

AXOS**e7 2**®

E7-2 XGS-PON 16 Port Line Card (XG1601)



Service providers looking to ensure their networks are ready for the continued increase of bandwidth and services demands are looking to deploy 10G PON. The Calix E7-2 XG1601 line card makes this possible by supporting high-density XGS-PON across all deployment environments. Broadband service providers can deploy the line card utilizing XGS-PON optics into any E7-2 chassis providing up to 32 ports of XGS-PON per chassis. To assist with the transition from GPON, the XG1601 line card also supports standard GPON OIM optics as well as Multi-PON Module (GPON + XGS-PON) optics. The E7-2 is the industry's benchmark for a modular, small form factor, environmentally hardened access solution for broadband service providers (BSPs).

The AXOS E7-2 leads a rapidly expanding family of Intelligent Access EDGE systems capable of supporting both centralized and decentralized network architectures that range from the data center edge, central office, or headend, to the remote cabinet.

Key Attributes

AXOS: Utilizing AXOS, the only true SDA (Software Defined Access) architecture, the E7-2 XG1601 line card enables service providers to maintain an always on network.

PON optics: Service providers have the flexibility to choose the PON technology that meets their needs. The XG1601 supports dual-density XGS-PON, XGS-PON, GPON, or MPM modules (XGS + GPON) based on the optics inserted into the PON ports.

Flexible service delivery: Utilize layer 2 Open Access service delivery for residential/ business services based on your specific needs with carrier class network redundancy options.

THE AXOS PLATFORM

The E7-2 Intelligent Edge System is built on the Calix Intelligent Access EDGE platform, ensuring faster time to revenue, standards-based APIs, and northbound interfaces for simplified OSS/BSS/SDN Controller integration and an always-on network.

FUNCTIONAL DESCRIPTION

The Calix E7-2 AXOS XG1601 line card provides multi-service capability over IP/Ethernet-based networks. Each XG1601 provides eight SFP-DD PON OLT ports that can support dual density XGS-PON optics, providing a card capacity of sixteen XGS-PON optical distribution networks and up to 2,048 ONTs. Two 10GE/2.5GE/GE SFP+ ports provide additional aggregation or service line capacity (via optical links from central office

locations, or via DAC cable connections to collocated E7-2 systems in RT locations). Two 100GE QSFP28 sockets per card can provide high-bandwidth connectivity uplinks.

DEPLOYMENT OPTIONS

As with all E7-2 line cards, the Calix E7-2 AXOS XG1601 can be deployed into any E7-2 chassis slot for both Central Office and remote cabinet installations supporting Layer 2 use cases. The E7-2 XG1601 line card interoperates with other AXOS-based line cards from the same location providing services providers the flexibility to meet the deployment requirements for subscribers. Each line card enables 100G uplinks allowing the Service Provider network to grow and scale to meet future networks requirements.

FLEXIBLE OPTICS SUPPORT

The Calix E7-2 AXOS XG1601 line card supports flexible optics types, allowing a service provider to select the PON technology supported on a port-by-port basis. To optimize the XG1601 line card for XGS-PON networks, Service Providers may deploy dual-density XGS-PON optics which provide up to sixteen XGS PONs per card (up to 32 XGS PONs per E7-2 chassis). To ease the transition from GPON to XGS-PON, the XG1601 card supports MPM (Multi PON Modules) optics, providing both XGS-PON and GPON output from a single optical fiber. Finally, the XG1601 also supports standard single-port XGS-PON and GPON SFP OIMs.

NETWORK RESILIENCY

All Calix E7-2 line cards support a flexible set of standards-based network topology protocols for use in aggregation, ring-based transport, and uplink.

- IEEE 802.3ad/802.1AX Link Aggregation
- ITU G.8032 Ethernet Ring Protection Switching (ERPS)
- ITU G.8032v2 Ethernet Ring Protection Switching (ERPS)
- ITU G.983.5 - Type B Protection and enhanced survivability for XGS-PON OLTs

SERVICES DELIVERY

The Calix E7-2 XG1601 line card delivers a full spectrum of IP access services over fiber networks.

- High-Speed Internet (HSI) access
- IPTV – broadcast and Video on Demand (VOD)
- MEF CE 2.0 compliant business services
- Voice – Native SIP/VoIP, H.248 and MGCP

SPECIFICATIONS

Ports

- 8 SFP-DD ports supporting XGS Dual Density/ XGS-PON/GPON/MPM optical modules
- 2 SFP+ ports supporting 10GE/2.5GE/GE direct attach cable or optical connections
- 2 QSFPDD ports supporting 100GE/40GE optical modules

Wavelength Support

- XGS-PON: 1577nm down, 1270 nm up
- GPON: 1490nm down, 1310nm up

Split Ratio

- XGS-PON: 1:128
- GPON: 1:128

Quality and Service

- Service classification based on port, SVLAN-ID, CVLAN-ID, p-bit
- Strict priority and Weighted Round Robin (WRR) based scheduling
- Hierarchical QoS Congestion avoidance: Tail Drop

