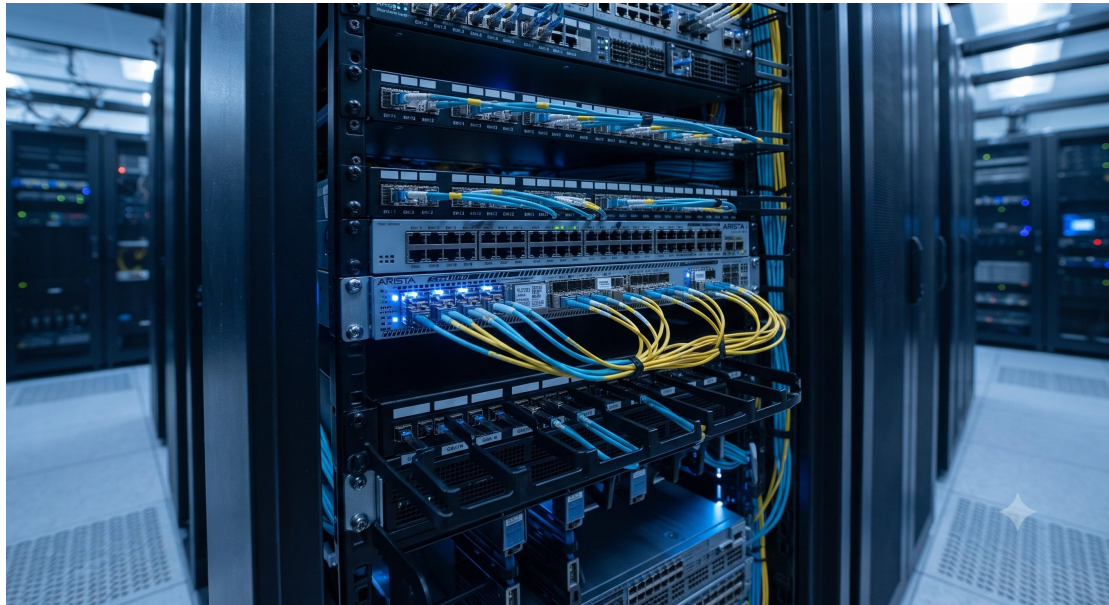


BIDI Transceiver Technology - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

Bidirectional (BiDi) transceiver technology represents a paradigm shift in optical network infrastructure, enabling full-duplex data transmission over a single optical fiber strand. By leveraging Wavelength Division Multiplexing (WDM), BiDi modules effectively double the capacity of existing fiber plants while reducing capital and operational expenditures. This document provides a comprehensive technical overview of BiDi transceiver architecture, operational principles, performance specifications, and application scenarios for carrier-grade and enterprise network deployments. As bandwidth demands continue to accelerate, BiDi technology offers a strategic solution to fiber scarcity, infrastructure cost management, and network scalability challenges .



ARCHITECTURE & CHASSIS DESIGN

The fundamental architecture of a BiDi transceiver is distinguished by its Bidirectional Optical Sub-Assembly (BOSA), which integrates a laser transmitter, a photodiode receiver, and a WDM filter into a single optical subassembly . This integrated design allows the BiDi module to transmit and receive optical signals on different wavelengths through a single simplex LC or SC connector interface .

Wavelength Division Multiplexing (WDM) is the core enabling technology for BiDi modules. The WDM coupler, also known as a diplexer, separates and combines data transmitted over a single fiber based on wavelength . The internal WDM filter is typically implemented using thin-film coating technology, allowing the module to transmit on one wavelength while receiving on a

different, spectrally separated wavelength to prevent signal interference .

Crucially, BiDi transceivers must be deployed in matched pairs with complementary wavelength configurations. For example, a module transmitting at 1310 nm and receiving at 1550 nm must be paired with a module transmitting at 1550 nm and receiving at 1310 nm at the opposite end of the link . This wavelength complementarity ensures proper bidirectional communication over the single fiber link .

HARDWARE FEATURES

BiDi transceiver modules are available in a comprehensive range of form factors and data rates to support diverse network requirements:

- Form Factor Support: SFP (1G), SFP+ (10G), SFP28 (25G), QSFP+ (40G), QSFP28 (100G), and emerging QSFP-DD/OSFP for 400G and 800G applications
- Data Rate Capabilities: From 155 Mbps to 800 Gbps, supporting Ethernet, Fibre Channel, and CPRI protocols
- Wavelength Combinations: Common pairs include 1310/1550 nm, 1310/1490 nm, 1270/1330 nm, and CWDM channel pairs for longer reach applications
- Transmission Distances: Ranging from 100 meters over multimode fiber to 80+ kilometers over single-mode fiber

- Connector Types: Simplex LC (most common), SC, or duplex LC for QSFP form factors

All modules incorporate digital diagnostic monitoring (DDM) features compliant with SFF-8472 standards, providing real-time visibility into parameters such as temperature, supply voltage, bias current, transmit power, and receive power .

COMPLIANCE & STANDARDS

BiDi transceiver modules conform to a comprehensive suite of industry standards:

- SFP/SFP+ MSA (Multi-Source Agreement) compliance ensures interoperability across a wide range of network equipment
- IEEE 802.3ah-2004 (1000BASE-BX) for Gigabit Ethernet single-fiber communications
- ITU-T G.959 and G.691 compliance for optical interface standards
- GR-253-CORE for SONET/SDH network equipment compliance
- Class 1 laser safety compliant with IEC 60825 international safety standards
- RoHS (Restriction of Hazardous Substances) compliant
- Hot-pluggable design allowing module insertion or removal without network

interruption

TECHNICAL SPECIFICATIONS

Parameter	Specification
Form Factor	SFP, SFP+, SFP28, QSFP+, QSFP28
Data Rate Range	155 Mbps to 800 Gbps
Wavelength Pairs	1310/1550 nm, 1270/1330 nm, 1490/1550 nm, CWDM
Transmission Distance	Up to 80+ km (Single-Mode Fiber)
Connector Type	Simplex LC or SC
Operating Temperature	Commercial: 0°C to +70°C Industrial: -40°C to +85°C
Power Supply	Single +3.3V DC
Laser Type	FP/DFB Laser Diode
Receiver Type	PIN or APD Photodiode
Digital Monitoring	SFF-8472 Compliant DDM
Safety Standard	Class 1 Laser, IEC 60825 Compliant
Environmental Compliance	RoHS Compliant

ORDERING OPTIONS

BiDi transceivers are available in multiple operating temperature grades to accommodate various deployment environments:

- Commercial (C-TEMP): 0°C to +70°C for standard enterprise and data center environments
- Extended (E-TEMP): -20 ° C to +85 ° C for outdoor and uncontrolled environments
- Industrial (I-TEMP): -40 ° C to +85 ° C for extreme environments such as industrial and outdoor deployments

The modules support both single-mode fiber (SMF) for long-distance links and multimode fiber (MMF) for short-reach applications, with specific wavelength combinations optimized for each fiber type .

