Classification of Pluggable Optical Modules



Overview

Linear Pluggable Optics – An OverviewComparison of proposed solutions: In response, several solutions such as Linear Receive Optics (LRO), Linear Pluggable.

Key Takeaways

Pluggable optical modules are classified by form factor, data rate, fiber type, and transmission distance, with common types including SFP, SFP+, SFP28, QSFP, QSFP28, QSFP-DD, OSFP, CFP, and CFP8. Classification by Form FactorSFP (Small Form-factor Pluggable): Compact, hot-pluggable modules supporting up to 4 Gbps, widely used in enterprise networks. SFP+ (Enhanced SFP): Supports 10 Gbps, similar size to SFP but with higher performance and sensitivity to EMI.

SFP28: Same size as SFP+, supports 25 Gbps, compatible with 10G SFP+ modules.

QSF

P (Quad SFP): Four-channel SFP interface, used for 40 Gbps (QSFP+) or 100 Gbps (QSFP28) applications. QSFP-DD (Double Density): High-speed, eight-lane module for 400 Gbps, designed for ultra-high-speed networking.

OSF

P (Octal SFP): Eight-channel module for 400 Gbps and above, optimized for heat dissipation and high throughput. CFP/CFP8: Larger modules for high-speed applications, supporting 100 Gbps to 400 Gbps, often used in telecom and data centers.

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CX

P: High-density parallel module with 12 Tx/Rx channels, mainly for short-distance multimode links.

CSF

P (Compact SFP): Dual 100 Mbps or 1 Gbps bidirectional transceivers in a single SFP form factor, doubling port density. Classification by Data Rate100 Mbps – 1 Gbps: Legacy or standard enterprise networks, often SFP or CSFP modules. 10 Gbps: SFP+, XFP modules for high-performance networks.

25/40/100 Gbps: SFP28, QSFP+, QSFP28 for modern data centers. 200/400 Gbps: QSFP-DD, OSFP, CFP8 for ultra-high-speed networking. Classification by Fiber TypeSingle-mode optical modules: Center wavelengths typically 1310 nm or 1550 nm, suitable for long-distance transmission.

Multi-mode optical modules: Center wavelength typically 850 nm, cost-effective for short-distance links, but limited by modal dispersion. Classification by Transmission DistanceShort-distance (SR): Typically multimode, lower cost, used in data centers. Long-distance (LR/ER): Single-mode, higher optical power, suitable for metro or long-haul networks.

Fiber attenuation must be considered to prevent module overload. Additional ConsiderationsCWDM/DWDM modules: Enable multiple signals over a single fiber using wavelength division multiplexing, extending reach and capacity. TOSA/ROSA Components: Transmitter and receiver assemblies define module performance, including laser type (LD or LED) and photodetector (PIN or APD) sensitivity.

In summary, pluggable optical modules are systematically classified by form factor, data rate, fiber type, and transmission distance, with each type optimized for specific networking requirements, from enterprise LANs to high-speed data centers and telecom networks. Proper selection ensures network efficiency, compatibility, and cost-effectiveness.

Article Content

Linear Pluggable Optics – An Overview

Comparison of proposed solutions: In response, several solutions such as Linear Receive Optics (LRO), Linear Pluggable Optics (LPO) and Co-Packaged Optics (CPO) have been proposed. Fig. 1

Understanding Pluggable Optical Modules

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According to the encapsulation type, optical modules are classified into SFP, eSFP, SFP+, XFP, SFP28, QSFP28, QSFP+, CXP, CFP and CSFP. SFP: small form-factor pluggable. eSFP: enhanced small

Complete Guide to Pluggable Optical Transceivers

Pluggable optical transceivers are compact, hot-swappable network interface modules that serve as the critical bridge between electronic and optical domains in modern networks.

Optical Transceiver Pluggable Nomenclature and Naming Conventions

This comprehensive guide covers the nomenclature, acronyms, and naming conventions for optical fiber communication pluggable transceivers. The optical networking industry has

Comprehensive Guide to Optical Transceiver Classifications and

Understanding their classifications and types is essential for selecting the appropriate module for specific networking requirements. This guide covers the most common classification

Optical Interconnect Technology Analysis: LPO, NPO, CPO

Exploring optical interconnects for AI data centers: LPO for low-power, short-distance links, NPO for high-density, near-package connections, and CPO for ultra-high-bandwidth co

XPO: Redefining Pluggable Optics for AI Networking

The XPO pluggable module preserves the advantages of field pluggability, enabling quick replacement or upgrades of optical modules without servicing the entire switch and minimizing downtime.

The Most Comprehensive Guide Of Optical Modules

In the upcoming sections, we will delve into the classification of optical modules, future trends, and guidelines for selecting the appropriate optical module for your network.

Linear Pluggable Optics_V2

By design, LPO offers a scalable path to reconciling high data rates with low power consumption for pluggable modules, while CPO enables direct integration of photonics onto the switch IC, thereby

The Rise of Co-Packaged Optics (CPO) and Silicon Photonics in

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As generative AI models scale, traditional pluggable optical transceivers face a power-performance wall. Co-packaged Optics (CPO) and Silicon Photonics address this by integrating

Lumentum

Lumentum Holdings Inc. (“Lumentum”), a global leader in photonic solutions, today announced its showcase of technology and product demonstrations designed to meet the

Coherent Demonstrates Technologies for Next

Coherent will showcase a comprehensive portfolio of next-generation pluggable optical technologies at OFC 2026, spanning 1.6T, 3.2T, and emerging

Pluggables, Power, and Geopolitics: Mapping the 800G and 1.6T Optical ...

3.2 Linear Pluggable Optics (LPO): The Low-Power Challenger LPO technology removes the DSP from the optical module entirely. Instead, it relies on the equalization capabilities of the host

Why Arista''s New Optical Transceiver Is a Big Deal

Every module is equipped with its own liquid-cooled cold plate. As to density, Arista says in a white paper that XPO can deliver "4X the front-panel density of OSFP, enabling up to 204.8Tbps

Catalog :: AV Distribution & Switching :: Extenders :: Fiber Optic ...

SFP1-SM-D is a fiber optic transceiver using 1310nm single-mode signals. These standard pluggable SFP optical modules have two LC connectors for reception and transmission over two strands of

The Global Optical Transceiver Market 2026-2036

The optical transceiver is the fundamental building block of modern digital infrastructure - a compact module that converts electrical signals into light and back, enabling the high-speed data transmission

FinancialContent

Adding the 400G-FR4-LPO physical medium specification supports the LPO MSA''s goal of enabling broad market adoption of linear pluggable fiber optic links. The specification defines the

The Evolution of Optical Modules: 400G → 800G → 1.6T – A Strategic ...

Discover the evolution from 400G to 800G and 1.6T optical modules. Learn key technologies, CPO vs pluggable, and upgrade strategies for future-ready data centers.

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