Standards and RFC Supports

- ITU-T G.9807.1 XGS-PON
- ITU-T G.984 GPON
- TR-101 VLAN Service models IEEE 802.1p CoS Prioritization
- IEEE 802.1 MAC Bridges IEEE
- 802.1Q VLAN tagging IEEE
- 802.1ad VLAN stacking (Q-in-Q)
- ITU-T G.8032 Ethernet Ring Protection Switching (ERPS)/ Enhanced EAPS
- ITU-T G.8032v2 Ethernet Ring Protection Switching (ERPS)
- RFC 2236 IGMP v2
- RFC 3376 IGMP v3
- RFC 3810 MLDv2
- RFC 3046 DHCP Relay Agent Information Option ("Option 82")
- RFC 4541 IGMP Proxy RFC 4553 Structure Agnostic Time Division Multiplexing
- (TDM) over Packet (SAToP)
- Dynamic Bandwidth Allocation (DBA)
- Advanced Encryption Standard (AES)
- Forward Error Correction (FEC)

Frame Size

- XGS-PON: 9,216 byte frames
- GPON: 2,048 byte frames

Synchronization

- External reference timing
- Built-in Stratum-3 clock

Compliance

- NEBS Level 3 compliance (GR-63-CORE, GR-1089- CORE)
- UL 62368 FCC Part 15 Class A
- CE Mark

Power and Heat Dissipation

- XG1601 power consumption: 135 Watts max (with optics)

Operating Environment

- Temperature: -40° to +65° C (-40° F to +149° F)
- Humidity: 10 to 95% (non- condensing)

Storage Environment

- Temperature: -40° to +85° C (-40°F to +185°F)
- Humidity: 5 to 95%

Dimensions

- 14 x 10.1 x 0.78 inches
- 35.6 x 25.7 x 2 cm

Weight

- 2.08 lbs. (0.94 Kg) – (without optical modules)

Notes: Among other exclusions, the Calix Product Warranty shall not apply to any third party products used with Calix Products, nor shall the Product Warranty apply in the event that the Product's defect or nonconformance is due to its use with hardware which is not purchased directly from Calix, including any optical interfaces, optical transceivers and direct attach cables. For complete Product Warranty terms and exclusions, please refer to the Calix Purchase Agreement.

ORDERING INFORMATION

Calix E7-2 XGS-PON 16-Port Line Card

100-05770.....E7-2 XG1601 line card (16 ports XGS-PON)

The Calix Pluggable Transceiver Modules

The E7-2 supports pluggable modules for all service and network interfaces. Refer to the Calix Optical Transceiver Modules Datasheet (#250-00191) for a complete list of modules and specifications.

SFP1GE and 2.5GE optical and copper Small Form-factor Pluggable (SFP) modules

SFP+10GE optical Enhanced Small Form-factor Pluggable (SFP+) modules

Direct Attach.....Multi-rate copper Small Form-factor Pluggable (SFP/SFP+/QSFP28) cables

AXOS XGS-PON / GPON Modules

B+ OIM2.5Gbps GPON (Class B+, 20km, C-Temp, AXOS) 2.5Gbps GPON (Class B+, 20km, I-Temp, AXOS) AXOS GPON

C+ OIM2.5Gbps GPON (Class C+, 60Km, I-Temp, AXOS)

N1 OIM.....10Gbps XGS-PON (Class N1, 20km, I-Temp, AXOS)

N2 OIM.....10Gbps XGS-PON (Class N2, 40km, I-Temp, AXOS)

E1 OIM.....10Gbps XGS-PON (Class E1, 20km, I-Temp, AXOS)

N2/C+ OIM..... 10Gbps XGS-PON/2.5Gbps GPON/ (Class N2/C+, 20km, I-Temp, AXOS)

N1-DD OIM 10Gbps Dual-Density XGS-PON (Class N1, 20km, I-Temp, AXOS)

N2-DD OIM 10Gbps Dual-Density XGS-PON (Class N2, 40km, I-Temp, AXOS)

E1-DD OIM 10Gbps Dual-Density XGS-PON (Class E1, 20km, C-Temp, AXOS)

N2/C+ MPM OIM.....10Gbps XGS-PON SFP-DD, Dual Channel 10G/10G, 2.5G/1.25G (Class N2/C+, 20km, I-Temp, OLT)

E1/C+ MPM OIM.....10Gbps XGS-PON SFP-DD, Dual Channel 10G/10G, 2.5G/1.25G (Class E1/C+, 60km, I-Temp, OLT)

CALIX SOURCED MODULES

High-speed optic module operational tolerances and performance vary significantly and can dramatically affect network operations. To maintain predictable performance and product reliability, Calix E-Series systems are supported with Calix GPON, XGS-PON, and NG-PON2 optical modules only (“Optical Modules”). Ethernet based SFP, CSFP, CDFP, XFP, SFP+, QSFP+, QSFP-DD, QSFP-28 pluggable transceivers (“Optical Transceivers”) and direct attach cables are available directly from Calix. Calix does not guarantee full compliance to product specifications for units using non-Calix modules and does not provide customer service support for optical network issues when non-Calix modules are used. Some third-party optics do not fully comply to the standard power and reach characteristics and in several cases have overheated and damaged the Calix equipment resulting in service outages. Calix Product Warranty shall not apply to any third-party products used with Calix Products, nor shall the Product Warranty apply in the event that the Product’s defect or nonconformance is due to its use with hardware which is not purchased directly from Calix, including any optical interfaces, optical transceivers and direct attach cables. For complete Product Warranty terms and exclusions, please refer to the Calix Purchase Agreement.

Note: Calix believes the information in this publication to be accurate as of publication date, and is not responsible for error. Product Specifications are subject to change without notice.