

New technologies to replace optical modules



Article Overview

Emerging technologies like Co-Packaged Optics (CPO), Linear-drive Pluggable Optics (LPO), Near-Package Optics (NPO), and silicon photonics (SiPh) are poised to complement or replace traditional pluggable optical modules in high-speed data centers.

Co-Packaged Optics (CPO)

CPO integrates optical components such as photonic integrated circuits (PICs) and lasers directly alongside switching ASICs or processors within the same package. This reduces electrical I/O distance, lowers power consumption, improves signal integrity, and increases bandwidth density compared to traditional pluggable modules. CPO is particularly suited for AI data centers where massive data exchange between GPUs, switches, and memory systems demands high efficiency and low latency. While CPO is not expected to immediately replace pluggable modules, it represents a fundamental shift toward chip-level optical integration and is likely to coexist with traditional modules in the near term .

Linear-drive Pluggable Optics (LPO)

LPO removes digital signal processors (DSPs) and clock data recovery circuits from the module, creating a purely analog "linear direct-drive" optical link. The transmitter directly drives the optical modulator, and the receiver uses a high-linearity transimpedance amplifier (TIA) for photoelectric conversion. LPO offers lower power...

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The future of optical modulators and integrated photonics

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Gradual replacement of copper with optical brings benefits beyond better chip performance. "What this really means is

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To sum up, the recent advancement in the field of inorganic-organic integrated optics enabled new applications and

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