

Oscillator used in optical modules



Article Overview

Optical modules require ultra-low jitter differential oscillators, typically in the 156.25 MHz to 625 MHz range, with LVDS or LVPECL outputs depending on module design.

Key Requirements

Ultra-low jitter: Optical modules, especially high-speed ones like 100G to 800G QSFP, OSFP, and CFP2, rely on digital signal processors (DSPs) that demand reference clocks with extremely low phase noise and jitter, often below 60 femtoseconds, to minimize bit error rates and maintain signal integrity . Frequency range: Common reference frequencies include 156.25 MHz, 312.5 MHz, 644.53125 MHz, and other multiples derived from Ethernet/SerDes architectures. The exact frequency must match the module chipset or PHY requirements . Output logic:

- LVDS (Low Voltage Differential Signaling): Preferred for compact modules with tight power budgets due to lower power consumption .
- LVPECL (Low Voltage Positive Emitter-Coupled Logic): Used when higher swing and stronger edge integrity are required for high-speed SerDes/CDR paths .
- Package size and power: Oscillators are available in very small packages (e.g., 2.5 × 1.6 mm) to fit space-constrained optical modules, with low power dissipation to maintain thermal stability .
- Technology options:
 - Quartz crystal oscillators: Provide high stability and low jitter.
 - MEMS oscillators: Offer ultra-low phase noise, excellent immunity to power supply noise, and wide temperature operation, suitable for 400G-800G modules .

Selection Guidelines...

Article Content

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What is a crystal oscillator? Explaining the mechanism, differences ...

The oscillator circuit is responsible for this detection and the force used to push the “pendulum” back at a constant energy. Crystal

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Applications of Optical Modules in AI Intelligent Devices ...

Optical modules typically use crystal oscillators internally to provide stable clock signals. Different rates and

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Oscillators – laser

In laser physics, the term laser oscillator is sometimes used for a laser device to distinguish it explicitly from an optical amplifier,

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Expand the Performance Limits of Optical Modules with MEMS-Based ...

Optical modules are expected to significantly improve throughput with little additional power consumption. In addition

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Different Types of Crystal Oscillators: A Comprehensive

Learn about different types of crystal oscillators and discover their unique applications and

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Oscillators for High-Speed Optical Telecommunications

Types of Oscillators Used with Optical DSPs: The advancement in optical

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Overview of the Development of Fiber Optic Transceivers

Introduction to Fiber Optic Transceivers Fiber optic transceiver, also called optical module, is used to realize the

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Everything You Need to Know About Optical Modules

Optical modules are electronic devices used in communication systems to transmit optical

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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

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Optical Parametric Oscillators

An optical parametric oscillator (OPO) is a tunable light source based on parametric amplification in a

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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

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Tutorial on optoelectronic oscillators

As a hybrid microwave photonic oscillator, OEOs have also been used for the generation of optical signals, such as

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Opto-Electronic Oscillators for Micro

Using Tunable Dispersion-Compensated Modules to Overcome the Power Penalty of a Millimeter-Wave Opto

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Optical Fiber Applications

Ultra-low jitter clock oscillators improve signal integrity in high-speed data transmission by reducing noise in optical systems. They

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Optical Module Solutions

Our differential clock solutions include quartz and MEMS oscillators to meet the tight jitter requirements for 400G optical modules.

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The application of crystal oscillator in optical modules

In the optical module, the main function of the crystal oscillator is to provide high-precision clock signals and

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Oscillators Selection Guide: Types, Features, Applications | GlobalSpec

Oscillators that are modules or boards are also available. Connectorized devices attach with coaxial or radio frequency (RF)

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MEMS and Crystal Oscillators | Microchip Technology

It is an excellent choice for applications in optical modules, medical, ultrasound, fiber channel, Ethernet,

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Optical module design resources | TI

Integrated circuits and reference designs help you create a smaller and faster optical module design used in high-bandwidth data

Sep 22, 2025

What is Optical Transceiver: A Beginner Guide (2024)

What is an Optical Transceiver? An optical transceiver, also known as a fiber optic transceiver or optical module, is a

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Optical Components and Modules

Everything you need to build an optical network from end-to-end. Thin-film filter and PLC based AWG for multiplexing, a full suite of

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Taitien Electronics Introduces Ultra Low Jitter Crystal Oscillator for ...

Taitien Electronics Introduces Ultra Low Jitter Crystal Oscillator for High Speed Optical Modules Rapid adoption of 5G

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Optoelectronic Oscillators: Progress from Classical Designs to ...

Optoelectronic oscillators (OEOs) have emerged as indispensable tools for generating low-phase-noise microwave

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Optical and Electronic Oscillators: A Comprehensive Guide to Laser

Optical and electronic oscillators cover a wide range of technologies. Each is optimized for specific uses and frequency ranges—from

Sep 19, 2025

BAW Oscillator Solutions for Optical Modules

The BAW oscillator can be used as a drop-in replacement for standard oscillators in many existing optical module systems. The 125

Mar 12, 2026

Optical Oscillators | Springer Nature Link

Positive feedback converts an amplifier into an oscillator. In optics, feedback can be provided by mirrors at the two

Contact Us

For more information, pricing, or custom solutions, please contact us:

Website: <https://www.iiss.co.za>

Email: sales@iiss.co.za

Phone: +27 63 174 2895

Address: Unit 8, Innovation Park, 15 Rivonia Road, Sandton, Johannesburg, 2196, South Africa

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