

Transmit and receive wavelengths of single-core optical modules



Overview

BiDi SFP modules enable bidirectional transmission over a single-mode fiber using paired wavelengths. They are available across 155M, 1G, and 10G speeds, supporting both legacy and modern networks.

Key Takeaways

Single-core (BiDi) optical modules transmit and receive simultaneously over one fiber using two distinct wavelengths, typically 1310 nm and 1550 nm, with each module's Tx and Rx wavelengths reversed at the opposite end.

How Bi

Di Modules WorkBiDi (bidirectional) SFP modules enable full-duplex communication over a single strand of single-mode fiber by using Wavelength Division Multiplexing (WDM). Each module contains a transmitter (Tx) and receiver (Rx) that operate on different wavelengths, allowing simultaneous sending and receiving of optical signals on the same fiber (). Inside the module, a BOSA (Bi-Directional Optical Sub-Assembly) integrates the TOSA (transmitter) and ROSA (receiver) with an optical filter to separate the wavelengths ().

Typical Wavelength Pairs



Common configuration: One module transmits at 1310 nm and receives at 1550 nm, while the paired module transmits at 1550 nm and receives at 1310 nm ().

Alternative configurations: Depending on the network and module type, some BiDi modules may use other wavelength pairs, but the principle remains the same: opposite wavelengths at each end to ensure proper signal separation and avoid interference ().

Deployment Considerations

Matched pairs: BiDi modules must be deployed in matched Tx/Rx pairs; using two identical modules at both ends will prevent the link from initializing (). Laser type: High-speed networks (10G+) often require DFB lasers to mitigate chromatic dispersion over longer distances (). Thermal drift: Low-cost FP-based BiDi modules may experience wavelength shifts (~ 0.1 nm/°C), which can cause intermittent packet loss if not accounted for ().

Optical isolation: Integrated filters or WDM components prevent crosstalk between Tx and Rx wavelengths, maintaining signal integrity ().

Advantages

Fiber savings: Only a single fiber is needed for bidirectional communication, reducing infrastructure costs by up to 50% compared to traditional dual-fiber setups ().

Simplified cabling: Fewer fibers and connections reduce potential failure points and streamline network upgrades (). Compatibility: BiDi SFPs are available in multiple speeds, including 1G, 10G, and legacy 155M networks, making them suitable for various enterprise and metro applications ().

In summary, single-core BiDi optical modules achieve simultaneous transmit and receive over one fiber by using two distinct wavelengths, typically 1310 nm and 1550 nm, with reversed roles at each end, and careful pairing and laser selection are essential for reliable operation.

Article Content

Single Strand Mastery: BiDi SFP Architecture

Bidirectional (BiDi) Small Form-factor Pluggable transceivers utilize internal WDM diplexers to transmit and receive optical signals over a single strand of fiber using asymmetric

BiDi SFP Module: A Complete Guide for Fiber Networks

BiDi SFP modules enable bidirectional transmission over a single-mode fiber using paired wavelengths. They are available across 155M, 1G, and 10G speeds, supporting both legacy and modern networks.

The Complete Guide to BiDi Transceiver

This article delves into the intricacies of BiDi optical modules, their operational principles, and the critical role fiber optic choices play in achieving optimal performance.

What Is a Single Fiber SFP? A Complete Guide for Beginners

Single fiber SFP is an optical transceiver that transmits and receives data over a single strand of single-mode fiber by using two different wavelengths, enabling full-duplex communication while reducing

Single-fiber Bidirectional Transceivers

Bidirectional transceivers transmit and receive optical signals through a single fiber, saving optical fiber resources. This is useful where fiber resources are scarce

BiDi Optical Modules: Unlocking Single-Fiber Bidirectional Connectivity

This technology utilizes two different wavelengths, typically 1310 nm for the Transmit (Tx) wavelength and 1550 nm for the Receive (Rx) wavelength, to transmit data in both directions without

Bi-Directional Optical Sub-Assembly (BOSA) | Single-Fiber Full

What is Bi-Directional Optical Sub-Assembly? A Bi-Directional Optical Sub-Assembly (BOSA) is an integrated optical module that combines both transmitting and receiving optical paths in

The Essential Guide to BiDi Transceivers: Everything You Need to Know

BiDi transceiver, a compact optical transceiver with WDM (wavelength division multiplexing) technology and SFP multi-source protocol (MSA) compliance, allows fast data

What is BiDi Transceiver: A Beginner's Guide

What is a BiDi Transceiver? BiDi transceiver, or Bidirectional or simplex optical transceiver, is an optical module that uses Wavelength Division Multiplexing (WDM) technology to

Introduction to BIDI Optical Module.

BIDI optical modules are an efficient solution for single-fiber bidirectional communication, leveraging WDM technology to optimize fiber usage. By understanding their working principles and

Multi-wavelength optical transmitting and receiving modules

The following description relates to multi-wavelength optical transmitting and receiving modules which can be used to multiplex and demultiplex optical signals of multiple wavelengths.

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 Optical Modules

If an optical module is installed in a running device, you can run the display transceiver command to view parameters of the optical module, including the center wavelength, transmission distance, 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 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

Juniper 800G Optical Transceivers and Cables Guide

To efficiently transmit (Tx) and receive (Rx) data in such networks, optical transceivers utilize various types of optics. The following sections provide an overview of these different optics types.

Simplex vs Duplex Fiber Optic Cables: Key Differences & Guide

Because the transmit and receive lines are physically separate, the network achieves native full-duplex communication with standard wavelengths. No wavelength management is

Cisco 40G QSFP+ Transceiver Modules – Network Warehouse

The Cisco 40G QSFP+ transceiver modules portfolio offers customers a wide variety of high-density and low-power 40 Gigabit Ethernet connectivity options.

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