

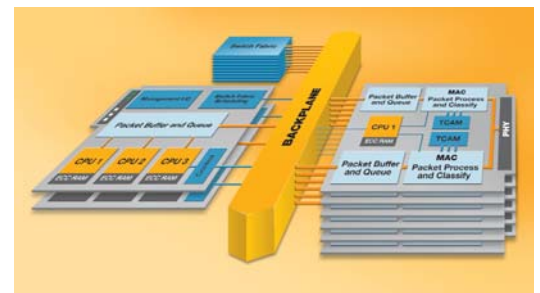
- Best-in-Class Resiliency**
- Massive Scalability**
- 1,260 GbE or 224 Ten GbE Ports per Chassis**
- Full L2 Switching and IPv4/IPV6 Routing**

## E-Series Overview

The Force10 E-Series switch/routers provide best-in-class resiliency, unmatched scalability, line-rate performance and full L2 switching and IPv4/IPV6 routing. Based on revolutionary system architecture that combines fully distributed hardware and modular software, the E-Series switch/routers ensure predictable application performance, increase network availability and reduce operating costs.

The Force10 E-Series sets a new standard for high performance switch/routers with unmatched scalability to 1,260 Gigabit Ethernet or 224 Ten Gigabit Ethernet ports per chassis, consistent performance with ACLs on all ports, and full L2 switching and L3 routing. These groundbreaking products simplify network applications from server/cluster consolidation, grid computing, campus backbones, and next-generation data centers.

The Force10 E-Series E1200/E600 provides 56.25 Gigabits per second per slot and the E300 delivers 25 Gigabits per second per slot. All deliver predictable line-rate performance with any combination of features enabled, deterministic low latency and jitter, robust L2/L3 functionality, and the resiliency to thwart denial of service (DoS) attacks. Built upon the powerful and cost-effective Force10 architecture, the E-Series sets the industry standard both for resiliency and performance.



## The Force10 E-Series Architecture

The Force10 E-Series Architecture delivers line-rate performance, cost-effective scalability, and robust L2 switching and L3 routing:

- Three CPU Route Processor delivers best-in-class resiliency and security
- Scalable, non-blocking switch fabric enables the low latency and jitter critical for streaming media applications
- High performance Force10 ASICs distribute packet forwarding, ACL processing, QoS, and buffering to every line card
- Robust L2/L3 multiprocessor control plane with innovative control traffic filtering and rate limiting capabilities
- Cost-effective, reliable passive copper backplane technology maximizes system reliability and minimizes cost
- High availability features include hot-swap of all key components and system-wide environmental monitoring, maximizing system uptime and serviceability



