

How many kilometers does the optical module take



Overview

transceiver module transmission distance
if you've worked in network engineering long enough, you've likely come across a common, Basic Knowledge Of Optical.

Key Takeaways

The appropriate transmission distance for an optical module depends on its wavelength, data rate, and fiber type, ranging from a few hundred meters for multimode modules to over 160 km for single-mode modules at 1550 nm.

Key Factors Affecting Distance

1. Wavelength:

- 850 nm: Typically used with multimode fiber. Transmission distances are short: 100 Mbps up to 2 km, 1 Gbps up to 550 m, 10 Gbps up to 300 m, 40 Gbps up to 400 m, and 100/400 Gbps up to 100 m .
- 1310 nm: Lower attenuation (~ 0.35 dB/km). Multimode fiber supports up to 2 km, while single-mode fiber can reach up to 40 km. Higher-speed modules (100G) may reach 500 m on multimode .
- 1550 nm: Lowest attenuation (~ 0.19 dB/km). Single-mode modules can transmit 100 Mbps and 1 Gbps up to 160 km, and 10 Gbps up to 80 km. For distances ≥ 40 km, CWDM or DWDM modules are typically used .

2. Fiber Type:

- Multimode fiber (MMF): Shorter distances due to modal dispersion. OM3, OM4, and OM5 fibers improve bandwidth and extend reach slightly, but generally under 500 m for high-speed modules .
- Single-mode fiber (SMF): Supports much longer distances, especially at 1310 nm and 1550 nm, suitable for metro and long-haul networks .
- 3. Data Rate: Higher data rates reduce maximum distance due to increased signal attenuation and dispersion. For example, 10G modules transmit shorter distances than 1G modules on the same fiber type .
- 4. Module Type and Standards: Short-reach (SR) modules are designed for short distances on multimode fiber, while long-reach (LR, ER, ZR) modules are optimized for single-mode fiber and longer distances. Protocols and optical power budgets also influence achievable distance .

Practical Guidelines

- Short-reach (SR) multimode modules: Typically under 500 m, suitable for data centers and campus networks.
- Long-reach (LR) single-mode modules: Can reach 10–80 km depending on wavelength and data rate, suitable for metro networks.
- Extended-reach (ER/ZR) modules: Can exceed 100 km, often using 1550 nm with DWDM for long-haul applications . In summary, the "enough" distance for an optical module depends on your network requirements. For short intra-building links, multimode SR modules suffice. For inter-city or long-haul links, single-mode LR or DWDM modules at 1310–1550 nm are necessary to achieve distances from tens to hundreds of kilometers.

Article Content

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

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Wavelength and Transmission Distance of Optical Transceiver Modules

The transmission distance of optical transceiver modules is divided into short distance, medium distance, and long distance. Usually,

Optical module transmission distance

The optical module used with multimode optical fiber has short transmission distance. Let's take a look at the calculation

Wavelength and Transmission Distance of Optical Transceiver Modules

Under 1310nm wavelength, 100Mbps, 1Gbps, 10Gbps, 40Gbps, and 100Gbps optical transceiver modules can transmit up to 40km,

Calculating Fiber Loss and Distance Estimates

Estimate the maximum fiber distance if optical budget and loss variables are known. Loss variables are connectors, splices and

Optical module

An optical module is a typically hot-pluggable optical transceiver used in high-bandwidth data communications applications. Optical

Indicator 1: Cable length

Indicator 1: Transmission network length (Route kilometers) Definition: Transmission network length refers to the physical length of

How many kilometers does a Huawei gigabit optical module travel

Overview Operating at 1 Gbps (1000BASE-LX), this single-mode transceiver provides stable and secure data transmission over

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

