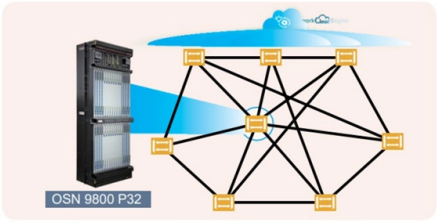
# Optical Communication CPO Module




Typical Application Scenarios of HUAWEI OSN 9800 P32

## Overview

Next-Gen Optical Modules: A Technical Comparison of Compare CPO, NPO, and XPO optical modules for 800G/1.6T data centers. Evaluate power efficiency, integr.

## Key Takeaways

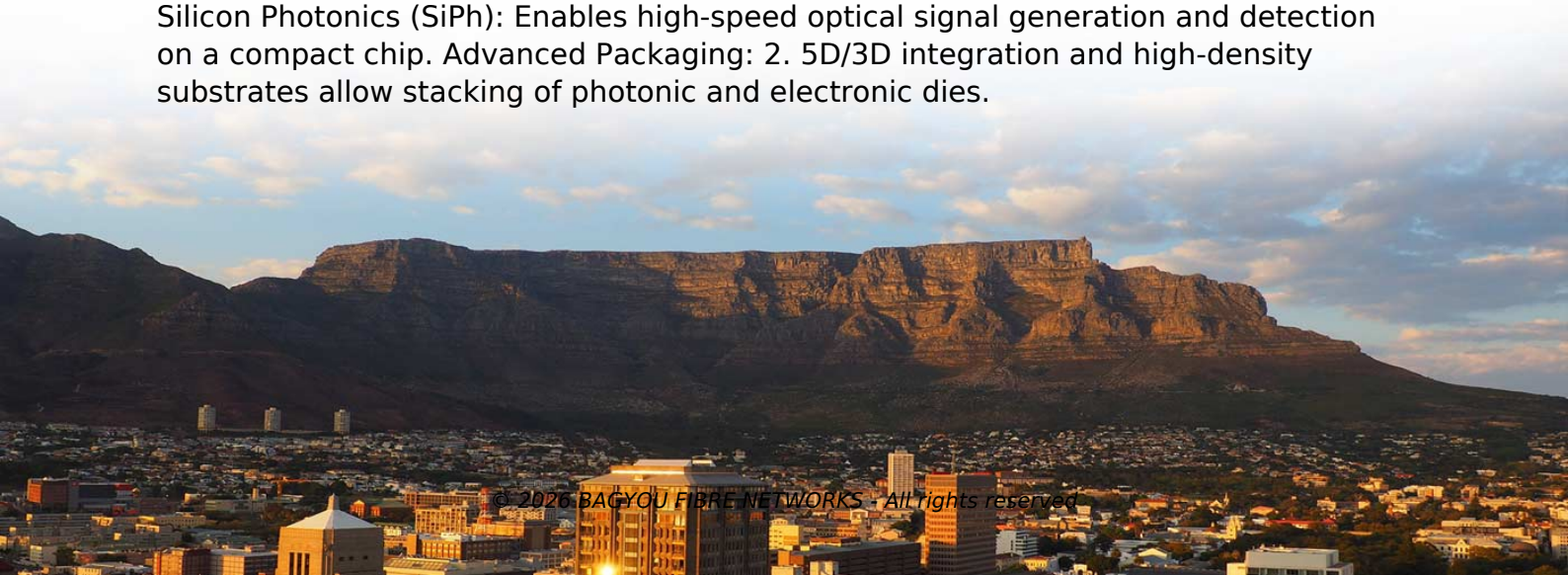
Co-Packaged Optics (CPO) integrates optical engines directly with ASICs to dramatically improve bandwidth, reduce power consumption, and enhance data center performance. What is a CPO Optical Module?

### A CP

O optical module is an advanced optical communication module where optical components (lasers, modulators, photodetectors) are integrated directly with electronic components, such as switch ASICs, on the same substrate or interposer. Unlike traditional pluggable optical transceivers, which are discrete and hot-swappable, CPO modules are tightly integrated assemblies designed for co-location with the ASIC. This integration shortens the high-speed electrical lanes from centimeters to millimeters, reducing signal loss, latency, and power consumption.

## Key Technology Enablers

Silicon Photonics (SiPh): Enables high-speed optical signal generation and detection on a compact chip. Advanced Packaging: 2. 5D/3D integration and high-density substrates allow stacking of photonic and electronic dies.



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## High-

Density Substrates: Silicon interposers or organic packages support multiple optical engines and efficient heat dissipation.

