

Article Overview

Coherent optical modules, such as 100G ZR QSFP28 and 400G/800G QSFP-DD, enable high-capacity, long-reach optical transmission for power grid and network applications with low power consumption and flexible deployment.

Overview of Coherent Optical Modules

Coherent optical modules use digital coherent optics (DCO) to transmit high-speed data over long distances with improved signal integrity. Unlike traditional direct-detect optics, coherent modules leverage phase and amplitude modulation along with digital signal processing (DSP) to compensate for fiber impairments, enabling higher data rates and extended reach .

Key Types and Specifications

- o 100G ZR QSFP28-DCO: Supports 100G transmission over up to 120 km (dispersion-limited) and optionally up to 300 km with amplification. It integrates a tunable laser and Steelerton DSP, achieving power dissipation below 5W, making it suitable for edge network deployments, including street cabinets or pole-mounted enclosures .
- o 400G ZR/ZR+ QSFP-DD: Optimized for high-density access and point-to-point data center interconnects. 400ZR can deliver 400 Gb/s up to 40 km unamplified, while 400ZR+ supports extended reaches up to 600-750 km using advanced modulation formats like QPSK, 8QAM, and 16QAM with external amplification .
- o 800G ZR/ZR+ QSFP-DD and OSFP: Designed for metro, regional, and long-haul networks, supporting 800G traffic over DWDM links up to 120 km (800ZR) or beyond 1000 km (800G ZR+) with high-performance probabilistic constellation shaping (PCS) for interoperability .

Deployment Considerations

- o Single-fiber bi-directional operation: Some modules, like the Coherent 100G ZR QSFP-DCO, integrate dual tunable lasers for transmit and local oscillator, enabling IP-over-DWDM transmission on a single fiber, effectively doubling fiber capacity .
- o Power efficiency: Coherent modules are optimized for low power consumption, typically under 5-6W for 100G modules, which is critical for distributed power grid or edge deployments .
- o Form factor compatibility: QSFP28 modules are not directly compatible with SFP+ ports, but breakout cables or adapters can connect a QSFP+ port to multiple SFP+ ports for flexible network integration .
- o Temperature and environmental tolerance: Industrial-grade versions support extended temperature ranges, suitable for outdoor or harsh environments in power grid networks .

Applications in Power Grid Networks

Coherent optical modules are increasingly used in power grid communications to support:

- o High-capacity SCADA and telemetry data transmission over long distances.
- o Redundant and resilient optical links for critical infrastructure.
- o Integration with existing fiber infrastructure, leveraging DWDM to maximize capacity without laying new fiber.
- o Efficient deployment in edge substations or remote monitoring points due to low power and compact form factors.

Summary

Coherent SFP/QSFP modules provide high-speed, long-reach, and power-efficient optical connectivity for power grid and network applications. Modules range from 100G QSFP28 for edge and metro networks to 400G/800G QSFP-DD for high-capacity regional and long-haul links. Key advantages include single-fiber bi-directional operation, low power consumption, and flexible deployment, making them ideal for modern power grid communications and high-performance optical networks .

Introduction Cisco offers a comprehensive range of pluggable optical modules in the Cisco ONS pluggables portfolio. The wide

Networking 100G ZR QSFP28 Digital Coherent Optics Transceiver Standard Tx output power (-8dBm), 100GE & OTU4, C-temp, 0~70°C

Are you curious about the next-generation coherent modules and how they are shaping the future of

QSFP28 with 5W power consumption Hot-swappable QSFP28 pluggable module electrically and mechanical compliant to QSFP28

Discover Coherent's latest 1.6T OSFP optical module demonstrated live at OFC 2026,

Understanding the working principle of optical modules--especially SFP transceivers--is critical for network

The 400G QSFP-DD ZR+ is a C-Band optical frequency tunable coherent optical module, combines 7nm coherent

Product overview The Cisco QSFP28 100G ZR module expands the portfolio of digital coherent optics (DCO) modules to connect



Power grid coherent optical module SFP

By plugging Coherent's high transmit output power 400G QSFP-DD-DCO transceivers directly into their switches or routers, network

Cisco QSFP-DD and OSFP 800G coherent optical modules are

FOCM01FXC1MN Featuring unprecedented resolution, power and frequency accuracy, the High Resolution Optical Channel Monitor

Get the pluggable module performance you need from the manufacturer of choice for all major networking

Design requirements Modern optical module designs often require: Reduced power consumption to control and limit module

SFP modules, or Small Form-factor Pluggable modules, are essentially the workhorses of

The module is compatible with widely deployed ports of QSFP28 100G and 100GBASE ER CAUI-4 client interfaces. Its maximum

Cisco offers a range of GBIC, SFP, XFP, SFP+, CXP, CFP, Cisco CPAK, and QSFP+

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