# What does LR4 mean for optical modules



## Overview

Compare 100G LR vs LR4 optical modules. Learn about NRZ vs PAM4 modulation, channel differences, and which module fits your network needs best.

## Key Takeaways

An LR4 optical module is a long-range, four-channel transceiver designed for high-speed data transmission over single-mode fiber, typically supporting distances up to 10 kilometers. What LR4 MeansLR4 stands for "Long Range 4", where "Long Range" indicates the module is designed for extended-distance transmission over single-mode fiber (SMF), and the "4" denotes that it uses four separate optical channels to transmit data in parallel. Each channel typically carries 25 Gbps in a 100G LR4 module, combining to achieve a total data rate of 100 Gbps.

For 400G LR4 modules, the principle is similar but scaled to higher aggregate speeds using multiple lanes.

### Technical Details

Wavelengths: LR4 modules use four distinct wavelengths (commonly 1295 nm, 1300 nm, 1305 nm, and 1310 nm) for bidirectional communication over a single fiber pair. Modulation: Most 100G LR4 modules use NRZ (Non-Return-to-Zero) modulation, which provides a higher signal-to-noise ratio, while newer single-lambda 100G LR modules may use PAM4 for more efficient bandwidth utilization. Transmission Distance: Typically up to 10 kilometers over standard single-mode fiber (OS2), making it suitable for metro, regional, and inter-data center connections.

© 2026 CGWEB NETWORK INFRASTRUCTURE - All rights reserved

Connectors: LR4 modules generally use duplex LC connectors for single-mode fiber connections. Multiplexing: The four channels are multiplexed at the transmitter and demultiplexed at the receiver, allowing a single fiber pair to carry multiple wavelengths simultaneously. ApplicationsLR4 optical modules are commonly used in scenarios requiring long-distance, high-bandwidth connections, such as: Interconnecting data centers within a metropolitan areaEnterprise network backbonesTelecom and service provider infrastructureHigh-speed links in campus or regional networks Comparison with Other ModulesSR4 (Short Range 4): Uses multimode fiber for short distances (up to 300 meters) and four parallel channels.

ER4 (Extended Range 4): Supports longer distances (up to 40 km) with higher optical power. FR4 (Fiber Range 4): Designed for intermediate distances, typically up to 2 km. In summary, LR4 modules are optimized for long-distance, high-speed optical transmission using four parallel channels over single-mode fiber, making them a standard choice for 100G and 400G Ethernet links where distance and reliability are critical.

## Article Content

100G LR vs LR4: Key Differences & Applications Guide

Compare 100G LR vs LR4 optical modules. Learn about NRZ vs PAM4 modulation, channel differences, and which module fits your network needs best.

LR4 vs LR1 Transceivers – MapYourTech

100GBASE-LR4 (commonly known as LR4) is a mature optical transceiver standard introduced in 2010 as part of IEEE 802.3ba. It achieves 100 Gigabit per second (Gbps) transmission

400G QSFP-DD LR4 Optics: Architecture, Specs and Application

Within the 400G transceiver family, LR4 modules are designed specifically for longer-distance single-mode fiber links. Different 400G module types target different transmission distances and fiber

100G QSFP28 CWDM4 vs. LR4 vs. PSM4 vs. ER4 vs. SR4

LR4: LR4, which means Long Range 4, is a 100G transceiver that employs four separate optical channels to transmit data over a longer distance. It can cover distances of up to 10 kilometers

400G SR4 vs DR4 vs FR4 vs LR4: What Are the Differences and How

LR4: Designed for long distances up to 10km, uses LWDM technology, and can achieve inter-campus or long-distance connections. For those with clear requirements who want to make a

*© 2026 CGWEB NETWORK INFRASTRUCTURE - All rights reserved*

Choosing the Right Fiber Optic Transceiver: 100GBASE-LR vs.

This article examines 100GBASE LR and LR4 optic transceivers, detailing performance characteristics, selection criteria, and differences to guide your choices.

100GBASE-LR4 Specifications: Long-Range Optical Standards

To determine whether a 100GBASE-LR4 module will actually work in your network, you need to interpret its optical parameters in practical terms. This section translates key datasheet values into real-world

SR4 vs LR4 vs ER4 vs ZR4: Which 100G QSFP28 Module Should

LR4 uses Wavelength Division Multiplexing (WDM). Instead of four fibers, it sends four wavelengths (1295, 1300, 1305, 1310nm) over one fiber pair (Tx and Rx). Each lane runs at 25.78

100G Optical Module: How to Choose Between SR4, DR4, FR4, LR4,

Long-distance modules (e.g., LR4/ER4) may have higher costs but offer reliable performance, justifying the investment for critical links. Today, we''ve delivered a clear and

100GBASE QSFP-100G Modules Data Sheet

It also interoperates with Cisco''s QSFP100 and CPAK IEEE 100GBASE-LR4 modules up to 10km. Cisco QSFP-100G-B20U4-I and QSFP

100G Optical Module: How to Choose Between SR4, DR4, FR4, LR4,

Continuing our discussion on 100G optical modules, let''s explore the essential 100G transmission standards—SR4, DR1, DR4, BiDi SR, LR4, CWDM4, SWDM4, ER, and ZR. These

Why Are PCB Concept Stocks Surging? Morgan Stanley Report

Morgan Stanley forecasts that the global AI optical module PCB market will grow more than fivefold over the next three years, with an annual compound growth rate of 83%. Kingboard

100 Gigabit Ethernet

A networking device may support different PHY types by means of pluggable modules. Optical modules are not standardized by any official standards body but are in multi-source agreements (MSAs). One

Understanding High-Speed Transceiver Tests | 100G & 400G Optical ...

*© 2026 CGWEB NETWORK INFRASTRUCTURE - All rights reserved*

In this article, we''ll explain why high-speed optical transceiver testing matters, which tests are most important, and how to choose modules that deliver long-term stable performance.

One Minute to Understand: What Do SX, LX, EX, ZX, SR, LR, ER,

(Including 1.25G, 10G, 25G, 40G, 100G, and 400G Optical Modules) At Sate Optics, we often get asked what those abbreviations like SX, LX, SR, LR4 actually mean when it comes to fiber

One Minute to Understand: What Do SX, LX, EX, ZX, SR ...

□□ One Minute to Understand: What Do SX, LX, EX, ZX, SR, LR, ER, ZR, DR, FR, LR4 Mean? (Including 1.25G, 10G, 25G, 40G, 100G, and 400G Optical Modules) At Sate Optics, many

100G QSFP28 SR4 vs LR4 vs CWDM4: The Architect''s Selection Guide

LR4 modules contain an internal Thermo-Electric Cooler (TEC) to stabilize wavelength drift across multiple LAN-WDM channels. If switch airflow is restricted or hot aisle containment is

What''s so great about LR compared to LR4 optics?

So that''s the sequence of events in a nutshell. As for what''s so great about 100G LR from the network operator perspective: Like all Single-Lambda 100G optics, 100G LR offers seamless

Related Video Reference

This video was associated with the source search result. Verify technical details against current product documentation and project requirements.

*© 2026 CGWEB NETWORK INFRASTRUCTURE - All rights reserved*

## Contact Us

Continue your research online:

Website: https://cgweb.co.za
Technical inquiry: https://cgweb.co.za/project-enquiry.html

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

© 2026 CGWEB NETWORK INFRASTRUCTURE - All rights reserved