

Optical module phase jitter



Summary of Content

Phase jitter in optical modules refers to the short-term timing variations of the signal clock, which directly impacts data integrity and bit error rate in high-speed optical communication systems.

Understanding Phase Jitter

Phase jitter is the temporal fluctuation of the signal's phase relative to an ideal clock. In optical modules, such as QSFP, SFP, or PAM4-based transceivers, phase jitter can degrade signal quality, increase bit error rates (BER), and limit achievable data rates . It is particularly critical in high-speed optical links (100G to 800G), where even tens of femtoseconds of jitter can affect performance .

Sources of Phase Jitter

Phase jitter in optical modules arises from several sources:

- Reference clock instability: The crystal or MEMS oscillator driving the module can introduce jitter if not ultra-stable .
- Power supply noise: Variations in supply voltage can modulate the oscillator phase .
- Temperature and environmental effects: Thermal fluctuations and mechanical stress can affect oscillator performance .
- SerDes and PLL circuits: Clock and data recovery (CDR) loops and phase-locked loops (PLLs) can contribute to jitter if bandwidth or filtering is not optimized .

Measurement and Analysis

Article Content

Optical Modules: Small Ultra-Low Phase Noise Oscillators | SiTime

SiTime MEMS differential oscillators are ideal for 100G to 800G optical modules. They offer breakthrough 70-fs jitter, the smallest

Ultra-low jitter timing sources for Optical Transceiver Modules

Diodes Incorporated addresses these needs with ultra-low jitter timing sources in compact 2016-size packages for Small Form-factor

Ultra Low Jitter Crystal Oscillator

Recently, we release a new series of crystal oscillator (OB-U series). It's ultra-low jitter performance (50fs typical, 100fs max), low

Design Considerations for Improving Phase-Jitter Margin in 1.6T

This article examines the phase-jitter challenges of the 1.6T optical communication era, the technical characteristics of

Optical Modules: Small Ultra-Low Phase Noise

SiTime MEMS differential oscillators are ideal for 100G to 800G optical modules. They offer breakthrough

What Problem Jitter Solves for Optical Transmitters

Viavi ONE LabPro used to test individual lanes of different 1.6T modules in 8x200G mode. Configured duplex mode with variable

Improvement of amplitude and phase margins in optical RZ receiver

We proposed a new technique to improve the amplitude and phase margins in an optical RZ receiver using Kerr nonlinearity in

The LMK6B: Revolutionizing Optical Module Performance with

By combining revolutionary BAW resonator technology with industry-leading jitter performance, comprehensive output options, and

Low Phase Noise Oscillators Enable High Speed Optical Modules

The phase jitter in the retimer adds to the jitter in the serial data stream passing through the module, resulting in data

Rethinking Jitter Analysis for SerDes Reference Clocks | SiTime

The traditional approach to refclk jitter analysis is outdated and no longer useful for high-speed SerDes applications,

Contact Us

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