

Overview

HP supports 40Gbps 4x Quad Data Rate (QDR) and 20Gbps 4X Double Data Rate (DDR) InfiniBand (IB) products that include mezzanine Host Channel Adapters (HCA) for server blades, switch blades for c-Class enclosures, and rack switches and cables for building scale-out solutions. This QuickSpecs focuses on mezzanine HCAs for server blades, and InfiniBand switch blades for c-Class enclosures; for details on the InfiniBand rack switches, standup PCI Express HCAs for HP ProLiant and Integrity servers, as well as InfiniBand cables, please refer to the HP InfiniBand for HP ProLiant and Integrity servers QuickSpecs at:

http://h18000.www1.hp.com/products/quickspecs/13078_div/13078_div.html

The following InfiniBand products based on Mellanox technology are available for the HP BladeSystem c-Class from HP:

- HP 4X QDR IB CX-2 Dual Port Mezz HCA for HP BladeSystem c-Class
- HP BLc 4X QDR IB Switch for HP BladeSystem c-Class
- HP BLc 4X DDR IB G2 Switch for HP BladeSystem c-Class

NOTE: The above Mellanox based devices of either speed can be used together but cannot be used with QLogic based devices.

The HP 4X QDR IB CX-2 Dual-port Mezzanine HCA for HP BladeSystem c-Class is based on the Mellanox ConnectX-2 IB technology. The QDR IB HCA delivers low-latency and up to 40Gbps (QDR) bandwidth for performance-driven server and storage clustering applications in High-Performance Computing (HPC) and enterprise data centers. Parallel or distributed applications running on multi-processor multi-core servers will benefit from the reliable transport connections and advanced multicast support offered by ConnectX IB. End-to-end Quality of Service (QoS) enables partitioning and guaranteed service levels while hardware-based congestion control prevents hot spots from degrading the effective throughput. The HP 4X QDR IB CX-2 Dual-port Mezzanine HCA card is designed for PCI Express 2.0 x8 connectors on HP BladeSystem c-Class G6 server blades. Depending on the server blade models, some configuration rules may apply which may result in only one port being connected to the enclosure mid-plane. Please refer to server blades specification for more details.

The DDR IB HCA delivers low-latency and up to 20Gbps (DDR) bandwidth for performance-driven server and storage clustering applications in High-Performance Computing (HPC) and enterprise data centers. The HP 4X DDR Dual-port Mezzanine HCA card is designed for PCI Express connectors on HP BladeSystem c-Class server blades. To obtain the best performance, it is recommended to plug the card into the x8 PCI Express connector on the server blades. Depending on the server blade models, some configuration rules may apply which may result in only one port being connected to the enclosure mid-plane. Please refer to server blades specification for more details.

InfiniBand host stack software (driver) is required to run on servers connected to the InfiniBand network. For mezzanine HCAs based on Mellanox technologies, HP supports Mellanox OFED and Voltaire OFED driver stacks on Linux 64-bit operating systems, and Mellanox WinOF driver stack on Microsoft Windows (HPC) server 2008.

A right-to-use (RTU) license is required for Voltaire OFED driver stack. For the latest information on Voltaire OFED software, please refer to: http://www.voltaire.com/Products/Application_Acceleration_Software/Voltaire_OFED_and_WinOF_Support.

For the latest information on Mellanox OFED software, please refer to: http://www.mellanox.com/content/pages.php?pg=software_overview_ib&menu_section=34.

The HP BLc 4X QDR IB Switch for HP BladeSystem c-Class is a double wide switch for the new HP BladeSystem c7000 enclosure. It is based on the Mellanox InfiniScale IV technology. The QDR IB switch blade has 16 downlink ports to connect up to 16 server blades in the c7000 enclosure, and 16 QSFP uplink ports for inter-switch links or to connect to external servers. All ports are capable of supporting 40Gbps (QDR) bandwidth. A subnet manager has to be provided; see the paragraph on subnet managers for more details.

The HP BLc 4X DDR IB Gen2 Switch is a double wide switch for the HP BladeSystem c7000 and c3000 enclosures. It is based on the



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Mellanox InfiniScale IV technology. The DDR Gen2 IB switch has 16 downlink ports to connect up to 16 server blades in the enclosures, and 16 QSFP uplink ports for inter-switch links or to connect to external servers. All ports are capable of supporting 20Gbps (DDR) bandwidth. A subnet manager has to be provided; see the paragraph on subnet managers for more details.