# Specifications: TeraScale E-Series

## Ordering Information

| ORDER NUMBER       | DESCRIPTION   |
|--------------------|---|
| CH-E300            | E300 6-slot chassis with backplane  |
| CH-E600I           | E600i 7-slot chassis with backplane   |
| CH-E1200I-DC       | E1200i-DC 14-slot DC power chassis with backplane   |
| CH-E1200I-AC       | E1200i-AC 14-slot AC power chassis with backplane   |
| CC-E300-FAN        | E300 fan subsystem  |
| CC-E600-FAN        | E600 fan subsystem  |
| CC-E1200I-FAN      | E1200i-AC fan subsystem   |
| LC-EF3-RPM         | E300 Route Processor Module (RPM) (series EF3)  |
| LC-EF-RPM          | E600/E1200 Route Processor Module (RPM) (series EF)   |
| CC-E-SFM3          | E-Series Switch Fabric Module 3 (SFM3)  |
| CC-E300-PWR-DC     | E300 DC Power Entry Module (PEM)  |
| CC-E300-1200W-AC   | E300 1200 W/800 W AC Power Supply Module (PSM)  |
| CC-E600-PWR-DC     | E600 DC PEM   |
| CC-E600-2500W-AC   | E600 2500 W/1500 W AC PSM   |
| CC-E1200-PWR-DC    | E1200 DC PEM  |
| CC-E1200I-2800W-AC | E1200i-AC 2800 W AC PSM   |
| LC-EF-10GE-4P      | E600/E1200 4-port 10 GbE line card – XFP modules required (series EF)                         |
| LC-EG-10GE-4P      | E600/E1200 4-port 10 GbE line card – XFP modules required (series EG)                         |
| LC-EF-10GE-16P     | E600/E1200 16-port 10 Gigabit Ethernet line card – XFP modules required (series EF)           |
| LC-EG-10GE-16P     | E600/E1200 16-port 10 GbE line card – XFP modules required (series EG)                        |
| LC-EF-1GE-48P      | E600/E1200 48-port GbE line card – SFP modules required (series EF)                           |
| LC-EG-1GE-48P      | E600/E1200 48-port GbE line card – SFP modules required (series EG)                           |
| LC-EF-GE-48T       | E600/E1200 48-port 10/100/1000Base-T line card with RJ45 interfaces (series EF)               |
| LC-EG-GE-48T       | E600/E1200 48-port 10/100/1000Base-T line card with RJ45 interfaces (series EG)               |
| LC-EF-GE-48T1      | E600/E1200 48-port high density 10/100/1000Base-T line card with RJ45 interfaces (series EF)  |
| LC-EF-GE-90M       | E600/E1200 90-port high density 10/100/1000Base-T line card with MRJ21 interfaces (series EF) |
| LC-EG-OC-48C-4P    | E600/E1200 4-port OC-3c/OC-12c/OC-48c POS line card – SFP modules required (series EG)        |
| LC-EF3-10GE-2P     | E300 2-port 10 GbE line card – XFP modules required (series EF3)                              |
| LC-EG3-10GE-2P     | E300 2-port 10 GbE line card – XFP modules required (series EG3)                              |
| LC-EF3-10GE-8P     | E300 8-port 10 GbE line card – XFP modules required (series EF3)                              |
| LC-EG3-10GE-8P     | E300 8-port 10 GbE line card – XFP modules required (series EG3)                              |
| LC-EF3-1GE-24P     | E300 24-port GbE line card – SFP modules required (series EF3)                                |
| LC-EG3-1GE-24P     | E300 24-port GbE line card – SFP modules required (series EG3)                                |
| LC-EF3-GE-48T      | E300 48-port high density 10/100/1000Base-T line card with RJ45 interfaces (series EF3)       |
| SW-EF-LATEST       | FTOS software   |

## E300 Chassis

### E300

6 line card slots  
 Size: 8 RU, 14 h x 17.4 w x 22.78" d  
 (35.6 h x 44.2 w x 57.8 cm d)  
 Weight (factory-installed components): 90 lbs (40.8 kg)  
 Weight fully loaded: 170 lbs (77.1 kg)  
 ISO 7779 A-weighted sound pressure level:  
 79.21 dBA at 73.4°F (23°C)

AC Power  
 Nominal input voltage: 100-240 VAC 50/60 Hz  
 Maximum thermal output:  
 6,989 BTU/h (2,049 W) at 100/120 VAC  
 6,483 BTU/h (1,900 W) at 200/240 VAC  
 Maximum input current per module:  
 7.2 A at 100 VAC 6.0 A at 120 VAC  
 5.1 A at 200 VAC 4.2 A at 240 VAC  
 Maximum system power input:  
 2.2 KVA at 100/120 VAC  
 2.0 KVA at 200/240 VAC  
 Maximum power consumption:  
 2,149 W at 100/120 VAC  
 2,000 W at 200/240 VAC

DC Power  
 Nominal input voltage: –44 to –60 VDC  
 Maximum thermal output: 5,596 BTU/h (1,640 W)  
 Maximum current draw per DC PEM: 60 A  
 Maximum power consumption: 1,740



