

Article Overview

A QSFP28 optical module using a Directly Modulated Laser (DML) offers compact, low-power 100G transmission but is limited in distance due to laser chirp and chromatic dispersion.

Overview of QSFP28 Modules

QSFP28 (Quad Small Form-Factor Pluggable 28) modules are designed for 100G Ethernet transmission, aggregating four 25G electrical lanes into a single optical channel. They maintain the same mechanical footprint as QSFP+ modules, enabling high-density deployment in data centers, HPC networks, and enterprise cores while supporting IEEE 802.3 standards for interoperability . QSFP28 modules can use different optical technologies, including DML and EML, depending on the required transmission distance and performance .

Directly Modulated Laser (DML) Technology

A DML laser modulates light directly by varying the current supplied to the laser diode. When the diode is powered, it emits light representing a logical "1"; when off, it represents a logical "0" . Key characteristics include:

- o Compact size: The laser diode and control electronics are integrated into a single semiconductor element.
- o Low power consumption: DML modules typically consume less power than EML modules at low output levels.
- o Narrow spectral width: Suitable for high-frequency signal transmission over short to medium distances.

Limitations

- o Laser chirp: Direct modulation causes frequency variations in the emitted light, which, combined with chromatic dispersion in the fiber, can blur the signal spectrum.
- o Distance constraints: DML modules are most effective at lower supply currents and shorter distances, typically up to 10 km for 100G LR4 applications .
- o Power scaling: Increasing the drive current to extend distance can exacerbate chirp, reducing signal quality.

Comparison with EML

Electro-absorption Modulated Lasers (EML) emit light at a constant intensity, with modulation applied externally via an electro-absorption modulator. Compared to DML:

- o Higher power consumption: EML requires additional energy for modulation.

- o Longer reach: EML can support longer distances due to reduced chirp and better spectral stability.
- o Complexity: EML modules are more complex and costly but suitable for metro and long-haul applications.

Applications in Quantum Communication

While QSFP28 DML modules are primarily designed for classical 100G Ethernet, their compact size, low power, and high-speed capability make them candidates for integration into quantum communication networks where short-distance, high-bandwidth optical links are required. However, for long-distance quantum key distribution (QKD) or entanglement-based systems, EML or coherent optics modules may be preferred due to their superior spectral stability and lower dispersion-induced signal degradation .

Summary

QSFP28 DML optical modules provide a cost-effective, low-power solution for 100G short- to medium-range optical links, with advantages in compactness and simplicity. Their main limitations are distance and signal quality due to laser chirp and chromatic dispersion. For longer distances or high-precision quantum communication, alternative optical technologies like EML or coherent optics are more suitable.

In the QSFP28 module the DSP is paired with a highly efficient silicon photonics optical front-end and a

Discover ascentoptics about QSFP28 transceiver solutions. Master 100G optical modules with in-depth insights and

The INTCERA 100G QSFP28 LR4 DML 10km optical transceiver (GQS-SPO101-LR4CB) is a 100Gb/s transceiver module designed

Laser technology: EML vs DML 100G QSFP28 form factor transceivers are today heavily

Explore the QSFP28 100G optical module, a vital component for high-speed network connections. Discover its unique

This LR4 module uses WDM technologies to achieve 100G transmission over four different wavelengths around 1310nm. It can

100G QSFP28 (or 100 Gigabit Quad Small Form-Factor Pluggable 28) is a series of high-speed optical modules designed for data

The INTCERA 100G QSFP28 4WDM-40 DML 40km optical transceiver (GQS-SPO101-4ER4C) is a

100Gb/s transceiver module

100G QSFP28 Transceivers Hot-pluggable 100 Gigabit high-performance QSFP28 transceivers for long-distance serial optical

Description This product is a 100Gb/s transceiver module designed for optical communication applications compliant to QSFP and

This product is a 100Gb/s transceiver module designed for optical communication applications compliant to QSFP MSA, 4WDM-40

If you're looking for the most advanced optical module package on the market, look no further than QSFP. QSFP+ and

100G QSFP28 DR Single Lambda is a transceiver module designed for 500m optical communication applications. The module

This DCO module is tunable across C-band. The module is compatible with widely deployed ports of QSFP28 100G

The chromatic dispersion in DML is caused by the drift of the laser wavelength due to changes in refractive index in its active area,

QSFP28-1D-DML-C - Transceiver Module 1302nm LC Pluggable, QSFP28 from Amphenol ProLabs. View datasheets, pricing and

Web: <https://www.in-au.co.za>

