Different Kilometer Optical Modules



Overview

Complete guide to long distance transceivers covering 10km to 120km optics, 1310nm vs 1550nm, ER/ZR modules, link budget calculation, and deployment best practices.

Key Takeaways

Optical modules are classified by transmission distance—short (up to 2 km), medium (10–20 km), and long (30 km or more)—with wavelength and fiber type determining their range and application.

Overview of Optical Modules

Optical modules are transceivers that convert electrical signals into optical signals and vice versa, enabling data transmission over fiber optic networks. They consist of a Transmitter Optical Sub-Assembly (TOSA), a Receiver Optical Sub-Assembly (ROSA), and supporting circuitry for signal processing and control. Modules are available in various form factors, such as SFP, SFP+, and BIDI, and are designed for specific distances and fiber types.

Distance ClassificationsShort-Distance Modules (up to 2 km)Typically use 850 nm wavelength on multimode fiber (OM1/OM2). Common in data centers and server rooms. Example: 1G SFP modules can transmit up to 550 m, while 10G modules reach around 300–400 m.

Advantages: Low cost, low power consumption, and suitable for high-density environments.

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Medium-

Distance Modules (10–20 km)Use 1310 nm wavelength on single-mode fiber (SMF). Suitable for campus networks and metro links. Example: 1.

25G SFP modules can reliably cover distances up to 20 km. These modules balance cost and reach, providing moderate optical power budgets.

Long-

Distance Modules (30 km and above)Use 1310 nm or 1550 nm wavelengths on single-mode fiber. Designed for metropolitan, regional, or long-haul networks. Variants include LX, EX, ZX, ER/LR SFPs, supporting distances from 10 km up to 80 km or more.

Require higher optical power and precise alignment, often with digital diagnostics monitoring (DDM) for performance tracking.

Key Considerations

Wavelength Selection: Longer wavelengths (1550 nm) experience lower attenuation, making them ideal for long-distance transmission. Fiber Type: Multimode fibers are used for short distances, while single-mode fibers are required for medium and long distances. Power Budget: Ensure the module's transmit and receive power levels match the fiber link's loss budget.

Compatibility: Verify module support with network equipment to avoid port errors or unsupported transceiver issues. Environmental Conditions: Industrial-grade modules may be needed for extreme temperatures or outdoor deployments.

Summary

Choosing the right optical module depends on distance, wavelength, fiber type, and network equipment compatibility. Short-distance modules are cost-effective for data centers, medium-distance modules suit campus networks, and long-distance modules are essential for metro and long-haul links. Proper selection ensures reliable, high-speed optical communication across the intended network span.

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Article Content

Long Distance Transceiver: Types, Reach and Selection Guide

Complete guide to long distance transceivers covering 10km to 120km optics, 1310nm vs 1550nm, ER/ZR modules, link budget calculation, and deployment best practices.

1.25G SFP 550m vs 20km vs 80km: Which One

Compare 1.25G SFP 550m, 20km, 40km, and 80km modules by distance, fiber type, and cost. Make the right choice — the first time.

10G Optical Modules: Short-Range vs. Long-Range

Understand short-range and long-range 10G optical modules in terms of distance, budget, energy use, and scalability to make the right choice.

How to Choose SFP Module for Compatibility, Speed, and Distance

Learn how to choose the right SFP module based on compatibility, speed, fiber type, wavelength, and distance. Practical guide for engineers and IT buyers.

SFP Optical Transceiver Modules for Long Distance: A Complete

Discover everything you need to know about SFP optical transceiver modules for long-distance fiber transmission. Compare LX, EX, ZX models and choose the right module for your

The Most Comprehensive Guide Of Optical Modules

Explore the ultimate guide to optical modules. Learn types, functions, performance metrics & how to choose the right module for your fiber network.

Basic Knowledge Of Optical Module Transmission Distance

Optical modules are generally categorized into short-range (less than 2 km), medium-range (10 km to 20 km), and long-range (more than 20 km) based on their transmission ...

What Are Long-Distance Optical Modules? Guide to Types, Specs,

Different network segments and applications require modules with specific characteristics. In this article, Svelol explores the specifics of long-distance optical modules, their applications, types,

Things You Need to Know About Optical Modules and Wavelengths

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Multi-mode optical modules are used for short-range (SR) transmission, whereas single-mode optical modules are used for long-range (LR), extended-range (ER), and ze-best-range (ZR)...

What is the difference between LX and LR SFP□

Here are the main differences between LX and LR SFP modules: LX typically stands for "Long-Reach" in the context of SFP modules. LX modules are commonly used for longer-distance

Optic Modules Datasheet

Features and Benefits The following table lists the different pluggable optic modules and supported platforms, along with the technical specifications for each.

400G vs 800G Optical Modules: Differences, Use Cases, and

Compare optical modules for data centers and AI clusters. Learn key differences in standards, power, cabling, and use cases.

Which of the following is/are correct about

Which of the following is/are correct about BIDI SFP? □ A. It uses only 1 fiber core for both Tx and Rx B. Connected interface should have different Tx wavelength to avoid interference and work properly. C.

Optical Transceivers | Coherent

Get the pluggable module performance you need from the manufacturer of choice for all major networking equipment vendors worldwide.

Optical Modules Market Research Report 2034

Optical Modules Market Outlook 2025-2034 The global optical modules market was valued at $14.8 billion in 2025 and is projected to reach $39.6 billion by 2034, advancing at a compound annual

EML vs VCSEL vs CW Laser: Optical Transceiver Guide (2025)

Compare EML, VCSEL, and CW laser technologies in optical transceivers. Covers cost, reach, speed, the 2025 EML shortage, and silicon photonics alternatives.

Differences Between Optical Modules SFP, SFP+, CFP, XFP, QSFP?

Originally designed to replace single-channel SFPs with high-density optical modules, the QSFP is only 30% larger than a standard SFP module. The device supports rates from 100Mbps to

HTF DWDM equipment,OTN Solution,QSFP28 OSFP

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