XPONSHOP Alternate Huawei-Compatible 16-Port GPON Board Component Blueprint - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The XPONSHOP Alternate Huawei-Compatible 16-Port GPON Board Component Blueprint represents a paradigm shift in optical access network infrastructure, delivering a fully interoperable, carrier-grade solution meticulously engineered to function as a drop-in replacement for Huawei's MA5600T/MA5680T series GPON line cards. This board is not merely a clone but a comprehensive re-architecture, integrating next-generation silicon to provide enhanced forwarding capacity, superior power efficiency, and advanced quality of service (QoS) mechanisms, all while maintaining absolute protocol and physical compatibility with existing Huawei OLT chassis. Designed for telecommunications service providers, ISPs, and enterprise network operators, this component blueprint ensures seamless network upgrades, supply chain diversification, and long-term operational continuity without the proprietary vendor lock-in constraints. This document serves as the definitive technical reference for the product, detailing its hardware architecture, performance specifications, and deployment advantages.



HARDWARE ARCHITECTURE & SILICON

At the core of the XPONSHOP Alternate 16-Port GPON Board is a state-of-the-art, purpose-built Broadcom or equivalent packet processing engine, optimized for dense GPON aggregation. The board's design leverages a high-speed backplane interface conforming to the Huawei OLT bus standard, supporting up to 10 Gbps of upstream bandwidth and 10 Gbps of downstream bandwidth per GPON port, achieving a total system switching capacity of 160 Gbps. The internal architecture is partitioned into distinct functional blocks: a high-performance network processor for Layer 2 switching and Layer 3 routing, a dedicated encryption/decryption module for robust AES-128 security, and a sophisticated Dynamic Bandwidth Allocation (DBA) engine that ensures sub-millisecond latency and jitter performance for latency-sensitive services such as VoIP and video conferencing. The board integrates a 2 GB DDR4

memory subsystem for packet buffering and a 512 MB NAND flash for firmware storage, facilitating robust handling of up to 16,000 concurrent subscriber sessions. The component blueprint emphasizes a modular design philosophy, allowing for independent field-replaceable units (FRUs) for the optical transceivers (SFP) and power management modules, significantly reducing mean time to repair (MTTR).

KEY FEATURES & ROUTING LOGIC

- Full Huawei-Compatibility & Interoperability: Engineered to be 100% compatible with Huawei's OLT management system (e.g., iManager U2000) and command-line interface (CLI), ensuring a frictionless 'plug-and-play' deployment within existing brownfield networks. The board supports standard OMCI (ONU Management and Control Interface) for comprehensive remote ONU/ONT management, configuration, and firmware upgrades.

- High-Density 16-Port GPON Aggregation: Provides 16 independent GPON interfaces (ITU-T G.984.x compliant) in a single slot, supporting a Class B+ and C+ optical power budget. This high density allows service providers to maximize subscriber per chassis ratios, reducing both capital expenditure (CAPEX) and operational expenditure (OPEX) by consolidating network infrastructure.

- Advanced Routing & Forwarding Engine: The integrated Layer 3 routing engine supports static routing, RIPv2, OSPF, and BGP protocols for enterprise and carrier-grade network segmentation. The hardware-based forwarding table supports up to 16,000 MAC addresses and 4,000 VLANs, enabling sophisticated multi-service network architectures.

- Intelligent Traffic Management & QoS: Features a Hierarchical QoS (HQoS) framework with hardware-accelerated traffic classification, policing, and shaping. Supports up to 8 priority queues per GPON port with strict priority (SP) and Weighted Round Robin (WRR) scheduling algorithms, ensuring deterministic delivery for critical applications like IPTV, VoLTE, and business VPNs.

- Enhanced Security & Network Protection: Integrated hardware-based AES-128 encryption for downlink traffic ensures subscriber data privacy. The board supports MAC address filtering, IP source guard, and DHCP snooping to mitigate common Layer 2 attacks. A hardware-based control plane protection (CPP) mechanism isolates management traffic from user data, preventing denial-of-service (DoS) attacks from compromising the board's operational stability.

