

What is a single-mode single-fiber optical module



AI Overview

Single-mode single-fiber optical modules (BiDi transceivers) enable full-duplex communication over a single optical fiber using different wavelengths for transmitting and receiving, ideal for long-distance, high-speed networks.

Overview Single-mode single-fiber optical modules, often called bidirectional (BiDi) transceivers, are designed to transmit and receive data over a single strand of single-mode fiber (SMF). Unlike dual-fiber modules that use separate fibers for transmitting (TX) and receiving (RX), single-fiber modules use Wavelength Division Multiplexing (WDM) to carry upstream and downstream signals simultaneously on the same fiber. This approach reduces fiber usage, lowers deployment costs, and simplifies cabling in environments with limited fiber availability.

Technical Characteristics

- Fiber Type:** Single-mode fiber with a narrow core ($\sim 9 \mu\text{m}$) and $125 \mu\text{m}$ cladding, optimized for long-distance transmission.
- Wavelengths:** Typically, one wavelength is used for TX and a complementary wavelength for RX (e.g., 1271 nm for TX and 1331 nm for RX).
- Transmission Distance:** Supports long-range communication, often from 2 km up to 120 km depending on module type and network design.
- Speeds and Form Factors:** Available in various transceiver types such as SFP, SFP+, SFP28, QSFP, QSFP28, QSFP-DD, and OSFP, supporting speeds from 1 Gbit/s to 800 Gbit/s.
- Interface:** Commonly uses LC connectors for single-fiber connections.

Advantages

- Fiber Efficiency:** Doubles the capacity of a single fiber by enabling bidirectional communication.
- Cost Savings:** Reduces CAPEX and OPEX by minimizing fiber procurement, trenching, and maintenance.
- Space Optimization:** Lower cable density and simpler patching in data centers or metro networks.
- Long-Distance Capability:** Single-mode fiber allows high-speed transmission over long distances with minimal signal loss.

Applications Single-...

Article Content

Ubiquiti 10 Gbps Bidirectional Single-Mode Optical Module

Ubiquiti 10 Gbps Bidirectional Single-Mode Optical Module Single-mode, simplex, fiber transceiver module. The 10 Gbps Bidirectional Single-mode Optical Module is a simplex transceiver that delivers

Single Mode vs. Multimode Fiber Optic Cables

There are two main types of fiber optic cables: single mode fiber and multimode fiber. Single mode fiber optic cables feature a narrow core diameter, allowing only a single mode of light to

Cisco 10GBASE SFP+ Modules Data Sheet

The Cisco 10GBASE-ER Industrial Temperature Module supports a link length of up to 40 kilometers on standard Single-Mode Fiber (SMF, G.652). The SFP-10G-ER-I for Industrial Operating Temperature

Understanding Single Mode Fiber Optic Cable: A Comprehensive Guide

It comprises one glass or plastic fiber and features a tiny core of about 8-10 microns in diameter. This small core permits only one light mode to propagate through the cable, minimizing

Select The Right Fiber Patch Cables For 1G/10G/25G Modules

Deploying optical modules requires the right fiber patch cable. It directly affects network connection stability, performance, and maintenance. This article will explain how to pick the right fiber

What is Optical Transceiver: A Beginner Guide (2024)

What is an Optical Transceiver? An optical transceiver, also known as a fiber optic transceiver or optical module, is a small packaged device that uses fiber optic technology to transmit

What Are Fiber Modes? Single-Mode vs. Multi-Mode

Single-Mode Fiber (SMF) is engineered with an extremely narrow core, typically 8 to 10 micrometers in diameter. This physical constraint restricts the light to a single propagation path or

The Key Differences Between 1-core, 2-core, Single Mode, and Multi

Single Mode fibers have a smaller core, allowing light to travel in a single, straight path, ideal for long distances with less signal loss. Multi-mode fibers have a larger core, allowing...

Ubiquiti 1 Gbps Bidirectional Single-Mode Optical Module

Ubiquiti 1 Gbps Bidirectional Single-Mode Optical Module The 1 Gbps Bidirectional Single-mode Optical Module is a simplex transceiver that delivers up to 1.25 Gbps speed over distances up to 3

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 Difference Between Single/Dual Fiber and Single/Multi-Mode

Most single-fiber modules are single-mode due to the complexity and cost of wavelength multiplexing in multi-mode applications. However, while they are conceptually independent, in

Single-mode vs Multimode SFP 2026: Fiber Types and distances

A guide to single-mode vs multimode SFP modules. Covers fiber types, wavelengths, distances, BiDi, CWDM/DWDM, SMF vs MMF selection, and application scenarios.

Single Mode vs. Multimode Fiber Optic Cables

There are two main types of fiber optic cables: single mode and multimode. Although they can do the same job in some instances, the different construction methods make each of them better

Single-Mode Optical Fiber

Dual-mode optical fiber having a larger core diameter than single-mode optical fiber, without sacrificing bandwidth, was proposed as an alternative to single-mode optical fiber.

BiDi SFP: The Complete Guide to Bidirectional SFP Transceivers and ...

BiDi SFP (Bidirectional Small Form-Factor Pluggable) transceivers have emerged as a powerful solution, enabling full-duplex communication over a single optical fiber. By using

Single Mode SFP vs Multimode SFP: What the Differences Are

A single-mode SFP is specially used with the 9/125µm single-mode fiber (SMF) but can not be used with multimode fiber cable. It utilizes ultra-low optical attenuation for medium to long

How to distinguish whether an optical fiber module is single-mode or ...

Correctly distinguishing single-mode and multi-mode optical modules is critical for matching fiber patch cords, ensuring transmission stability, and avoiding network failures.

The Key Differences Between 1-core, 2-core, Single Mode, and Multi-mode ...

o In optical modules, "core" refers to the light-transmitting channel in the fiber. A 1-core module uses a single fiber core for data transmission, while a 2-core module uses two cores.

Fiber Optic Transceiver Guide | PHILISUN

A fiber optic transceiver (also called an optical transceiver) is a compact module that both transmits and receives data signals through optical fibers. It serves a dual purpose — transmitting

Single-Mode Fiber Cable Guide: Types, Specs & Selection

What Is Single-Mode Fiber Optic Cable? Single-mode fiber optic cable (SMF) is a type of optical fiber designed to carry a single ray of light mode directly down the fiber core.

What is an Optical Transceiver? – VCELINK

What are Optical Transceivers? The optical transceiver, also simply known as an optical module or fiber optic transceiver, is an integration of a

Single-Mode Optical Fiber

Single-mode fiber allows only one transmission mode. It can transmit higher bandwidth than multimode fiber but requires a light source with a limited spectral range.

Single Mode vs Multimode Fiber, What is The Difference?

Learn the key differences between single mode vs multimode fiber cables and choose the right one for your fiber optic system.

How to Choose the Right Fiber Optic Cable for Your Optical Transceiver

How to Choose the Right Fiber Optic Cable for Your Optical Transceiver Selecting the right optical transceiver is only half of building a reliable fiber network. Many network failures that appear

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