

RIVO MULTITRADE OPTICAL SYSTEMS

Long-distance optical modules for short-distance transmission



Overview

The Difference Between Long-distance Optical Modules In practical applications, long-distance optical modules are often unable to reach their “Understandin.

Key Takeaways

Long-distance optical modules can technically operate over short distances, but doing so may lead to performance issues, higher costs, and unnecessary complexity. Technical Considerations

Long-distance optical modules are designed for extended reach, typically 40 km or more over single-mode fiber (SMF) using wavelengths like 1310 nm or 1550 nm to minimize attenuation and support stable signal propagation in metro or carrier networks . They have strict receiver sensitivity requirements, meaning that if the transmitted laser power is too high for a short link, it can overload the receiver, potentially causing module failure or degraded performance . Additionally, long-distance modules are optimized for single-mode fiber and may not function properly on multimode fiber used in short-distance applications.

Practical Implications

Using a long-distance module for a short link (e.g., a few hundred meters in a data center) is generally inefficient:

- Cost: Long-distance modules are more expensive than short-reach modules due to higher-quality lasers and stricter specifications .

- **Power mismatch:** Excess optical power can exceed the receiver's operable range, risking damage or signal errors .
- **Unnecessary features:** Long-distance modules often include capabilities like dispersion compensation or support for optical amplification, which are irrelevant for short links . Short-distance modules, such as 40GBASE-SR4 or 100G-SR4, are optimized for multimode fiber and short links (up to 150 meters on OM4 fiber), using lower-cost 850 nm lasers and simpler interfaces like MPO/MTP or LC duplex connectors . They are more suitable for data center interconnects, server racks, and indoor networks.

Recommendations

- **Match module to distance:** For links under 500 meters, use short-reach modules to avoid overpowered signals and reduce costs .
- **Consider fiber type:** Long-distance modules require single-mode fiber; short-distance modules typically use multimode fiber.
- **Check link budget:** Ensure the optical power and receiver sensitivity are compatible with the actual link length.
- **Avoid overspending:** Purchasing long-distance modules for short links is often unnecessary and may complicate network management . In summary, while long-distance optical modules can operate over short distances, it is generally not recommended due to potential receiver overload, higher costs, and wasted capabilities. For short links, short-reach modules are more efficient, cost-effective, and reliable.

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

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