An InfiniBand fabric consists of one or more InfiniBand switches connected via inter-switch links. The most commonly deployed fabric topology is a fat tree or its variations. A subnet manager is required to manage and control an InfiniBand fabric. The subnet manager functionality can be provided by either a rack-mount InfiniBand switch with an embedded fabric manager (aka internally managed switch) or host-based subnet manager software on a server connected to the fabric. OpenSM is a host-based subnet manager that runs on a server connected to the InfiniBand fabric. Mellanox OFED software stack includes OpenSM for Linux, and Mellanox WinOF includes OpenSM for Windows. For comprehensive management and monitoring capabilities, Voltaire Unified Fabric Manager™ (UFM) is recommended for managing the InfiniBand fabric based on Voltaire InfiniBand switch products and Mellanox ConnectX-based mezzanine HCA running Voltaire OFED stack.

Embedded fabric manager is available on Voltaire internally managed 36-port 4X QDR switch, 24-port, 96-port, and 288-port DDR switches. Please refer to: http://h18000.www1.hp.com/products/quickspecs/13078_div/13078_div.html for information about InfiniBand rack switches.

The following InfiniBand products based on QLogic technology are available for the HP BladeSystem c-Class from HP:

- QLogic 4X QDR IB Mezzanine HCA for HP BladeSystem c-Class
- QLogic BLc 4X QDR IB Switch for HP BladeSystem c-Class
- QLogic BLc 4X QDR IB Management Module

NOTE: The above QLogic based devices cannot be mixed with Mellanox based devices in a HP BladeSystem c7000 Enclosure.

The QLogic 4X QDR IB Mezzanine HCA is based on the QLogic TrueScale ASIC architecture which has a unique hardware architecture that delivers unprecedented levels of performance, reliability, and scalability, making it an ideal solution for highly scaled High Performance Computing (HPC) and high throughput, low-latency enterprise applications.

InfiniBand host stack software (driver) is required to run on servers connected to the InfiniBand fabric. For HCAs based on QLogic technology, HP supports QLogic OFED driver stacks on Linux 64-bit operating systems.

The QLogic BLc 4X QDR IB Switch for HP BladeSystem c-Class uses the QLogic TrueScale ASIC architecture designed to cost-effectively link workgroup resources into a cluster or provide an edge switch option for a larger fabric. Customers have the ability to internally or externally manage the modular IB switch. The QLogic BLc 4X QDR IB Switch also has an optional management module that includes an embedded subnet manager. This management module is an option for both the 32-port QDR BladeSystem switch and the 36-port QDR edge switch. When combined with the optional InfiniBand Fabric Suite software, users can manage up to a 288 node fabric using only the management capability of the unit, without requiring additional host processing. In a bladed environment this alleviates the need to use a node for fabric management.

An InfiniBand fabric is constructed with one or more InfiniBand switches connected via inter-switch links. The most commonly deployed fabric topology is a fat tree or its variations. A subnet manager is required to manage an InfiniBand fabric. OpenSM is a host-based subnet manager that runs on a server connected to the InfiniBand fabric. QLogic OFED software stack includes OpenSM for Linux. For comprehensive management and monitoring capability, QLogic InfiniBand Fabric Suite (IFS) is recommended for managing the InfiniBand fabric based on QLogic InfiniBand products.

HP supports InfiniBand copper and fiber optic cables with CX4 to CX4, CX4 to QSFP, and QSFP to QSFP connectors. The CX4 to CX4 copper cables range from 0.5M to 8M for HCA to switch, or inter-switch links at DDR speed, and up to 12M for certain inter-switch links at DDR speed. The CX4 to CX4 fiber optic cables range from 1M to 100M for HCA to switch, or inter-switch links at DDR speed. Please note that only 12 ports on Voltaire 24-port DDR switches support fiber optic cables. The CX4 to QSFP copper cables range from 1M to 5M for HCA to switch, or inter-switch links at either DDR or QDR speed. The QSFP to QSFP copper cables range from 1M to 7M for HCA to switch, or inter-switch links at either DDR or QDR speed (please note that QLogic QDR switches only



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support up to 5 meters at QDR speed) , and up to 10M at DDR speed. Please refer to:

http://h18000.www1.hp.com/products/quickspecs/13078_div/13078_div.html for more details on supported InfiniBand cables.

