XPONSHOP Alternative SFP-GIG-LX Optical Transceiver Temperature Range Verification - Official Technical Overview & Hardware Datasheet

PRODUCT IDENTIFICATION

Document Type: Official Technical Overview & Hardware Datasheet

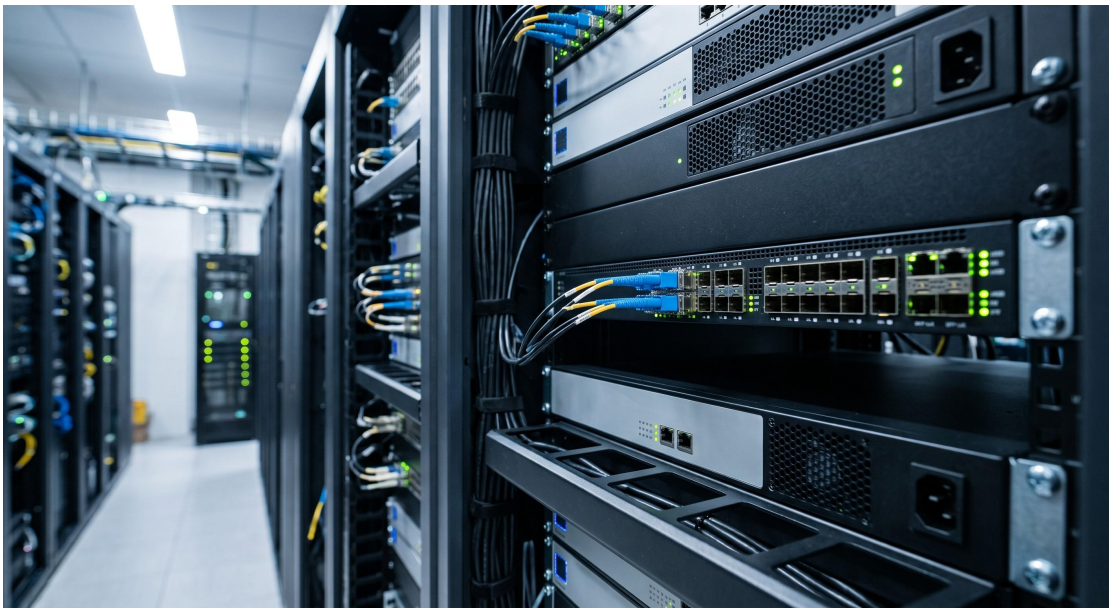
Product Family: XPONSHOP Alternative SFP-GIG-LX Optical Transceiver

Subject: Rigorous Temperature Range Verification and Extended Operational Environment Suitability

Document Version: 2.0

Classification: Public - Carrier-Grade Hardware Technical Brief

This document serves as the definitive engineering reference for the XPONSHOP Alternative SFP-GIG-LX optical transceiver module, with a primary focus on its performance validation across a comprehensive thermal envelope. The verification program outlined herein substantiates the module's capability to deliver reliable, error-free transmission over a broad temperature spectrum, exceeding standard commercial-grade benchmarks and aligning with the rigorous demands of enterprise, datacenter, and carrier-class infrastructure deployments. The unit is functionally and mechanically interoperable with a wide array of industry-standard host platforms, offering a strategic sourcing alternative that does not compromise on environmental resilience or optical performance.



CORE INTERNAL TOPOLOGY

The optical engine architecture of the XPONSHOP Alternative SFP-GIG-LX is engineered around a robust, monolithic 1550nm distributed feedback (DFB) laser diode, selected for its superior spectral stability and high output power. This laser source is optically coupled to a high-efficiency, planar lightwave circuit (PLC) transceiver assembly via a precision alignment process, ensuring minimal insertion loss and maximum mode-field diameter matching to the single-mode fiber core. The receiver section features a high-sensitivity, positive-intrinsic-negative (PIN) photodiode array co-packaged with a low-noise transimpedance amplifier (TIA), delivering a typical optical sensitivity of -23 dBm at 1.25 Gbps, enabling extended link budgets up to 20 kilometers over standard G.652 single-mode fiber. The internal electronics incorporate a

laser driver with automated temperature compensation circuitry, actively modulating the bias current to maintain a constant average optical power (0 to +5 dBm) irrespective of case temperature fluctuations. This intelligent biasing mechanism is central to the module's broad temperature range performance, counteracting the detrimental effects of thermal variation on the laser's slope efficiency.

