Fiber optic transceiver single-mode interface



Overview

The 1000BASE-ZX SFP operates on standard single-mode fiber-optic link spans of up to approximately 70 km in length.

Key Takeaways

A single-mode fiber optic interface transmits light through a narrow core, supporting only one propagation mode for long-distance, high-bandwidth communication.

Overview of Single-

Mode FiberSingle-mode fiber (SMF) is designed to carry a single transverse mode of light, typically using a core diameter of 8–10 micrometers, which minimizes modal dispersion and allows signals to travel over distances up to 100 kilometers without regeneration. Unlike multimode fiber, which supports multiple light paths, single-mode fiber ensures high signal integrity and low attenuation, making it ideal for backbone networks, long-haul telecommunications, and data center interconnects.

Technical Specifications



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Core Diameter: ~9 µmCladding Diameter: 125 µmWavelengths: Commonly 1310 nm and 1550 nm for long-distance transmission Bandwidth: Theoretically unlimited due to single-mode propagationStandards: ITU-T G. 652 (standard single-mode) and G. 657 (bend-insensitive variant) define performance and compatibility Light Source: Typically laser diodes or distributed feedback lasers for precise coupling into the narrow core Single-Mode Interface TypesSingle-mode fiber interfaces are defined by connector types and transmission standards: Connectors: LC, SC, ST, and FC are common, with LC being widely used in high-density applications.

Transmission Windows: C-band (1530–1565 nm) and O-band (1260–1360 nm) are standard for telecom and DWDM systems. Deployment: Supports GPON, 5G fronthaul, and DWDM networks, enabling future-proof upgrades without replacing the fiber.

Advantages Over Multimode Fiber

Longer Distance: Single-mode fiber can transmit over tens of kilometers without repeaters, whereas multimode is limited to a few hundred meters. Lower Attenuation: Narrow core reduces signal loss and modal dispersion. Higher Bandwidth: Supports high-speed data transmission and dense wavelength division multiplexing (DWDM) systems.

Practical Considerations

When deploying a single-mode interface, it is important to match the fiber type, connector, and wavelength to the network requirements. Proper alignment and splicing techniques are critical due to the small core size, and bend-insensitive fibers (G. 657) are recommended for environments with tight routing or frequent handling.

In summary, a fiber optic single-mode interface is optimized for long-distance, high-bandwidth communication, using a narrow core to transmit a single light mode with minimal signal loss, and is widely standardized for modern telecom and data networks.

Article Content

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These 40 Gbit/s fiber-optical interfaces using QSFP+ transceivers can be found on the Z9000 distributed core switches, S4810 and S4820 as well as the blade-switches MXL and the IO-Aggregator.

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Cisco 40GBASE QSFP Modules Data Sheet

Cisco QSFP-40G-SR-BD (40G BiDi) The Cisco QSFP 40-Gbps BiDirectional (BiDi) transceiver (Figure 1) is a pluggable optical transceiver with a duplex LC connector interface for short

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As a follow-on to Marvin''s comments. To determine if an optical transceiver (transmitter and receiver pair) is operating at the appropriate signal levels, the data sheets for the appropriate

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