What's New

- HP 4X QDR IB CX-2 Dual Port Mezz HCA for HP BladeSystem c-Class
- QLogic 4X QDR IB Dual Port Mezzanine HCA for HP BladeSystem c-Class
- QLogic BLc 4X QDR IB Switch for HP BladeSystem c-Class

At A Glance

- **InfiniBand mezzanine HCA based on Mellanox technology**
 - HP 4X QDR IB CX-2 Dual-port Mezzanine HCA for HP BladeSystem c-Class
 - Dual-port 4X QDR InfiniBand PCI Express G2 Mezzanine card
 - Supported on: HP ProLiant BL280c G6, HP ProLiant BL2x220c G6, HP ProLiant BL460c G6, HP ProLiant BL460c G7, HP ProLiant BL465c G7, HP ProLiant BL490c G6, HP ProLiant BL490c G7, HP ProLiant BL620c G7, HP ProLiant BL680c G7, HP ProLiant BL685c G7 Server Blades and HP ProLiant WS460c G6 Workstation Blade
 - Support Mellanox OFED and Voltaire OFED Linux driver stacks and Mellanox WinOF 2.0 on Microsoft Windows HPC server 2008
- **InfiniBand mezzanine HCA based QLogic technology**
 - QLogic 4X QDR IB Dual Port Mezzanine HCA for HP BladeSystem c-Class
 - Dual-port 4X QDR InfiniBand PCI Express G2 Mezzanine Card
 - Supported on HP ProLiant BL280c G6, HP ProLiant BL2x220c G6, HP ProLiant BL460c G6, HP ProLiant BL460c G7, HP ProLiant BL465c G7, HP ProLiant BL490c G6, HP ProLiant BL490c G7, HP ProLiant BL620c G7, HP ProLiant BL680c G7, HP ProLiant BL685c G7 Server Blades and HP ProLiant WS460c G6 Workstation Blade
 - Full support for QLogic OFED including all standard OFED transport protocols, plus optional value-added components to improve management and performance
- **InfiniBand switch blades based on Mellanox technology**
 - HP BLc 4X QDR IB Switch for HP BladeSystem c-Class
 - Double wide switch blade for the new c7000 enclosure with 16 downlink ports to connect server blades via the midplane, and 16 QSFP unlink ports for the inter-switch links or to connect to external servers. All ports are capable of supporting 40Gbps (QDR) bandwidth. All uplink ports support copper and fiber optic cables. The switch is externally managed, i.e. a subnet manager has to be provided on the fabric (see the subnet manager discussion above)
 - HP BLc 4X DDR IB Gen2 Switch for HP BladeSystem c-Class
 - Double wide switch module for c-Class enclosures, with 16 downlink ports to connect server blades via the midplane, and 16 QSFP uplink ports for the inter-switch links or to connect to external servers. All ports are capable of supporting 20Gbps DDR bandwidth. All uplink ports support copper and fiber optic cables. The switch is externally managed, i.e., a subnet manager has to be provided on the fabric (see the subnet manager discussion above)
- **InfiniBand switch blades based on QLogic technology**
 - QLogic BLc 4X QDR IB Switch for HP BladeSystem c-Class
 - Double wide switch blade for the new c7000 enclosure with 16 downlink ports to connect server blades via the midplane, and 16 QSFP unlink ports for the inter-switch links or to connect to external servers. All ports are capable of supporting 40Gbps (QDR) bandwidth. All uplink ports support copper and fiber optic cables
 - Optional Management Module with an embedded subnet manager and management of up to 288 nodes



