4 (Pulse Amplitude Modulation 4-level) to increase data per lane, improving efficiency.
- o Form Factor: Compact, hot-pluggable design suitable for high-density racks and hyperscale data centers.
- o Reach Variants: Available in multiple reach options, including SR8 (up to 100m over MMF), DR4 (500m SMF), FR4 (2km), and LR4 (10km) for flexible deployment.
- o Coherent Options: High-power variants, such as Cisco 400G QSFP-DD Bright modules, integrate mini optical amplifiers and support coherent DP-mQAM signaling for long-reach applications up to 120km.

Comparison with SFP Modules

- o SFP-DD (Double Density SFP): Doubles electrical lanes from one to two, enabling 100G on a server port while maintaining the SFP footprint.
- o QSFP-DD vs. OSFP: QSFP-DD is widely adopted in enterprise and standard cloud data centers due to backward compatibility, while OSFP is preferred in AI/ML supercomputing for better thermal performance at 800G+ speeds.
- o SFP56 and SFP28: SFP56 uses PAM4 for 50G, whereas SFP28 uses NRZ for 25G; SFP-DD and QSFP-DD extend this concept to higher speeds and lane counts.



Inquire about SFP optical modules QSFP-DD

Applications

- o Data Center Interconnects (DCI): Coherent QSFP-DD modules reduce the need for external transponders, lowering CapEx by up to 40% .
- o Cloud and Metro Networks: High-density, low-power modules support aggregation, campus interconnects, and wireless backhaul .
- o Hyperscale and AI/ML Networks: QSFP-DD modules provide the bandwidth and density required for large-scale AI inference and training clusters .

Summary

QSFP-DD optical modules are a critical technology for next-generation high-speed networks, offering high bandwidth, backward compatibility, and flexible deployment options. They support both short- and long-reach applications, advanced modulation, and coherent transmission, making them suitable for modern data centers, cloud infrastructure, and telecom networks .

The explosive growth of global data volume has placed higher demands on the bandwidth and performance of data

As a leading solution in high-speed applications, QSFP-DD transceivers are often compared with other modules such

FS provides an expanding portfolio of 400G OSFP/QSFP112/QSFP-DD solutions featuring high

SFP vs SFP+ vs QSFP28 vs QSFP-DD: Master optical transceiver selection for 1G to 800G AI networks with our lab

With optical modules, it is often helpful to think of them in three parts: Form factor (QSFP, QSFP-DD, OSFP)
Electrical

The definitive guide to the QSFP optical module series (40G, 100G, 400G, 800G). Learn the technical differences,

The 800G QSFP-DD optical module takes performance a step further by adopting higher-order PAM4 modulation at

The Cisco® family of QSFP-DD modules provide the industry's highest bandwidth density

Inquire about SFP optical modules QSFP-DD

Cisco Transceiver Modules - Learn product details such as features and benefits, as well as hardware and software specifications.

In this ultimate guide, I'll break down exactly what QSFP cables are, how they compare to

This article provides an overview of 800G optical transceivers, focusing on the QSFP-DD and OSFP packages.

For optical modules, backward compatibility is essential. The upkeep and operation of the network infrastructure are

QSFP-DD modules are available that support 400 Gb/s and 800 Gb/s. To accommodate the greater number of lanes,

Unsure which 400G module fits your data center? Compare QSFP-DD, OSFP, and

This article discusses the transition of server connection speeds in data centers from 10GE and 25GE to 100GE and

QSFP-DD is the mainstream module of 400G transceivers which is different than other form

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