## E600 Chassis

### E600i

7 line card slots  
 Size: 16 RU, 28 h x 17.4 w x 21.45" d  
 (71.1 h x 44.2 w x 54.4 cm d)  
 Weight (factory-installed components): 81 lbs (36.7 kg)  
 Weight fully loaded: 242 lbs (109.8 kg)  
 ISO 7779 A-weighted sound pressure level:  
 70.42 dBA at 73.4°F (23°C)

AC Power  
 Nominal input voltage: 120-240 VAC 50/60 Hz  
 Maximum thermal output:  
 10,822 BTU/h (3,172 W) at 100/120 VAC  
 9,914 BTU/h (2,906 W) at 200/240 VAC  
 Maximum input current per module:  
 11.5 A at 100 VAC 9.6 A at 120 VAC  
 8.0 A at 200 VAC 6.7 A at 240 VAC  
 Maximum system power input:  
 3.5 KVA at 100/120 VAC  
 3.2 KVA at 200/240 VAC  
 Maximum power consumption:  
 3,422 W at 100/120 VAC  
 3,156 W at 200/240 VAC

DC Power  
 Nominal input voltage: –44 to –60 VDC  
 Maximum thermal output: 8,838 BTU/h (2,590 W)  
 Maximum current draw per DC PEM: 75 A  
 Maximum power consumption: 2,840 W



## E1200 Chassis

### E1200i-DC

14 line card slots  
 Size: 21 RU, 36.75 h x 17.4 w x 21" d  
 (93.3 h x 44.2 w x 53.3 cm d)  
 Weight (factory-installed components): 97 lbs (44 kg)  
 Weight fully loaded: 321 lbs (145.6 kg)  
 ISO 7779 A-weighted sound pressure level:  
 77.93 dBA low fan speed,  
 84.83 dBA maximum at 73.4°F (23°C)

DC Power  
 Nominal input voltage: –44 to –60 VDC  
 Maximum thermal output: 16,924 BTU/h (4,910 W)  
 Maximum current draw per DC PEM: 150 A  
 Maximum power consumption: 5,210 W



### E1200i-AC

14 line card slots  
 Size: 24 RU, 42 h x 17.4 w x 22.25" d  
 (106.68 h x 44.2 w x 56.51 cm d)  
 Weight (factory-installed components):  
 139 lbs (63.05 kg)  
 Weight fully loaded: 394 lbs (178.7 kg)  
 ISO 7779 A-weighted sound pressure level:  
 77.93 dBA low fan speed,  
 84.83 dBA maximum at 73.4°F (23°C)

AC Power  
 Nominal input voltage: 200-240 VAC 50/60 Hz  
 Maximum thermal output: 18,710 BTU/h (5,484 W)  
 Maximum input current per module:  
 14.6 A at 200 VAC 12.2 A at 240 VAC  
 Maximum system power input: 5.8 KVA at 200/240 VAC  
 Maximum power consumption: 5,734 W at 200/240 VAC



## Specifications

### Common

19" front, 19" middle (optional) and 23" middle  
(E600/E1200 only) rack mountable  
Maximum Operating Specifications:  
Temperature: 32° to 104°F (0° to 40°C)  
Altitude: no degradation to 10,000 feet (3,048 m)  
Relative humidity: 5 to 85 percent, noncondensing  
Maximum Non-operating Specifications:  
Temperature: -40° to 158°F (-40° to 70°C)  
Maximum altitude: 15,000 feet (4,572 meters)  
Relative humidity: 5 to 95 percent, noncondensing

### Redundancy/Availability

#### E1200i-DC

1+1 redundant Route Processor Modules (RPMs)  
8:1 redundant Switch Fabric Modules (SFMs)  
1+1 redundant DC Power Entry Modules (PEMs)

#### E1200i-AC

1+1 redundant RPMs  
8:1 redundant SFMs  
2+2 redundant AC Power Supply Modules (PSMs) – 200/240 VAC  
2+1 redundant AC PSMs – 200/240 VAC

#### E600i

1+1 redundant RPMs  
4:1 redundant SFMs  
1+1 redundant DC PEMs  
2+2 redundant AC PSMs – 200/240 VAC  
3+1 redundant AC PSMs – 100/120 VAC and 200/240 VAC

