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Data Sheet

QLogic FastLinQ QL4541*x*HLCU

40GbE Intelligent Ethernet Adapters

QLOGIC FastLinQ™

- Fully featured 40GbE adapter delivers the best price per performance ratio versus 10GbE
- Increase VM density and accelerate multitenant networks with full offload for tunneling protocols
- Build the most powerful scale-out storage systems with QLogic's unique support of multiple RDMA technologies (RoCE, RoCEv2, and iWARP)
- Accelerate the most demanding telco NFV workloads with the QLogic DPDK high-speed packet processing engine
- Orchestrate and manage hyperscale OpenStack® deployments with QLogic QConvergeConsole cloud-enabled management framework

OVERVIEW

QLogic® FastLinQ™ QL45411HLCU single-port and QL45412HLCU dual-port Intelligent Ethernet Adapters leverage QLogic's fifth-generation technology to deliver true 40Gb per second (40Gbps) Ethernet performance. Optimized for use across enterprises, managed service providers, and large public and scalable private cloud deployments, the QL45411HLCU and QL45412HLCU enable organizations to achieve new levels of performance in physical, virtual, and cloud environments.

The QLogic FastLinQ QL45411HLCU and QL45412HLCU 40GbE Adapters deliver advanced features, including:

- Cutting-edge server virtualization technologies—single-root I/O virtualization (SR-IOV) and NIC partitioning (NPAR)
- Network virtualization—offloads for VXLAN, GENEVE, and NVGRE
- Multiple, concurrent RDMA technologies—RDMA over Converged Ethernet (RoCE), RoCEv2, iSCSI Extensions for RDMA (iSER), and are extensible to support iWARP

REDUCE CAPITAL EXPENDITURES (CAPEX) AND OPERATIONAL EXPENDITURES (OPEX)

QLogic QL45411HLCU and QL45412HLCU 40GbE technology delivers better price-per-gigabit ratio versus 10GbE. This technology enables cloud providers and large-scale data center operators to reduce operating expense while continuing to scale their network of server and storage nodes to meet increasing demands of the future.

ACCELERATE ANY NETWORK WITH MULTI-RDMA OFFLOAD

QLogic QL45411HLCU and QL45412HLCU 40GbE technology supports RoCE acceleration to deliver low latency, low CPU utilization, and high performance on Windows Server® Message Block Direct 3.0 and 3.02. QL45411HLCU and QL45412HLCU 40GbE Adapters have the unique capability to deliver multi-RDMA that provides customers with the choice of a low-latency interconnect that can best utilize the potential of emerging storage technologies such as NVM Express®. QLogic's cutting-edge offloading technology increases cluster efficiency and improves scalability.

HIGH-DENSITY SERVER VIRTUALIZATION

The latest hypervisors and multicore systems use several technologies to increase the scale of virtualization. The QLogic QL45411HLCU and QL45412HLCU 40GbE adapters support:

- VMware® NetQueue
- Windows® Hyper-V® virtual machine queue (VMQ)
- Linux® Multiqueue

- Windows, Linux, and VMware switch-independent NPAR
- Windows Hyper-V, Linux Kernel-based Virtual Machine, and VMware ESXi™ SR-IOV

These features provide ultimate flexibility, QoS, and optimized host and VM performance while providing full 40Gbps bandwidth per port. Public and private cloud virtualized server farms can now achieve four times the VM density for the best price and VM ratio.

WIRE-SPEED NETWORK VIRTUALIZATION

Enterprise-class data centers can be scaled using overlay networks to carry VM traffic over a logical tunnel using NVGRE, VXLAN, and GENEVE. Although overlay networks can resolve vLAN limitations, native stateless offloading engines are bypassed, which places a higher load on the system's CPU. QLogic QL45411HLCU and QL45412HLCU 40GbE technology efficiently handles this load with advanced NVGRE, VXLAN, and GENEVE stateless offloading engines that access the overlay protocol headers. This access enables traditional stateless offloads of encapsulated traffic with native-level performance in the network. Additionally, QLogic QL45411HLCU and QL45412HLCU 40GbE technology supports VMware NSX® and Open vSwitch.

HYPERSCALE ORCHESTRATION WITH OPENSTACK

QLogic QL45411HLCU and QL45412HLCU 40GbE technology supports the OpenStack open source infrastructure for deploying and orchestrating public, private, and hybrid cloud computing platforms. It provides for both networking and storage services (block, file, and object) for iSER. These platforms allow providers to rapidly and horizontally scale VMs over their entire, diverse, and widely spread network architecture to meet the real-time needs of their customers. The integrated, multiprotocol management utility, QLogic QConvergeConsole®, provides breakthrough features that allow customers to visualize the OpenStack-orchestrated data center using auto-discovery technology.