## Benefits of CPO

Power Efficiency: By minimizing electrical path lengths, CPO can cut power usage by up to 50% compared to conventional optics. High Bandwidth: Direct integration with ASICs supports ultra-high data rates, essential for AI, HPC, and next-generation data centers. Reduced Latency: Shorter signal paths improve signal integrity and reduce insertion loss, enhancing overall performance.

Scalability: CPO allows more optical channels in a smaller footprint, enabling data centers to handle increasing data volumes efficiently.

## Challenges

Thermal Management: Co-locating optics with high-power ASICs generates heat, requiring advanced cooling solutions. Manufacturing Complexity: Precise alignment of photonic and electronic components is challenging, though modular assembly and improved packaging techniques are mitigating these issues. Serviceability: Unlike pluggable optics, CPO modules are not hot-swappable, which can complicate maintenance and upgrades.

ApplicationsCPO is particularly valuable in AI workloads, high-performance computing, and hyperscale data centers, where traditional copper interconnects are reaching their limits in speed and power efficiency. Companies like Marvell, Broadcom, and Corning are actively developing CPO solutions to integrate optical engines with custom ASICs and XPUs, enabling high-bandwidth, low-latency, and energy-efficient data transfer. SummaryCPO represents a paradigm shift in optical communication modules, moving from discrete pluggable transceivers to tightly integrated optical engines co-located with ASICs.

This approach enhances bandwidth, reduces power consumption, and supports the growing demands of AI and HPC data centers, while presenting new challenges in thermal management, manufacturing, and serviceability.

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## Article Content

Next-Gen Optical Modules: A Technical Comparison of

Compare CPO, NPO, and XPO optical modules for 800G/1.6T data centers. Evaluate power efficiency, integration, and OCS synergy for your

The Rise of Co-Packaged Optics: A Deep Dive into

This article provides a comprehensive overview of CPO optical modules, exploring their technology, benefits, challenges, and the pivotal role

What is Co-Packaged Optics (CPO) Technology?

Instead of relying on traditional pluggable optics, CPO uses tightly integrated optical and electrical components within the same package to couple light into and out

Broadcom CPO: Highest Power Efficiency and Bandwidth Density

Broadcom''s co-packaged optics (CPO) technology is based on highly integrated Silicon Photonics and is purpose built to address the demanding needs of AI networks by providing the

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

Coherent Demonstrates Multiple Technologies for Co

Coherent announced it will demonstrate multiple co-packaged optics (CPO) technologies at OFC 2026 in Los Angeles.

Optics Primer, Part 3: Co-Packaged Optics (CPO)

Optics Primer, Part 3: Co-Packaged Optics (CPO) From EML lasers and DSPs to silicon photonics and external CW lasers. How CPO works and the impact on the optical supply chain.

Standing in the Light: A Comprehensive Guide to the Optical Module

"Standing in the Light: Understanding the Optical Module and CPO Industry Chain" This article analyzes the critical role of optical communication technology, specifically optical modules and

Co-Packaged Optics (CPO) Market Trends 2026: AI Data Center

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Explore the future of co-packaged optics (CPO) in AI data centers. Learn how silicon photonics, optical I/O, and high-speed optical interconnect technologies are shaping next-generation

Co Packaged Optics (CPO) – Scaling with Light for the Next Wave of ...

Co-Packaged Optics (CPO) has long promised to transform datacenter connectivity, but it has taken a long time for the technology to come to market, with tangible deployment-ready products

Samsung Foundry Reportedly Wins Optical Module Order,

As a result, optical transmission technologies are becoming increasingly important. TrendForce forecasts that co-packaged optics (CPO) will steadily increase their share of optical

MTC and Changelight Forge Strategic Partnerships to

The company is also working closely with a Hisense-affiliated optical module manufacturer to advance key optical chip technologies, including VCSELs and Micro LEDs. To

Mapping the Micro LED Optical Interconnect Ecosystem

Shipments of Micro LED CPO optical transceiver modules are expected to begin ramping in the second half of 2028, with the market projected to generate approximately USD 848 million in

TSMC Targets 2H26 COUPE on Substrate; NVIDIA Could Eye

TrendForce forecasts that co-packaged optics (CPO) will steadily increase its share of optical communication modules in AI data centers, with penetration potentially reaching 35% by 2030.

In-Depth Review of the CPO Delay Controversy: Why a Single

On June 9, 2026, a client-only report from SemiAnalysis claiming that the large-scale commercialization of CPO (Co-Packaged Optics) would be delayed triggered a sharp, single-day

Silicon photonics and co-packaged optics at the heart of

While linear-drive pluggable modules remain competitive, CPO is expected to offer unmatched customization and scalability, with large-scale

Opinion: optical transceivers at the chokepoint of AI

As AI infrastructure accelerates at an unprecedented pace, optical connectivity has become one of the defining enablers and constraints of next

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

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

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