

Dual-fiber optical module types



Overview

What Is a Dual Fiber SFP? Dual fiber SFPs are the traditional and more widely used type of optical transceivers.

Key Takeaways

Dual-fiber optical modules use two fibers for simultaneous transmit and receive, supporting speeds from 1Gbps to 400Gbps over multi-mode or single-mode fiber with varying reach depending on the module type.

Dual-fiber optical modules, also called duplex modules, transmit and receive data over two separate fibers—one for TX (transmit) and one for RX (receive). They are widely used in Ethernet, telecom, and data center networks. Common form factors include SFP+, QSFP, QSFP-DD, OSFP, and CFP2, each supporting different speeds and distances depending on the fiber type and wavelength .

Key Specifications

- Speed and Standards:
- SFP+ modules: up to 10Gbps, compliant with IEEE 802.3ae 10GBASE-SR .
- QSFP and QSFP-DD: 40G to 400G, supporting 40GbE, 100GbE, 200GbE, and 400GbE standards .
- OSFP 800G modules: support 2x400GE, 4x200GE, and 8x100GE breakouts .
- CFP2 BiDi modules: support up to 400Gbps using dual-laser bidirectional transmission over a single fiber pair .

- Fiber Type:
 - Multi-mode fiber (MMF): OM3/OM4, typically for short-reach applications (up to 300m for 10G SFP+ modules, up to 70m–100m for 400G QSFP-DD over OM4), .
 - Single-mode fiber (SMF): for long-reach applications, ranging from 1km to 80km depending on module type .
- Connector Types:
 - Duplex LC connectors for SFP/SFP+ modules .
 - MPO-12 or MPO-16 APC connectors for high-speed QSFP-DD and OSFP modules .
- Reach:
 - SFP+ 10G over MMF: up to 300m .
 - QSFP-DD 400G over parallel MMF: up to 70m–100m; over SMF: up to 10km .
 - OSFP 800G VR8 modules: up to 50m over OM4/OM5 MMF .
 - CFP2 BiDi 400G: supports single-fiber bidirectional transmission with external combiner for TX/RX .
- Electrical and Mechanical Compliance:
 - SFP+ modules: SFF-8431 electrical interface, hot-pluggable .
 - CFP2 modules: 104-contact card-edge interface, mechanically compliant with CFP2 MSA .
 - QSFP-DD/OSFP: compliant with IEEE 802.3 and OSFP MSA standards .
- Additional Features:
 - Low power consumption and EMI shielding for high-density deployments .
 - Support for Versatile Diagnostic Monitoring (VDM) and firmware upgrades in OSFP/CFP2 modules .
 - Forward Error Correction (FEC) for high-speed links .

Deployment Considerations

- Modules must be paired correctly with compatible transceivers and switches.
- Proper optical attenuation is required for short links to prevent receiver damage .
- Dual-fiber modules are ideal for duplex communication, while BiDi modules allow bidirectional transmission over a single fiber pair, reducing fiber count in constrained environments .

- Multi-rate modules (e.g., 25G/10G SFP+) provide flexibility for network upgrades . Dual-fiber optical modules provide a scalable, high-performance solution for modern data centers and enterprise networks, supporting a wide range of speeds, distances, and fiber types while maintaining interoperability with IEEE standards and industry MSA specifications.

Article Content

The Difference Between Single/Dual Fiber and

Dual fiber modules use two separate fibers: one for transmitting (TX) and one for receiving

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,

SFP Module: What's It and How to Choose It?

The SFP transceiver module is not standardized by any official standards body but rather by a multi-source agreement

The Most Comprehensive Guide Of Optical Modules

Explore the ultimate guide to optical modules. Learn types, functions, performance metrics

Which Optical Module Should You Choose: Single-Fiber or Dual

When designing or upgrading a fiber network, one key decision is whether to use dual-fiber or single-fiber (BiDi)

SFP Modules: Types, Selection Guide & Applications

Dual Media Support: Works with both fiber optic cables (single-mode and multimode) and copper cables (twisted-pair),

Choosing the Right SFP: Single Fiber vs Dual Fiber

What Is a Dual Fiber SFP? Dual fiber SFPs are the traditional and more widely used type of optical transceivers.

Single Fiber vs Dual Fiber Transceivers Understanding the Key

A dual fiber optical transceiver uses two separate fibers—one for transmitting and the other for receiving data. This

Guide to 10G SFP+ Modules: LRM, SR, LR, ER, ZR

The following are several popular 10G SFP+ dual-fiber optical modules from ETU-LINK: The selection of 10G SFP+

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

o In optical modules, "core" refers to the light-transmitting channel in the fiber. A 1-core module uses a single fiber

Difference Between Single and Dual Fiber Optical Transceivers

Know the key differences between Single and dual-fiber optical transceivers for efficient network deployment and

Things You Need to Know About Optical Modules and Wavelengths

Bidirectional (BiDi) optical module: An optical module that transmits data through only one fiber. Unlike general optical

Comprehensive Guide to Optical Transceiver Classifications and Common Types

Systematic classification of optical modules by data rate, form factor, transmission distance, and fiber type.

What is the Difference Between Single Fiber and Dual Fiber SFP?

But when choosing the right fiber optic module, you might come across two types: single fiber and dual fiber SFP

What is the difference between single fiber and dual fiber optical ...

The dual fiber optical module has two ports, TX is the transmitting port and RX is the receiving port. Two different

How to Choose SFP Module | FIBEYE

Price Single-mode modules are typically more expensive than multi-mode modules because they use more components and more

Single-Fiber vs. Dual-Fiber Optical Modules: Understanding ...

Dual-fiber modules use two optical fibers: One fiber is dedicated to transmitting (TX). The other fiber is dedicated to

Common SFP Optical Module Types and Selection Guide – Fibridge

Beyond standard dual-fiber transceivers, specialized optical module architectures exist to address bandwidth

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