OEM G/EPON Auto-Adaptive ONU Chipset Architecture and Flash Memory Configurations - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

This document provides a comprehensive technical overview of the next-generation OEM G/EPON Auto-Adaptive Optical Network Unit (ONU) chipset architecture. Designed to address the evolving demands of carrier-grade fiber-to-the-home (FTTH) and fiber-to-the-building (FTTB) deployments, this platform uniquely integrates a unified medium access control (MAC) layer capable of seamless switching between Gigabit-capable Passive Optical Network (G) and Ethernet Passive Optical Network (EPON) standards. The auto-adaptive intelligence is paired with a highly flexible, multi-level flash memory configuration strategy, enabling operators to standardize on a single hardware stock-keeping unit (SKU) while dynamically deploying differentiated service profiles and firmware versions. This datasheet details the underlying silicon architecture, memory mapping scheme, environmental tolerances, and operational parameters that define this platform as a strategic asset for network modernization.



HARDWARE ARCHITECTURE & SILICON

The core of the system is a highly integrated system-on-chip (SoC) that consolidates the Physical Coding Sublayer (PCS), burst-mode transceiver, and the auto-adaptive MAC engine. This engine employs a real-time preamble detection and handshaking mechanism to identify the optical line terminal (OLT) protocol within the first 100 nanoseconds of link establishment, selecting the corresponding G.984 (GPON) or IEEE 802.3ah (EPON) encapsulation. This dual-mode capability is hardware-accelerated, ensuring zero-latency penalty irrespective of the protocol in use. The chipset includes a dedicated cryptography co-processor for robust AES-128 and Triple Data Encryption Standard (3DES) decryption, essential for secure subscriber management, and a powerful integrated 1.25 Gbps serializer/deserializer (SerDes) interface to the optical transceiver. The SoC is fabricated on a low-power 28nm process,

enabling a thermal design power (TDP) of less than 3.5W per unit. The memory subsystem is bifurcated into two key domains: a high-speed DDR3/DDR4 SDRAM interface for dynamic packet buffering and traffic queuing, and a separate, highly reliable NAND/NOR flash interface for firmware and configuration storage. This decoupling ensures that high-throughput data plane operations do not interfere with control plane stability and boot integrity. The device employs a multi-stage bootloader architecture stored in a protected NOR flash sector, with fallback mechanisms to a secondary redundant image, guaranteeing a near-zero failure rate during remote firmware upgrades.

KEY FEATURES & ROUTING LOGIC

- Feature 1: Auto-Adaptive G/EPON MAC: The platform supports fully automatic, hitless switching between GPON and EPON OLTs. This is achieved through advanced preamble detection logic that identifies the burst synchronization pattern of the upstream OLT, allowing for universal interoperability in heterogeneous network environments.
- Feature 2: Advanced Flash Configuration Modes: The ONU supports up to four distinct operating modes loaded from its flash memory: a high-performance low-latency profile for gaming/voice, a balanced profile for general high-speed internet, and a high-reliability enterprise profile with enhanced forward error correction (FEC) thresholds. Configuration files are stored in a compressed

format, with multiple redundant boot images to support safe firmware rollbacks.

- Feature 3: Layer 2/3 Service Awareness: An integrated packet parsing engine classifies traffic at wire-speed, supporting up to 8 hardware-based priority queues with Weighted Round Robin (WRR) and Strict Priority (SP) scheduling. The chipset also supports VLAN Tag manipulation (802.1Q), QinQ (Double Tagging), and advanced multicast filtering for IPTV services.

- Feature 4: Enhanced Security and Encryption: Hardware-accelerated AES-128 and 3DES encryption ensures robust subscriber privacy and secure management communication. The device integrates a physically unclonable function (PUF) for secure key storage, mitigating the risk of credential theft during physical tampering.

- Feature 5: Flexible Management Interfaces: The chipset supports a comprehensive management suite including OMCI (for GPON), OAM (for EPON), and a standard TCP/IP stack for local or remote management via Telnet/SSH, SNMP, and TR-069.

