

# Calix E7-2 VDSL2-48D r2

## DESCRIPTION

The Calix E7-2 VDSL2-48 r2 card combines 48 VDSL2/ADSL2+ subscriber ports, with integrated 10G/1G Ethernet transport to provide a very compact, high-density DSL solution. Two E7-2 VDSL2-48 r2 line cards can be plugged into a Calix E7-2 shelf to create a compact, very high-density DSL node, with Ethernet aggregation and transport, ideal for copper-based delivery of IP services across the access network. With the E7-2 VDSL2-48 r2 cards ability to support vectoring and 8 pair bonding, supports a full set of residential and business services.



## KEY ATTRIBUTES

**HIGH DSL INTERFACE DENSITY:** The Calix E7 VDSL2-48D r2 line card comes equipped with 48 VDSL2/ ADSL2+ Fallback ports. These ports support both single line as well as any to any pair bonded subscriber connectivity. Two VDSL2-48D r2 line cards can be installed in an E7-2 chassis, providing an industry leading density of 96 ports in a 1RU high chassis, for DSL and VoIP access.

**INTEGRATED VECTORING SUPPORT:** The E7 VDSL2-48 r2 line cards support unit level as well as system level vectoring enabling higher subscriber bandwidth connectivity. The E7-2 is unique in the industry with its ability to support 96 ports of system level vectoring without the requirement for an external vector control processor. In addition, when the E7 VCP-192 or E7 VCP-384 vector control processor is used the E7 supports system level vectoring up to 384 ports.

**COPPER BONDED SERVICES/TRANSPORT:** The E7-2 VDSL2-48D r2 enables service providers to deliver high bandwidth symmetric services utilizing copper bonding in locations where fiber may not be available. The E7 VDSL2-48D r2 card can deliver services over up to 8 bonded pairs per subscriber for services or to a next hop cabinet location for transport.

**INDUSTRY STANDARDS COMPLIANCE:** The Calix E7 VDSL2-48D R2 card complies with all applicable ADSL/VDSL2 ITU standards including G.992.1 (ADSL/G.dmt), G.992.2 (G.Lite), G.992.3/4 (ADSL2), G.992.5 (ADSL2+), G.993.2 (VDSL2), G.994.1 (G.hs), G.998.2 (VDSL2 Ethernet Pair Bonding), G.998.1 (ATM-based multi-pair bonding), G.998.4 (G.inp), G.993.5 (G.Vector), and ANSI T1.413, ensuring interoperability with a wide range of CPE.

**NATIVE IPTV SUPPORT:** The E7 supports industry standard IGMP snooping and proxy, to identify and replicate multicast video sent between the set-top box and the video distribution network, providing efficient, scalable, high-quality IPTV distribution on DSL subscriber interfaces.

**NETWORK INTERFACE OPTIONS:** Industry standard pluggable modules are used for all E7 VDSL2-48D r2 Ethernet interfaces, including Small Form-Factor Pluggable (SFP) optical and copper Gigabit Ethernet, and SFP+ 10GE modules. The Ethernet SFP ports can be run at 1 Gigabit or 2.5 Gigabit data rates. SFP+ ports also support GE SFP modules, extending the versatility of the SFP+ ports to allow additional 1GE or 10GE transport flexibility.

**HIGH AVAILABILITY ETHERNET TRANSPORT:** The Calix E7 system bridges the gap between traditional DSL service access nodes and Ethernet switches, as it is designed to provide both copper pair service drops and Ethernet-based transport and aggregation. The VDSL2-48D r2 card includes two 10GE ports for use as uplink and transport for the local E7 system; or to sub-extend additional E7 chassis to extend DSL access capacity. Multiple E7 systems can be linked together at 2.5GE or 10GE stacking ring data rates using low cost copper cables.

**NETWORK RESILIENCY:** All Calix E7 cards support a flexible set of standards-based network topology protocols for use in aggregation, ring-based transport and uplink applications.

- ITU G.8032 Ethernet Ring Protection Switching (ERPS)
- IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- IEEE 802.3ad/802.1AX Link Aggregation

With multiple 1GE/2.5GE and 10GE interfaces, the VDSL2-48D r2 card can reside in ERPS transport rings, and provide Link Aggregation RSTP-protected uplink to network services.

**DELIVERING "QUALITY OF EXPERIENCE":** The E7 provides per-subscriber and per-service hierarchical QoS to deliver uncompromised triple play and business services. A powerful collection of classification, policing, queuing and scheduling algorithms let operators manage per-subscriber and per-service traffic flows to maintain priority/delay/loss differentiation within the E7 network.