#### E300

1+1 redundant RPMs  
1:1 redundant SFMs  
1+1 redundant DC PEMs  
2+2 redundant AC PSMs – 200/240 VAC  
3+1 redundant AC PSMs – 100/120 VAC and 200/240 VAC

Online insertion and removal of all components  
Built-in cable management  
Environmental self-monitoring

### IEEE Compliance

802.1AB LLDP  
802.1D Bridging, STP  
802.1p L2 Prioritization  
802.1Q VLAN Tagging, Double VLAN Tagging, GVRP  
802.1s MSTP  
802.1w RSTP  
802.1X Network Access Control  
802.3ab Gigabit Ethernet (1000BASE-T)  
802.3ac Frame Extensions for VLAN Tagging  
802.3ad Link Aggregation with LACP  
802.3ae 10 Gigabit Ethernet (10GBASE-W, 10GBASE-X)  
802.3ak 10 Gigabit Ethernet (10GBASE-CX4)  
802.3i Ethernet (10BASE-T)  
802.3u Fast Ethernet (100BASE-TX)  
802.3x Flow Control  
802.3z Gigabit Ethernet (1000BASE-X)  
ANSI/TIA-1057 LLDP-MED  
Force10 FRRP (Force10 Redundant Ring Protocol)  
Force10 PVST+  
MTU 9,252 bytes

### RFC and I-D Compliance

#### General Internet Protocols

768 UDP  
793 TCP  
854 Telnet  
959 FTP  
1321 MD5  
1350 TFTP  
1661 PPP  
1989 PPP Link Quality Monitoring  
1990 PPP Multilink Protocol  
1994 PPP CHAP  
2474 Differentiated Services  
2615 PPP over SONET/SDH  
2698 Two Rate Three Color Marker  
3164 Syslog  
draft-ietf-bfd-base-03 BFD

#### General IPv4 Protocols

791 IPv4  
792 ICMP  
826 ARP  
1027 Proxy ARP  
1035 DNS (client)  
1042 Ethernet Transmission  
1191 Path MTU Discovery  
1305 NTPv3  
1519 CIDR  
1542 BOOTP (relay)  
1812 Routers  
1858 IP Fragment Filtering  
2131 DHCP (relay)  
2338 VRRP  
3021 31-bit Prefixes  
3128 Tiny Fragment Attack Protection

#### General IPv6 Protocols

1981 Path MTU Discovery (partial)  
2460 IPv6  
2461 Neighbor Discovery (partial)  
2462 Stateless Address Autoconfiguration (partial)  
2463 ICMPv6  
2464 Ethernet Transmission  
2675 Jumbograms  
3587 Global Unicast Address Format  
4291 Addressing

#### RIP

1058 RIPv1  
2453 RIPv2

#### OSPF

1587 NSSA  
2154 MD5  
2328 OSPFv2  
2370 Opaque LSA  
2740 OSPFv3  
3623 Graceful Restart  
4222 Prioritization and Congestion Avoidance

#### IS-IS

1142 IS-IS  
1195 IPv4 Routing  
2763 Dynamic Hostname  
2966 Domain-Wide Prefixes  
3373 Three-way Handshake  
3567 MD5  
3784 Wide Metrics  
5120 Multi-topology  
draft-ietf-isis-igp-p2p-over-lan-06 Point-to-Point Operation  
draft-ietf-isis-ipv6-06 IPv6 Routing  
draft-kaplan-isis-ext-eth-02 Extended Frame Size

#### BGP

1997 Communities  
2385 MD5  
2439 Route Flap Damping  
2545 Multiprotocol Extensions for IPv6  
2796 Route Reflection  
2842 Capabilities  
2858 Multiprotocol Extensions  
2918 Route Refresh  
3065 Confederations  
4360 Extended Communities  
4893 4-byte ASN  
5396 4-byte ASN Representation  
draft-ietf-idr-bgp4-20 BGPv4  
draft-ietf-idr-restart-06 Graceful Restart