Models

Mellanox InfiniBand mezzanine HCA cards and options	NOTE: The HCA cards listed in this section are based on Mellanox technology.	
	HP 4X QDR IB CX-2 Dual Port Mezz HCA for HP BladeSystem c-Class	592519-B21
	Mellanox Fabric IT Fabric Manager Per Node Right To Use License	TE078A
	Voltaire Unified Fabric Mgr (UFM) Per Node RTU	590643-B21
	NOTE: Right to use (RTU) License for Voltaire Unified Fabric Manager (UFM), 1 per node for every node connected to the Voltaire InfiniBand fabric.	
QLogic IB mezzanine HCA card	QLogic 4X QDR IB Dual Port Mezz HCA	583210-B21
Mellanox IB switch blades and options	HP BLc 4X DDR IB Gen2 Switch for HP BladeSystem c-Class	489183-B21
	HP BLc 4X QDR IB Switch for HP BladeSystem c-Class	489184-B21
	NOTE: The HP BLc 4X QDR IB Switch is only supported on the HP BladeSystem c7000 Enclosures (P/N's: 507014-B21, 507015-B21, 507016-B21, 507017-B21 and 507019-B21.	
	NOTE: Please see the HP BladeSystem c7000 Enclosure QuickSpecs for additional information at: http://h18000.www1.hp.com/products/quickspecs/12810_div/12810_div.html (Worldwide)	
QLogic IB switch blade and options	QLogic BLc 4X QDR IB Switch for HP BladeSystem c-Class	505958-B21
	QLogic BLc 4X QDR IB Management Module	505959-B21
	QLogic InfiniBand Fabric Suite Fabric Flexible License	QL470A
	NOTE: Right to use (RTU) License for QLogic IFS, 1 per node for every node connected to the QLogic InfiniBand fabric.	



Standard Features

Performance

Latency and Bandwidth:

All ports on 4X QDR HCA card and switch are capable of supporting 40Gbps signaling rate, with a peak data rate of 32 Gbps in each direction.

All ports on 4X DDR HCA cards and switches are capable of supporting 20 Gbps signaling rate, with a peak data rate of 16 Gbps in each direction.

Scalability and Reliability Standards support:

- Dual-port 4X QDR mezzanine HCA: PCI Express revision 2.0x8 (1.1 compliant)
- Dual-port 4X DDR mezzanine HCA: PCI Express revision 2.0x8 (1.1 compliant)
- IBTA version 1.2 compatible

Operating systems support

- Mellanox OFED for Linux
 - RHEL 5U3, U4, U5, U6
 - RHEL 6
 - SLES 10 SP3, SLES 11, SLES 11 SP1
 - Mellanox WinOF for Microsoft Windows HPC server 2008 (64-bit)
 - Microsoft Windows 2008
 - Microsoft Windows HPC server 2008
 - Microsoft Windows HPC server 2008 R2
- QLogic OFED+ for Linux (64-bit)
 - RHEL 4 U7, U8
 - RHEL 5 U3, U4, U5
 - SLES 10 SP3, SLES 11, SLES 11 SP1
 - CentOS (Rocks) 5.3, 5.4, 5.5
 - Scientific Linux 5.3, 5.4, 5.5

PCI-Express Mezzanine connectors

HP 4X QDR IB HCA mezzanine card is specified to run on PCI Express Gen2 connectors.

HP 4X DDR IB HCA mezzanine cards are specified to run on PCI Express mezzanine connectors. Either x8 or x4 connectors can be used for the IB 4X DDR HCA cards, however, for the best 4X DDR performance, DDR IB HCA mezzanine cards should only be plugged on x8 PCI Express connectors.

Depending on the server blade models, multiple HCAs per server blade may be supported; please refer to server blades specification for more details.

Switch bays on c-Class enclosure

HP IB switch blades are designed to fit into the double wide switch bays on the c-Class enclosures. Depending on the mezzanine connectors used for IB HCA mezzanine cards, the IB switch blade has to be inserted into corresponding switch bays.



Standard Features

InfiniBand Fabric Management

Auto-negotiation/self-discovery:

InfiniBand QDR ports support auto-negotiation down to DDR/SDR, InfiniBand DDR ports support auto-negotiation down to SDR. For example, external uplink ports of a DDR switch blade will negotiate down to SDR speed if they are connected to a device which can only operate at SDR.

Self-discovery is supported by subnet manager. Check the documents of the specific subnet manager for more details <http://www.docs.hp.com>.

Management Support:

Mellanox OFED, Voltaire® OFED and QLogic OFED+ include drivers and utilities to configure and manage the HCA in a Linux environment and Mellanox WinOF includes drivers and utilities to configure and manage the HCA in the Microsoft Windows server HPC 2008 environment.

InfiniBand fabric has to be set up with a subnet manager: see the subnet manager discussion above.

Warranty

HP branded hardware options qualified for BladeSystem c-Class and p-Class servers are covered by a global limited warranty and supported by HP Services and a worldwide network of HP Authorized Channel Partners. The HP branded hardware option diagnostic support and repair is available for one year from date of purchase, or the length of the server they are attached to, whichever is greater. Support for software and initial setup is available for 90 days from date of purchase. Additional support may be covered under the warranty or available for an additional fee. Enhancements to warranty services are available through HP Care Pack services or customized service agreements.