- Power Efficiency & Thermal Management: Designed with a high-efficiency, 90%+ power supply conversion rate, the board consumes a maximum of 120W under full load. An intelligent thermal management system, featuring variable-speed fans and heat sink placement, maintains optimal operating temperatures across a wide range of environmental conditions (0°C to 55°C), ensuring reliability in diverse central office environments.

COMPLIANCE & STANDARDS

The XPONSHOP Alternate 16-Port GPON Board is designed and verified to meet the stringent requirements of global telecommunications standards. It adheres to the ITU-T G.984 series for GPON physical layer and transmission convergence layers, ensuring interoperability with a wide array of ONUs/ONTs from different vendors. The board complies with IEEE 802.1Q for VLAN tagging, IEEE 802.1p for Class of Service (CoS), and IEEE 802.3ah for Ethernet in the First Mile (EFM). For environmental and safety standards, the product is fully compliant with RoHS (Restriction of Hazardous Substances), REACH, and meets EMC immunity and emission standards as per EN 55022/55024 and FCC Part 15. Safety compliance is certified to IEC/EN 60950-1 and IEC/EN 62368-1, ensuring the board meets global safety requirements for telecommunications equipment.

TECHNICAL SPECIFICATIONS

The following section provides the comprehensive technical performance parameters for the XPONSHOP Alternate 16-Port GPON Board. These metrics define the board's operational limits, interfacing capabilities, and environmental resilience.

- Physical Specifications:

  - Form Factor: Standard Huawei OLT line card (e.g., MA5680T-compatible) – dimensions: 260 mm (H) x 180 mm (D) x 38 mm (W)

  - Weight: Approx. 1.5 kg

  - Front Panel Indicators: 16 port-specific bi-color LEDs (Link/Activity), System Status LED, Power LED, Alarm LED

- GPON Interface Specifications:

  - Optical Connector Type: SC/UPC (standard)

  - Optical Power Budget: Class B+ (20 dB) or Class C+ (32 dB) – Selectable via software

  - Wavelength: 1490 nm (downstream) / 1310 nm (upstream)

  - Receiver Sensitivity: -28 dBm (B+), -30 dBm (C+)

  - Maximum Reach: 20 km

  - Max Split Ratio: 1:128

- Performance Metrics:
  - Switching Capacity: 160 Gbps (full-duplex)
  - Forwarding Rate: 238 Mpps (million packets per second) for 64-byte packets
  - GPON Port Rate: 2.488 Gbps down / 1.244 Gbps up per port
  - On-Board Packet Buffer: 2 GB DDR4 SDRAM
  - MAC Address Table: 16,000 entries
  - VLAN ID Range: 1 – 4094, support for QinQ (double tagging)

- Power & Environmental Specifications:
  - Input Voltage: -48V DC (nominal) via OLT backplane
  - Power Consumption: Typical 80W, Maximum 120W
  - Operating Temperature: 0°C to 55°C (32°F to 131°F)
  - Storage Temperature: -40°C to 85°C (-40°F to 185°F)
  - Humidity (non-condensing): 5% to 95%
  - MTBF: > 300,000 hours at 25 °C ambient temperature, calculated per Telcordia SR-332

Parameter	**Specification**
Form Factor	Huawei MA5600T/MA5680T OLT Line Card (260mm x 180mm x 38mm)
Switching Capacity	160 Gbps (Full-Duplex)

Forwarding Rate	238 Mpps (for 64-byte packets)
GPON Ports	16 x SFP (Class B+/C+ optics support)
Wavelength (Tx/Rx)	1490 nm / 1310 nm
Max Split Ratio	1:128
Power Supply	Dual Hot-Swappable Redundant via Backplane (-48V DC)
Max Power Consumption	120W
Packet Buffer	2 GB DDR4 SDRAM
MAC Address Table	16,000 Entries
Operating Temperature	0°C to 55°C
MTBF (Mean Time Between Failures)	> 300,000 hours (Telcordia SR-332)
Standards Compliance	ITU-T G.984.x, IEEE 802.1Q, IEEE 802.1p, RoHS, IEC/EN 60950-1


Status
Fan
Stack
SFP+
SFP+