#### Multicast

1112 IGMPv1  
2236 IGMPv2  
2710 MLDv1  
3376 IGMPv3  
3569 SSM for IPv4/IPv6  
3618 MSDP  
3810 MLDv2  
3973 PIM-DM  
4541 IGMPv1/v2/v3, MLDv1 Snooping  
draft-ietf-pim-sm-v2-new-05  
PIM-SM for IPv4/IPv6

#### Network Management

1155 SMIv1  
1156 Internet MIB  
1157 SNMPv1  
1212 Concise MIB Definitions  
1215 SNMP Traps  
1493 Bridges MIB  
1724 RIPv2 MIB  
1850 OSPFv2 MIB  
1901 Community-based SNMPv2

2011 IP MIB  
2012 TCP MIB  
2013 UDP MIB  
2024 DLsw MIB  
2096 IP Forwarding Table MIB  
2558 SONET/SDH MIB  
2570 SNMPv3  
2571 Management Frameworks  
2572 Message Processing and Dispatching  
2574 SNMPv3 USM  
2575 SNMPv3 VACM  
2576 Coexistence Between SNMPv1/v2/v3  
2578 SMIv2  
2579 Textual Conventions for SMIv2  
2580 Conformance Statements for SMIv2  
2618 RADIUS Authentication MIB  
2665 Ethernet-like Interfaces MIB  
2674 Extended Bridge MIB  
2787 VRRP MIB  
2819 RMON MIB (groups 1, 2, 3, 9)  
2863 Interfaces MIB  
2865 RADIUS  
3273 RMON High Capacity MIB  
3416 SNMPv2  
3418 SNMP MIB  
3434 RMON High Capacity Alarm MIB  
3580 802.1X with RADIUS  
5060 PIM MIB  
ANSI/TIA-1057 LLDP-MED MIB  
draft-grant-tacacs-02 TACACS+  
draft-ietf-idr-bgp4-mib-06 BGP MIBv1  
draft-ietf-isis-vg-mib-16 IS-IS MIB  
IEEE 802.1AB LLDP MIB  
IEEE 802.1AB LLDP DOT1 MIB  
IEEE 802.1AB LLDP DOT3 MIB  
ruzin-mstp-mib-02 MSTP MIB (traps)  
sFlow.org sFlowv5  
sFlow.org sFlowv5 MIB (version 1.3)  
FORCE10-BGP4-V2-MIB  
FORCE10-FIB-MIB  
FORCE10-IF-EXTENSION-MIB  
FORCE10-LINKAGG-MIB  
FORCE10-CHASSIS-MIB  
FORCE10-COPY-CONFIG-MIB  
FORCE10-MON-MIB  
FORCE10-PRODUCTS-MIB  
FORCE10-SMI  
FORCE10-SYSTEM-COMPONENT-MIB  
FORCE10-TC-MIB  
FORCE10-TRAP-ALARM-MIB

### Regulatory Compliance

#### Safety

UL/CSA 60950-1, 1st Edition  
EN 60950-1, 1st Edition  
IEC 60950-1, 1st Edition Including all National Deviations and Group Differences  
EN 60825-1 Safety of Laser Products Part 1: Equipment Classification Requirements and User's Guide  
EN 60825-2 Safety of Laser Products Part 2: Safety of Optical Fibre Communication Systems  
FDA Regulation 21 CFR 1040.10 and 1040.11

#### Emissions

Australia/New Zealand: AS/NZS CISPR 22: 2006, Class A  
Canada: ICES-003, Issue-4, Class A  
Europe: EN 55022: 2006 (CISPR 22: 2006), Class A  
Japan: VCCI V3/2007.04 Class A  
USA: FCC CFR 47 Part 15, Subpart B, Class A

#### Immunity

EN 300 386 V1.3.3: 2005 EMC for Network Equipment  
EN 55024: 1998 + A1: 2001 + A2: 2003  
EN 61000-3-2: Harmonic Current Emissions  
EN 61000-3-3: Voltage Fluctuations and Flicker  
EN 61000-4-2: ESD  
EN 61000-4-3: Radiated Immunity  
EN 61000-4-4: EFT  
EN 61000-4-5: Surge  
EN 61000-4-6: Low Frequency Conducted Immunity

#### RoHS

All E-Series components are EU RoHS compliant.