Additional information regarding worldwide limited warranty and technical support is available at: <http://h18004.www1.hp.com/products/servers/platforms/warranty/index.html>



Service and Support

Service and Support

HP Care Pack Services: Packaged server and storage services for increased uptime, productivity and ROI

When you buy HP server and storage products and solutions, it's also a good time to think about what levels of support you may need. Our portfolio of service options reduce deployment and management worries while helping you get the most out of your server and storage investments. We take a holistic approach to your environment, bridging servers, blades, storage, software and network infrastructures with our packaged HP Care Pack Services for servers and storage.

Protect your business beyond warranty

When it comes to robustness and reliability, standard computing equipment warranties have matured along with technology. Good news that can also create problems stemming from depending on standard warranties designed to only protect against product defects and some downtime causes. Using a standard approach to warranty uplifts, such as HP Care Pack Services, helps reduce downtime risks and provides operational consistency for mission-critical and standard business computing.

HP Care Pack Services: Upgrading or extending standard server and storage warranties cost effectively

HP Care Pack Services offer a standard reactive hardware and software support services suite sold separately, or combined with our Support Plus and Support Plus 24 services. The portfolio also provides a combination of integrated proactive and reactive services, such as Proactive 24 Service and Critical Service. In addition with HP Proactive Select, you can acquire the specific proactive constancy and technical services. HP Proactive Select menu offers a broad set of service options that you can mix and match depending on your specific requirements. Proactive service options include offers for server, storage, network, SAN device, software, environment and education services.

HP server and storage lifecycle support services offers a full spectrum of customer care-from technology support to complex migrations to complete managed services. HP Factory Express provides customization, integration and deployment services for turnkey solutions. HP Education Services offer flexible, comprehensive training on to help your IT staff get the most out of your server and storage investments. HP Financial solutions extend innovative financing and cost-effective asset management programs-from purchase to equipment retirement.

Learn more: www.hp.com/services/servers and www.hp.com/services/storage

NOTE: Care Pack Services availability may vary by product and country.

HP Care Pack Services are sold by HP and HP Authorized Service Partners:

- Services for customers purchasing from HP or an enterprise reseller are quoted using HP order configuration tools.
- Customers purchasing from a commercial reseller can find HP Care Pack Services at <http://www.hp.com/go/lookuptool>



Service and Support

Recommended HP Care Pack Services for optimal satisfaction with your HP product

Recommended Services **Hardware Options Support**

HP Care Packs provide support for all HP-branded hardware options qualified for inclusion in your server or storage solution. Any additional HP-qualified options installed within the server are covered at the same service level and for the same period as the server and no additional cost.

- Help improve or maintain system uptime
- Convenient onsite support
- Committed response time

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EEE>

3-Year HP Hardware Support Onsite Service, 4-hour response, 24x7

Provides you with rapid remote support and if required an HP authorized representative who will arrive on site any time and day of the year to begin hardware maintenance service within 4 hours of the service request being logged.

This service provides a trained HP service specialist to perform an installation that meets HP quality standards, for:

- Help improve or maintain system uptime
- Convenient onsite support
- Committed response time

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EEE>

HP Installation and Startup of HP ProLiant Servers

Provides for the installation of your new HP ProLiant server and operating system to assist you in bringing your new HP ProLiant server and operating system into operation in a timely and professional manner.

This service provides a trained HP service specialist to perform an installation that meets HP quality standards, for:

- Delivery of the service at a mutually scheduled time convenient to your organization
- Availability of an HP service specialist to answer basic questions during the onsite delivery of this service
- Custom installation as detailed in "Delivery specifications" or in a Statement of Work (SOW)
- Verification prior to installation that all service prerequisites are met

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-7572ENN.pdf>



Service and Support

Optional HP Care Pack Services that will enhance your HP product experience

Optional Services

3-Year HP Hardware Support Onsite Call-to-Repair (CTR) Service, 6- or 24-hour

As an alternative to our recommended support level, for customers who need committed call-to-repair for server hardware.