ACCELERATE TELCO NETWORK FUNCTION VIRTUALIZATION (NFV) WORKLOADS

In addition to OpenStack, QLogic QL45411HLCU and QL45412HLCU 40GbE technology supports NFV that allows decoupling of network functions and services from dedicated hardware (such as routers, firewalls, and load balancers) into hosted VMs. NFV enables network administrators to flexibly create network functions and services as they need them, which reduces CAPEX and OPEX, and enhances business and network services agility. QLogic 40GbE technology is integrated into the Data Plane Development Kit (DPDK) to host the most demanding NFV workloads.

TRUSTED, RELIABLE, AND INTEROPERABLE

QLogic QL45411HLCU and QL45412HLCU 40GbE technology adheres to standards that ensure interoperability with a wide range of network solutions. Using advanced QLogic technologies based on mature software stacks, enterprise-class data centers can confidently deploy reliable, high-performance networks.

Note: All advertised features are enabled in the hardware. Actual feature availability is dependent on software driver releases. See the release notes.

Host Bus Interface Specifications

Bus Interface
- PCIe® 3.0 x16, 2.0 x16 (electrical), 1.0 x16 (electrical); x16 (physical connector)

Host Interrupts
- INTx and MSI-X

I/O Virtualization
- SR-IOV
- NPAR

Compliance
- *PCI Express Base Specification,* rev. 3.0
- *PCI Express Card Electromechanical Specification,* rev. 3.0
- *PCI Bus Power Management Interface Specification,* rev. 1.2

Ethernet Specifications

Throughput
- 40Gbps line rate per port

Ethernet Frame
- Standard MTU sizes and jumbo frames up to 9,600 bytes

Stateless Offload
- IP, TCP, and user datagram protocol (UDP) checksum offloads
- TCP segmentation offload (TSO)
- Large send offload (LSO)
- Giant send offload (GSO)
- Large receive offload (LRO)
  - LRO (Linux)
  - Receive segment coalescing (RSC) (Windows)
- Receive side scaling (RSS)
- Transmit side scaling (TSS)
- Interrupt coalescing
- VMware NetQueue, Microsoft® Hyper-V VMQ, and Linux Multiqueue

Network Virtualization
- GRE
- NVGRE
- VXLAN
- GENEVE

Compliance
- *IEEE Specifications:*
  - *40GBASE-CR4 (Direct Attach Copper)*
  - *40GBASE-SR4 (Multimode Fiber)*
  - *802.3-2012 (40Gb Ethernet and 10Gb Ethernet and Ethernet Flow Control)*
  - *802.1q (VLAN)*
  - *802.1AX- (Link Aggregation)*
  - *802.1p (Priority Encoding)*
  - *IPv4 (RFQ 791)*
  - *IPv6 (RFC 2460)*
  - *802.1Qbb (Priority-Based Flow Control)*
  - *802.1Qaz (DCBX/Enhanced Transmission Selection)*
  - *802.1Qau (Congestion Notification)*

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RDMA Specifications

RDMA Specifications Include:
- RoCE
- RoCEv2
- iWARP
- Storage over RDMA: iSER, SMB Direct, and NVMf

Tools and Utilities

Management Tools and Device Utilities
- QLogic Control Suite integrated network adapter management utility (CLI) for Linux and Windows
- QConvergeConsole integrated network management utility (GUI) for Linux and Windows
- QConvergeConsole Plug-ins for vSphere® (GUI) and ESXCLI plug-in for VMware
- Native OS management tools for networking

Boot Support
- Unified Extensible Firmware Interface (UEFI)
- Pre-execution environment (PXE)

Operating Systems
- For the latest applicable OS information, see http://driverdownloads.qlogic.com

Physical Specifications

Ports
- QL45411: Single 40Gbps QSFP+ and DAC Ethernet ports
- QL45412: Dual 40Gbps QSFP+ and DAC Ethernet ports

Form Factor
- Low profile PCIe card (6.6in. × 2.54in.)

Environment and Equipment Specifications

Temperature
- Operating: 0°C to 55°C (32°F to 131°F)
- Storage: –20°C to 70°C (–4°F to 158°F)

Humidity
- Operating: 10% to 90%
- Storage: 5% to 95%

Maximum Cable Distances
- 100m OM3 MMF
- 7m DAC

Agency Approvals—Safety

US and Canada
- UL 60950-1
- CSA C22.2

Europe
- TUV EN60950-1
- TUV IEC 60950-1
- CB Certified

Agency Approvals[1]—EMI and EMC (Class A)

US and Canada
- FCC Rules, CFR Title 47, Part 15, Subpart Class A
- Industry Canada, ICES-003: Class A

Europe
- EN55022
- EN55024
- EN61000-3-2
- EN61000-3-3

Japan
- VCCI: Class A

New Zealand and Australia
- AS/NZS: Class A

Korea
- KC-RRA Class A

Taiwan
- BSMI CNS 13438

Ordering Information

QL45411HLCU (Single-port)
- QSFP+ cage for DAC connectivity
- Can also be used with industry-standard 40G optical modules

QL45412HLCU (Dual-port)
- QSFP+ cage for DAC connectivity
- Can also be used with industry-standard 40G optical modules

1 Agency approvals are preliminary at the time of initial release.

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