## Highest Ethernet Density

The Force10 E-Series delivers unparalleled Gigabit Ethernet and 10 Gigabit Ethernet port densities. The E1200/E600 support 48 Gigabit Ethernet ports or 16 10 GbE ports per line card slot and up to 14 and 7 line card slots per chassis respectively. The E300 supports 48 GbE ports or eight 10 GbE port per line card slot and up to six line card slots per chassis.

## Line-Rate Performance

With six custom Force10 ASICs and advanced Ternary Content Addressable Memories (TCAM) on every line card, the Force10 E-Series provides line-rate, non-blocking forwarding performance across all ports, even with all features enabled imultaneously. These features include:

- Extended ACLs for packet filtering and policy routing
- Multi-field packet lookup and classification for QoS
- Packet metering and marking for rate limiting and policing
- Congestion control using WRED and WFQ

## Full L2 Switching / L3 Routing

Force10 ASICs, E-Series architecture and FTOS software work in unison to give robust L2 switching and L3 routing functionality to the E-Series with the scalability and security required for applications spanning the LAN, MAN, and Internet-connected WAN. The Force10 E-Series L2 and L3 features include:

- RIP, OSPF, IS-IS and BGP IPv4 unicast routing protocols
- PIM-SM, PIM-DM, SSM and MSDP IPv4 multicast routing protocols
- OSPF, IS-IS and BGP IPv6 unicast routing protocols
- PIM-SM, and SSM IPv6 multicast routing protocols
- Prefix-based distributed forwarding table on every line card
- Forwarding table support for up to 512K IPv4 and 32 IPv6 routes
- VLAN Redundancy, Rapid Spanning Tree, VLAN Stacking

| TeraScale E-Series Capabilities |    |  |   |
|---------------------------------|--|--|---|
|                                 | E1200  | E600                                       | E300                                      |
| Switch Fabric Capacity          | 1.68 Tbps  | 900 Gbps                                   | 400 Gbps                                  |
| Full-Mesh Forwarding Capacity   | 1 Bpps   | 500 Mpps                                   | 196 Mpps                                  |
| Interface Support               | 10 GbE XFP, 1 GbE SFP, 10/100/1000 Mb Copper   |  |   |
| I/O Line Card Slots             | 14   | 7  | 6   |
| Line-rate GbE (TeraScale)       | 672  | 336  | 132                                       |
| Total GbE (TeraScale)           | 1,260  | 630  | 288                                       |
| Line-rate 10 GbE (TeraScale)    | 56   | 28   | 12  |
| Total 10 GbE (TeraScale)        | 224  | 112  | 48  |
| Chassis Size                    | 21 Rack Units (DC)<br>24 Rack Units (AC)<br><i>2 Chassis/19" Rack</i>  | 16 Rack Units<br><i>3 Chassis/19" Rack</i> | 8 Rack Units<br><i>6 Chassis/19" Rack</i> |
| Hardware Redundancy             | Power, Route Processor, Switch Fabric, Passive Copper Backplane  |  |   |
| Software Redundancy             | L2/L3 Hitless Failover   |  |   |
| Operating System                | Fully Modular Utilizing a 3-CPU Architecture   |  |   |

| Line Card Capabilities & Applications | TeraScale Series EF                | TeraScale Series EG        |
|---------------------------------------|------------------------------------|----------------------------|
| Layer 2 Switching                     | ✓                                  | ✓                          |
| IPv4 Routing                          | Aggregation, Data Center, LAN Core | Backbone, Peering, Transit |
| IPv6 Routing                          | Aggregation, Data Center, LAN Core | Backbone, Peering, Transit |



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