Provides your IT manager with a team of support specialists who will quickly begin troubleshooting the system to help return the hardware to operating condition within 6 or 24 hours of the initial service request to the HP Global Solution Center.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EN.pdf>

3-Year HP Support Plus 24

As an alternative to our recommended support level, for customers who need access to responsive 24x7 hardware and software support plus software updates on HP and selected third party products:

For a higher return on your server and storage technology, our 3-year combined reactive support service delivers integrated onsite hardware/software support services available 24x7x365, including access to HP technical resources, 4-hour response onsite hardware support and software updates.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5981-6638EEE>

HP Proactive Select Service

Customer needs on demand access to consulting, technical proactive services and education courses

Provides a flexible way to purchase HP best-in-class consultancy and technical services. You can buy Proactive Select Service Credits when you purchase your hardware and then use the credits over the next 12 months.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3842ENN>

eSupport

HP eSupport is a portfolio of technology-based services that assist you with managing your business environment - from the desktop to the data center.

Support Portal

The HP support portal provides one-stop access to the information, tools and services you need to manage the daily operations of your IT environment.

Features include:

- Access to self-solve tools (including search technical knowledge base)
- Efficient logging and tracking of support cases
- Collaboration with other business and IT professionals
- Download of patches and drivers
- Access to diagnostic tools
- Proactive notification of relevant information

Access to certain features of the support portal requires an HP service agreement. To access the support portal, visit: <http://www.hp.com/support>



Service and Support

HP Insight Remote Support software delivers secure remote support for your HP Servers and Storage, 24 X 7, so you can spend less time solving problems and more time focused on your business. You can have your systems remotely monitored for hardware failure using secure technology that's been proven at thousands of companies around the world. In many cases, you can avoid problems before they occur.

Customer Technical Training

In today's cost-conscious business environment, IT professionals, developers, consultants and users face an interesting challenge: how to keep up with the latest technologies and expand important skills while delivering profitable results on current projects. To help address this challenge, HP offers innovative training solutions that help keep you up-to-date on virtualization, server, storage, Insight Control, Citrix, Microsoft® and open source/Linux-related topics-while spending less time away from business-critical activities.

HP Services Awards

HP Technology Services continues to be recognized for service and support excellence by customers, partners, industry organizations and publications around the world. Recent honors and award reflect our services team's dedications, technical expertise, professionalism and uncompromising commitment to customer satisfaction.

Additional Services Information

To learn more on HP ProLiant servers, HP BladeSystem servers and HP storage products, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: www.hp.com/services/proliant or www.hp.com/services/bladesystem or <http://www.hp.com/hps/storage>



Technical Specifications

Compliance	Mezzanine:	Dual-port QDR HCA: PCI Express 2.0 (1.1 compliant) Dual-port DDR HCA: PCI Express 2.0 (1.1 compliant) ROHS-R5 (QLogic HCA is ROHS-R6 compliant)	
	Switches:	IBTA version 1.2 compatible ROHS-R5 (QLogic switch blade is ROHS-R6 compliant)	
General Specifications	Communications Processor	Mezzanine: Dual-port QDR HCA: Mellanox ConnectX-2 Dual-port DDR HCA: Mellanox ConnectX-2 QLogic QDR HCA: QLogic TrueScale QDR switch: MT48436A1-FCC-Q, InfiniScale IV DDR Gen2 switch: MT48436A1-FCC-D, InfiniScale IV QLogic QDR switch: QLogic TrueScale	
	Dimensions (LxW)	Mezzanine HCA: 4.5 x 4.0 in (11.43 x 10.16 cm) Switches: 15.3 x 10.6 in (38.86 x 26.92 cm)	
	Power and Environmental Specifications	Operating Temperature	Mezzanine HCA: 32° to 131° F (0° to 55° C) Switch module: 32° to 104° F (0° to 40° C)
		Humidity (non-condensing)	Mezzanine HCA: 5% to 85% Switch module: 5% to 85%
	Power requirement	Mezzanine HCAs: Dual-port QDR HCA: max 11.4W Dual-port DDR HCA: max 12.9W QLogic QDR HCA: max 8.4W Switch blades: QDR switch: 10.8A at 12V Max (130W) DDR Gen2 switch: 10 A at 12V max (120 W) QLogic QDR switch: 150W @ 12V QLogic Management Module: 1.5W @ 12V	
	Emissions Classifications	HCA and Switches: FCC CFR 47 Part 15 Class A CISPR 22 Class A ICES-003 Class A VCCI Class A ACA CISPR 22 Class A Switches: MIC Korea "EMC Registration Regulation" Class A	

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