XPONSHOP OEM Dual-Fiber Bidirectional SFP Transceiver Laser Operating Currents - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

XPONSHOP presents the latest advancement in optical transceiver technology with its OEM Dual-Fiber Bidirectional SFP (Small Form-Factor Pluggable) module, specifically engineered for stringent carrier-grade and enterprise network applications. This datasheet provides a comprehensive technical overview of the device, with a focused deep-dive into the critical parameter of laser operating currents. Designed to support simultaneous transmit and receive operations over two distinct fiber strands, this transceiver is the optimal choice for high-density, high-reliability networks requiring enhanced link budgets and superior signal integrity over extended distances. This document details the hardware architecture, key performance metrics, and absolute maximum ratings, ensuring network architects and procurement specialists have the definitive technical reference for system integration.



HARDWARE ARCHITECTURE & SILICON

The XPONSHOP OEM Dual-Fiber Bidirectional SFP module is built upon a sophisticated optoelectronic architecture that guarantees reliable performance across a wide temperature range. At its core, the device integrates a high-performance 1310nm FP or DFB laser diode for transmission and a sensitive 1550nm or 1490nm (depending on wavelength variant) PIN photodiode for reception, allowing for full-duplex communication on two separate single-mode fibers. The active control circuitry employs an industry-standard Microprocessor Unit (MCU) for precise Digital Diagnostic Monitoring (DDM), enabling real-time tracking of key parameters. The laser driver is optimized for low current consumption while maintaining a high extinction ratio, and the receiver path includes a transimpedance amplifier (TIA) and a limiting post-amplifier to ensure clean output signals. The entire

assembly is housed in a durable, low-EMI zinc-alloy shell, complying with SFP MSA (Multi-Source Agreement) for seamless interoperability with any standard SFP port.

KEY FEATURES & ROUTING LOGIC

- Feature 1: Dual-Fiber Bidirectional Operation: Supports simultaneous data transmission and reception over two independent single-mode fibers (TX and RX), doubling the effective fiber utilization for duplex communication compared to simplex systems.
- Feature 2: Optimized Laser Diode Operating Currents: Engineered for efficiency, the laser operating current is tightly controlled within a predefined window (typically < 80mA @ 3.3V) to minimize power consumption and junction temperature, maximizing Mean Time Between Failures (MTBF).
- Feature 3: Long-Reach Capabilities: Supports optical link distances up to 40km, 80km, or 120km (dependent on specific SKU), driven by high-optical-power laser diodes with robust current biasing for stable output.
- Feature 4: Advanced Digital Diagnostic Monitoring (DDM): Real-time monitoring of laser temperature, bias current, optical output power, receive power, and transceiver voltage via 2-wire serial interface, providing deep insight into the optical link health.
- Feature 5: Industrial Temperature Range: Hardened components ensure stable

laser operating currents and wavelength stability across a wide case temperature range from -40°C to +85°C, suitable for outdoor and unventilated environments.

- Feature 6: ITU-T G.652 Compliant: Optimized for standard single-mode fiber (SMF) and compatible with coarse wavelength division multiplexing (CWDM) and dense wavelength division multiplexing (DWDM) grid variations for backbone applications.

COMPLIANCE & STANDARDS

- Form Factor: SFP (Small Form-factor Pluggable) MSA

- Optical Interface: IEEE 802.3ah / 1000BASE-BX / 100BASE-BX / other relevant standards

- Eye Safety: Compliant with IEC 60825-1 Class 1 Laser Product and FDA 21 CFR 1040.10 and 1040.11

- EMC/EMI: FCC Part 15 Class B, CE Mark EN55022/EN55024

- Environmental: RoHS 2.0 and REACH compliant, ensuring all materials meet global environmental regulatory standards.

- Electrical Interface: Compliant with SFF-8472 for Digital Diagnostic Monitoring

TECHNICAL SPECIFICATIONS

The following table delineates the core absolute and recommended operating conditions for the XPONSHOP OEM Dual-Fiber Bidirectional SFP transceiver. Laser operating current (I_bias) is the pivotal metric for assessing laser health and lifecycle.

Parameter	**Specification**
Form Factor	SFP (Small Form-factor Pluggable), MSA Compliant
Data Rate	100Mbps / 1Gbps / 2.5Gbps (Variant Dependent)
Wavelength (TX / RX)	1310nm / 1550nm or 1490nm / 1550nm
Fiber Type	Dual Simplex Single-Mode Fiber (G.652)
Typical Laser Bias Current (I_bias)	< 80 mA @ 25°C, Vcc = 3.3V
Maximum Laser Bias Current	< 100 mA (Absolute Maximum Rating)
Average Output Optical Power	-9 dBm to +3 dBm (Class 1 Laser)
Receiver Sensitivity	-28 dBm (BER < 1E-12)
Power Supply Voltage (Vcc)	3.14V to 3.47V (Typical: 3.3V)
Total Power Consumption	< 1.2W (Typical)
Case Operating Temperature	-40°C to +85°C (Industrial Grade)
Digital Diagnostic Interface	2-wire Serial, SFF-8472 Rev 12.2

Connector Type	Duplex LC / Simplex LC

ORDERING SKU INFORMATION

- XPON-SFP-BIDI-40KM-T1310/R1550: Dual-fiber, 40km reach, TX-1310nm / RX-1550nm, LC Simplex Interface.
- XPON-SFP-BIDI-80KM-T1490/R1550: Dual-fiber, 80km reach, TX-1490nm / RX-1550nm, LC Simplex Interface.
- XPON-SFP-BIDI-120KM-T1550/R1490: Dual-fiber, 120km reach, TX-1550nm / RX-1490nm, LC Simplex Interface.
- XPON-SFP-BIDI-40KM-T1310/R1490: Dual-fiber, 40km reach, TX-1310nm / RX-1490nm, LC Simplex Interface.

Note: Each SKU includes specific bias current setpoints and alarm thresholds pre-configured in the DDM firmware to ensure optimal laser performance over the lifetime of the module. Consult factory for alternative wavelengths and custom operating current calibrations.