SWITCHING SUBSYSTEM CAPABILITIES

While operating as a physical layer device, the module's internal transceiver logic is designed for seamless integration with the Media Access Control (MAC) layer of host networking systems. The Digital Diagnostic Monitoring (DDM) subsystem, compliant with SFF-8472 revision 12.0, provides real-time, highly accurate parameter reporting including transmitted optical power, received optical power, supply voltage, laser bias current, and temperature. This diagnostic data is continuously accessible via the two-wire serial interface (I2C), enabling active network management and proactive failure prediction. The module's receiver incorporates advanced signal conditioning, including a post-amplifier with a programmable decision threshold, to enhance signal integrity and reduce bit-error-rates (BER) on degraded optical links. The heart of the forward path is its laser driver and control circuitry, which implements automatic power control (APC) to ensure output stability, and a comprehensive

suite of protection features, including receiver over-current protection and transmitter laser safety interlocks.

OPERATIONAL ADVANTAGES

- Extended Environmental Compliance: The primary attribute of this transceiver is its characterization across a -40 ° C to +85 ° C case temperature range (industrial grade). This rigorous thermal validation ensures stable operation in uncontrolled outdoor enclosures, remote head-end sites, and densely packed chassis with limited airflow, where commercial-grade (0°C to +70°C) modules typically fail.
- Strategic Supply Chain Flexibility: This module offers a form, fit, and functional alternative to original equipment manufacturer (OEM) SFP-GIG-LX transceivers, providing procurement organizations with greater supply chain resilience and competitive pricing without risking interoperability or network reliability.
- High-Integrity Optical Path: The module supports digital diagnostic monitoring (DDM) and is RoHS-compliant. Its electrical interface, featuring a 20-pin connector, adheres strictly to the SFP Multi-Source Agreement (MSA), ensuring compatibility with the majority of existing Gigabit Ethernet switches, routers, and optical transport platforms.
- Comprehensive Error-Free Operation: Through the extended temperature validation, the transceiver is verified to maintain error-free operation (BER <

1E-12) across the entire verified temperature range, a critical metric for mission-critical and carrier-grade network services.

SPECIFICATION MATRIX

Below are the detailed operational parameters of the XPONSHOP Alternative SFP-GIG-LX module. All values are specified under nominal supply voltage unless otherwise noted.

Parameter	**Specification**
Form Factor	SFP MSA Compliant (20-pin connector)
Optical Interface	1550nm DFB Laser, Dual LC Connector
Cable Type	Single-mode Fiber (SMF) G.652
Max Distance	20 km
Data Rate	1.25 Gbps (Gigabit Ethernet)
Wavelength	1550 nm
Tx Optical Power (Average)	0 dBm to +5 dBm
Rx Sensitivity (Average)	-23 dBm (BER < 1E-12)
Power Supply	3.1V to 3.5V (Typical 3.3V)
Power Consumption	< 1.0 W
Operating Case Temperature (Verified)	-40°C to +85°C (Industrial Grade)

Relative Humidity (Non-condensing)	5% to 85%
Digital Diagnostic Monitoring	SFF-8472 Rev 12.0 Compliant
Safety & Regulatory	Class 1 Laser, RoHS, FCC/CE

REGULATORY COMPLIANCE

- Laser Safety: Certified Class 1 Laser Product according to IEC 60825-1:2014 and FDA 21 CFR 1040.10 and 1040.11.
- EMC/EMI: Compliant with FCC Part 15, Class B and EN 55032/55024 standards, ensuring minimal electromagnetic interference for use in sensitive telecom environments.
- Environmental Directives: Fully RoHS 2 (2011/65/EU) and REACH compliant, affirming environmental responsibility and restriction of hazardous substances.
- Industry Standards: The module's physical, electrical, and optical characteristics meet or exceed the requirements specified in the SFP MSA, INF-8074i, and SFF-8472 standards.

LIFECYCLE ASSURANCE (MTBF)

The Mean Time Between Failures (MTBF) for the XPONSHOP Alternative SFP-GIG-LX module is estimated at 3,500,000 hours under normal operating

conditions. This exceptional reliability metric is derived from accelerated life testing (ALT) based on the Telcordia SR-332 methodology, assuming a steady-state case temperature of 40°C. The significant de-rating factors applied during the extended temperature testing provide a high confidence level for the module's long-term reliability in real-world network environments. The estimated useful lifespan of the unit is projected to exceed the typical lifecycle of the host hardware systems it serves.