COMPLIANCE & STANDARDS

This platform is designed for global carrier certification and adheres to the following key industry standards and specifications. The hardware is compliant with the European Union's Restriction of Hazardous Substances (RoHS) and

Waste Electrical and Electronic Equipment (WEEE) directives.

- ITU-T G.984 series (Gigabit-capable Passive Optical Networks) for GPON operation, including G.984.1 (General Characteristics) and G.984.3 (Transmission Convergence Layer).
- IEEE 802.3ah (Ethernet in the First Mile) for EPON operation, including compliance with the Multi-Point Control Protocol (MPCP).
- IEEE 802.1D (Spanning Tree Protocol), IEEE 802.1Q (VLAN), and IEEE 802.1p (Quality of Service).
- Telecommunications regulatory compliance: FCC Part 15 Class B, CE Marking (EN 55032/55024), and VCCI for electromagnetic compatibility (EMC).
- Industry-wide encryption standards: AES-128 (FIPS 197 compliant) and 3DES for data encryption.
- Environmental standards: GR-1089-CORE for NEBS Level 3 compliance (thermal and vibration), IEC 60068-2 for operational humidity and temperature.

TECHNICAL SPECIFICATIONS

The following section details the exact hardware and performance parameters for the OEM G/EPON Auto-Adaptive ONU. These metrics represent the platform's capabilities under standard test conditions (25 ° C ambient temperature, standard fiber attenuation).

- Form Factor: Compact, fanless desktop or wall-mountable unit (192mm x 130mm x 34mm), optimized for customer premises equipment (CPE) deployment. Also available in a 1U rackmount chassis for multi-port aggregation.

- Optical Interface: Single SC/UPC or SC/APC connector. Class B+ optical power budget with a maximum transmission distance of 20 km.

- Data Rates: Symmetrical 1.244 Gbps down / 1.244 Gbps up (GPON) / Symmetrical 1.25 Gbps (EPON).

- User Interface Ports: 1 x 10/100/1000BASE-T Gigabit Ethernet (RJ45) port with Auto-MDI/MDIX. (Optional 4-port Ethernet switch configuration available via SKU extension).

- Power Supply: External DC power adapter: Input 100-240 VAC, 50/60Hz, Output 12V DC / 1.5A.

- Power Consumption: Maximum 5W (full load, active encryption).

- Operating Conditions: Temperature: 0°C to 50°C; Humidity: 10% to 90% (non-condensing).

- Flash Memory Configuration: 32MB NOR + 128MB NAND flash, dedicated to dual boot image partitions (primary and secondary firmware) with an additional 64MB partition for log storage and user configuration.

- Dynamic RAM (DRAM): 512MB DDR3 SDRAM for packet buffering and switching fabric.

Parameter	Specification
Form Factor	Desktop/Wallmount (CPE) or 1RU Rackmount Aggregation Unit
Switching Capacity	1.25 Gbps (Symmetric) with Non-Blocking Fabric
Power Supply	External DC Adapter (12V/1.5A), Optional Redundant Power on Rackmount SKU
Flash Memory	32MB NOR + 128MB NAND (Expandable to 256MB), Dual Partition for Redundancy
Operating Temperature	0°C to 50°C (Standard) / -40°C to 85°C (Industrial SKU)
Optical Budget	Class B+, 20km Reach, 1310nm Up / 1490nm Down

ORDERING SKU INFORMATION

This chipset is available through a variety of SKU configurations to meet differing operational requirements. Below is the standard ordering structure.

For custom firmware loads or specific flash partitioning schemes, please contact the OEM sales engineering team for a tailored quotation.

- SKU-ONU-100: Standard ONU with 1x GbE port, universal AC adapter, and 32MB NOR + 128MB NAND flash with pre-loaded G/EPON auto-adaptive firmware.
- SKU-ONU-400: Enhanced ONU with 4x GbE ports, integrated 4-port switch, enhanced hardware QoS, and 64MB NOR + 256MB NAND flash for advanced logging.
- SKU-ONU-100-W: Industrial temperature range SKU (-40 ° C to 85 ° C), hardened flash memory with extended read/write cycles, and conformal coating.

