

Article Overview

DCI coherent optical modules enable high-speed, long-distance data center interconnects with compact, energy-efficient, and pluggable form factors.

Overview

DCI coherent optical modules are specialized transceivers designed to connect data centers over distances ranging from tens of kilometers to over 1,000 km while supporting high data rates such as 100G, 200G, 400G, and the emerging 800G standards . They replace traditional stand-alone optical transponders, allowing direct deployment in routers or switches, which simplifies network architecture, reduces costs, and lowers power consumption .

Key Features

- o **Pluggable Form Factor:** Modules are available in QSFP-DD, OSFP, and CFP2 form factors, enabling hot-pluggable installation and easy upgrades .
- o **High-Speed Transmission:** Support for 400G-ZR, 800ZR, and 800G ZR+ allows single-wavelength transmission over DWDM links up to 120 km for 800ZR and beyond 1,000 km for 800G ZR+ .
- o **Integrated Architecture:** Each module typically includes a photonic integrated circuit (PIC), digital signal processor (DSP), and high-speed electro-optical/electro-optical conversion units. The PIC integrates tunable lasers, IQ modulators, and polarization beam splitters, while the DSP handles modulation, demodulation, dispersion compensation, and polarization tracking .
- o **Energy Efficiency:** Coherent modules significantly reduce power, cooling, and space requirements, with some solutions achieving over 80% energy savings compared to traditional optical line systems .
- o **High Capacity and Flexibility:** Techniques like QPSK, 16QAM, and dual-polarization multiplexing increase spectral efficiency, enabling multiple terabits per second over a single fiber .

Benefits for Data Center Interconnects

- o **Simplified Deployment:** Pluggable modules eliminate the need for complex rack-mounted optical line systems, integrating amplification, multiplexing, and demultiplexing into a single module .
- o **Cost Reduction:** By replacing stand-alone optical devices, operators save on equipment, installation, and operational costs .
- o **Improved Network Performance:** Coherent optics provide robust signal transmission, reduce the need for complex traffic engineering, and enhance visibility for IP network automation and management .
- o **Scalability:** Modules support incremental upgrades from 100G to 800G, allowing data centers to scale bandwidth without major infrastructure changes .

Applications

DCI coherent optical modules are primarily used for:

- o Data Center Interconnects (DCI): High-speed links between geographically distributed data centers.
- o Metro and Regional Networks: 800G ZR+ modules are suitable for metro or regional interconnects.
- o IP over DWDM Networks: Simplified deployment of high-capacity IP traffic over existing fiber infrastructure .

Conclusion

DCI coherent optical modules represent a compact, energy-efficient, and high-performance solution for modern data center interconnects. Their pluggable design, high data rates, and integrated coherent technology make them ideal for scaling bandwidth, reducing operational complexity, and improving network sustainability in large-scale data center environments .

Coherent announced advancements in its scale-across portfolio, including its multi-rail optical transport platform

The Marvell coherent-lite optical digital signal processor (DSP) powers a new category of optical modules designed to bridge the gap

The authors showcase a cutting edge 12.1 Tbps coherent optical fiber transmission system using two Quantum-Dot

Explore the advancements in 800G coherent optical modules and their application scenarios in enhancing data center

Direct detect relies on basic intensity modulation for short-reach DCI, whereas coherent optics leverage phase,

Introduction Data centre interconnect (DCI) is one of the fastest growing segments in the network element ecosystem. Multi-vendor

Download Citation | Role of Coherent Systems in the Next DCI Generation | Coherent transmission has been the

The 800G QSFP-DD and OSFP coherent optics expand Cisco

Coherent optical modules use coherent light (waves with fixed phase relationships) for

Coherent: Enabling Next-Gen Optical Networks The coherent 100G QSFP28 DCO transceiver is more than just a

As the pluggable coherent optics industry chain continues to mature, 200G and 400G coherent modules in CFP, CFP2, and other

Traditional fixed coherent modules struggle to balance flexibility and cost, while pluggable coherent optics, with their

As the single-channel transmission rate continues to rise, the application landscape in modern optical communication

Data Center Interconnect using 400G-ZR optical modules and the OSFP-LS Arista dramatically simplifies Data Center Interconnect

FS 800G/400G Coherent OSFP/QSFP-DD optical transceiver module solutions offer a range of OSFP/QSFP-DD modules

PDF Article More Like This Optical PAM4 Signaling and System Performance for DCI Applications S.M.R. Motaghiannezam M3A.1

Web: <https://bssoda.pl>