## SPECIFICATIONS

# Calix E7-2 VDSL2-48D r2

### MINIMUM SYSTEM REQUIREMENTS

Calix E7-2 shelf support only  
Two VDSL2-48D R2 line cards per E7-2 chassis  
Calix E7 Software Release 2.4

### DIMENSIONS (W x L x H)

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

### PORTS

48 ports VDSL2/ADSL2+ Fallback  
2 SFP sockets at 1GE/2.5GE rates  
2 SFP+ ports supporting 10GE and GE modules  
1 Vector Control Interface port

### VDSL2 ETHERNET PACKET TRANSFER MODE

VDSL2 ITU-T G.993.2  
ITU-T G.994.1 G.hs or Handshake  
Compliant with IEEE STD 802.3AH-2004, Ethernet in the First Mile (EFM)

### ADSL2+ FORMAT

Full-rate ANSI T1.413, Issue 2  
G.DMT full-rate ITU-T G.992.1  
G.Lite ITU-T G.992.2  
ADSL2 ITU-T G.992.3 including Annexes A/L/M  
ADSL2+ ITU-T G.992.5 including Annex A/M  
ITU-T G.994.1 G.hs or Handshake

### XDSL MULTI-PAIR BONDING

ITU-T G.998.1 ADSL2+ ATM-based multi-pair Bonding  
ITU-T G.998.2 VDSL2 PTM-based multi-pair Bonding

### E7 PORT CONCENTRATION

Two VDSL2-48D R2 line cards per E7-2; 96 DSL ports per 1RU chassis

### MAXIMUM LINE RATES

**VDSL2 (1 pair):** Selectable in 64-Kbps increments  
Profile 17a: up to 140 Mbps downstream, 60 Mbps upstream.  
Profile 12a/b; up to 100Mbps downstream, 30 Mbps upstream  
Selectable in 64-Kbps increments  
Profile 8a/b/c/d; up to 80Mbps downstream, 20 Mbps upstream  
**2 pair VDSL2 Bonding:**  
Profile 17a: Aggregate data rate: up to 160 Mbps downstream, 120 Mbps upstream  
**8 pair VDSL2 Bonding:**  
Profile 17a: Aggregate data rate: up to 918Mbps downstream, 340 Mbps upstream  
ADSL2+: up to 24 Mbps downstream, 3 Mbps upstream.  
Selectable in 64-Kbps increments  
ADSL2+ Bonding (2 pairs): up to 45 Mbps downstream, 5 Mbps upstream, selectable in 64-Kbps increments  
Full rate ADSL: up to 8 Mbps downstream, 896 Kbps upstream.  
Selectable in 64-Kbps increments

### POWER DISSIPATION

Maximum operating condition 72.2 Watts (assumes 48 modems trained at Profile 17a)  
Heat dissipation: 246.2 BTU/Hour

### POWER OPTIONS

–48vDC provided by E7-2 chassis

### OPERATING ENVIRONMENT

Temperature: –40° C to +70° C (–40° F to +158° F)  
Humidity: 10 to 95% (non-condensing)

### STORAGE ENVIRONMENT

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

### STANDARDS SUPPORT

Broadband Forum TR-101  
DHCP Relay, and Layer 2 DHCP Relay w/ DHCP Option 82 insertion  
Broadband Forum TR-114 "VDSL2 Performance Test Plan", and TR-115 "VDSL2 Functionality Test Plan".  
IGMPv2 & IGMPv3 Proxy and Snooping  
IEEE 801.X (EAPOL)  
IEEE 802.1Q VLAN tagging  
IEEE 802.1p Prioritization  
IEEE 802.1ad QinQ (Provider Bridges)  
IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)  
IEEE 802.1AX / 802.3ad Link Aggregation  
PPPoA to PPPoE conversion, and PPPoE Intermediate Agent  
IETF RFC 2684 bridged encapsulation  
IETF RFC 4562 MAC-Forced Forwarding  
SNMP V2c and SNMPv3  
Secured management access as per HTTPS and SSHv2

### COMPLIANCE

UL-60950, Standard for Safety, Issue 1, April 1, 2003  
FCC 47 CFR (ICES-003) Part 15 Class A  
NEBS Level 1 and NEBS Level 3; GR-1089-CORE Sect. 7, Electrical Safety  
GR-3028-CORE Thermal Management in COs  
GR-63-CORE Physical Protection, Issue 4

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# Calix E7-2 VDSL2-48D r2

## 3<sup>rd</sup> Party Modem Interoperability

Calix continues to test VDSL2 and ADSL2+ modems against the different DSL Service Platforms supported. These modems must be commercially available, and candidates for service deployment by Calix customers. Extensive rate/reach and data throughput performance testing is performed against all of modems. Qualification testing is conducted for physical layer, HIS/data as well as IPTV/Video service performance. Customer Advisory Bulletins (CAB) documents are available from Calix summarizing completed testing; new versions of the document will provide updates to tests that are in progress. Please refer to up to date CABs from Calix for the latest list of qualified and supported modems.

## ORDERING INFORMATION

### CALIX E7 LINE CARDS

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100-03882..... E7-2 VDSL2-48D r2 card; 48x VDSL2 Data-only ports, 2x 1GE/2.5GE SFP, 2x 1GE/10GE SFP+

### CALIX OPTICAL AND COPPER PLUGGABLE MODULES

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Calix offers a full suite of optical and copper modules for E7 line cards.

SFP+ ..... 10GE optical Small Form-factor Pluggable modules

Copper cable assemblies are supported in SFP and SFP+ ports at 1GE, 2.5GE and 10GE data rates

SFP..... 1GE optical modules may also be used in SFP+ ports at a 1Gbps rate

Notes: - For GPON OIM, 10GE XFP, 10GE SFP+, and 2.5GE pluggable transceivers, only modules purchased directly from Calix are supported.