QLogic FastLinQ QL41112 Dual Port 10GbE CNA SFP+

10GbE Converged Network Adapters with iSCSI, FCoE, and Universal RDMA

**OVERVIEW**

QLogic® FastLinQ® QL41112HFCU-DE and QL41112HLCU-DE 10Gb Ethernet (10GbE) Converged Network Adapters (CNAs) with Universal Remote Direct Memory Access (RDMA) leverage QLogic’s eighth-generation technology to deliver 10Gb per second (10Gbps) Ethernet performance. Integrated, advanced networking with simultaneous LAN (TCP/IP) and SAN (Fibre Channel over Ethernet [FCoE] and iSCSI) traffic eliminates I/O bottlenecks and conserves CPU cycles. Optimized for use across enterprises, managed service providers (MSPs), and large public and scalable public cloud deployments, the QL41112 enables organizations to achieve new levels of performance in physical, virtual, and cloud environments.

For more effective use of the 10GbE bandwidth, QL41112 CNAs offer Dell Switch Independent Partitioning, which enables segmentation of each 10GbE port into eight virtual ports, with flexible allocation of bandwidth to each port. The segmentation allows IT organizations to improve resource utilization while lowering infrastructure and operational costs.

Virtualization, cloud computing, High Performance Computing, convergence, and clustering initiatives are increasing workload demands. The QL41112 CNA is the solution of choice for workload-intensive computing environments, providing a reliable, high-performance 10GbE connectivity solution.

QLogic FastLinQ QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters deliver advanced Ethernet solutions that are designed to meet requirements from leading enterprise and cloud providers. QLogic features that collectively deliver the most advanced 10GbE adapter include:

- Delivers full line-rate 10GbE performance across both ports
- Universal RDMA delivers the ultimate choice and flexibility with concurrent support for RoCE, RoCEv2, and iWARP technologies
- Enables provisioning of 25GbE/10GbE ports for greater deployment flexibility through switch-independent NIC partitioning
- Increases VM density and accelerates multitenant networks with full offload for tunneling protocols
- Supports FCoE and iSCSI stateless offload operation

- Accelerates the most demanding telco NFV workloads with QLogic DPDK high-speed packet processing engine
- Cutting-edge server virtualization technologies—single-root I/O virtualization (SR-IOV) and Dell Switch Independent Partitioning
- Network virtualization—offsloads for Virtual Extensible LAN (VXLAN), Generic Network Virtualization Encapsulation (GENEVE), and Network Virtualization using Generic Routing Encapsulation (NVGRE)
- Universal RDMA technologies—RDMA over Converged Ethernet (RoCE), RoCEv2, iSCSI Extensions for RDMA (iSER), and Internet wide area RDMA protocol (iWARP)
- Orchestrate and manage hyperscale OpenStack® deployments with QLogic cloud-enabled management framework
- Enables provisioning of 10GbE ports for greater deployment flexibility through Dell Switch Independent Partitioning
STREAMLINING NETWORKING WITH SWITCH INDEPENDENT PARTITIONING

Switch Independent Partitioning helps simplify the data center and the network and storage infrastructure in several ways. For example, when connecting servers, administrators may need to use many cables, sometimes adding switches to reduce cable proliferation. Switch Independent Partitioning provides a third alternative: consolidating connections onto significantly reduced numbers of devices. Like switches, Switch Independent Partitioning reduces the number of cables without adding workloads on the network. However, Switch Independent Partitioning requires fewer devices versus using switches and cables, thereby reducing network sprawl, maximizing network scalability, and simplifying administration.

ACCELERATE ANY NETWORK WITH UNIVERSAL RDMA OFFLOAD

QLogic QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters support RoCE and iWARP acceleration to deliver low latency, low CPU utilization, and high performance on Windows Server® Message Block (SMB) Direct 3.0 and 3.02, and iSER. QL41112 10GbE Adapters have the unique capability to deliver Universal RDMA that enables RoCE, RoCEv2, and iWARP. QLogic Universal RDMA and emerging low latency I/O bus mechanisms such as Network File System over RDMA (NFSoRDMA) allow customers to accelerate access to data. QLogic’s cutting-edge offloading technology increases cluster efficiency and scalability to many thousands of nodes.

HIGH DENSITY SERVER VIRTUALIZATION

The latest hypervisors and multicore systems use several technologies to increase the scale of virtualization. QLogic QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters support:

- VMware® NetQueue
- Windows® Hyper-V® Virtual Machine Queue (VMQ)
- Linux® Multiqueue
- Windows, Linux, and VMware switch-independent NIC partitioning (NPAR)
- Windows Hyper-V, Linux Kernel-based Virtual Machine (KVM), and VMware ESXi™ SR-IOV

These features provide ultimate flexibility, quality of service (QoS), and optimized host and virtual machine (VM) performance while providing full 10Gbps bandwidth per port. Public and private cloud virtualized server farms can now achieve greater 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 virtual LAN (VLAN) limitations, native stateless offloading engines are bypassed, which places a higher load on the system’s CPU. QLogic QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters efficiently handle this load with advanced NVGRE, VXLAN, and GENEVE stateless offload 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 QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters support VMware NSX® and Open vSwitch (OVS).

HYPER-SCALE ORCHESTRATION WITH OPENSTACK

QLogic QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters support the OpenStack open source infrastructure for constructing and supervising public, private, and hybrid cloud computing platforms. They provide 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. QLogic’s integrated, multiprotocol management utility, QConvergeConsole® (QCC), 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 QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters support 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, reducing capital expenditure and operating expenses, and enhancing business and network services agility. QLogic 10GbE technology is integrated into the Data Plane Development Kit (DPDK) and can deliver up to 38 million packets per second to host the most demanding NFV workloads.

TRUSTED, RELIABLE, AND INTEROPERABLE

QLogic is an industry leader in 10GbE Ethernet FCoE and iSCSI solutions. QLogic QL41112HFCU-DE and QL41112HLCU-DE 10GbE Adapters adhere to standards that ensure interoperability with a wide range of network solutions.
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**Host Bus Interface Specifications**

- **Bus Interface**
  - PCI Express® (PCIe®) Gen 3 x8, Gen 2 x8 (electrical)

- **Host Interrupts**
  - MSI-X supports independent queues

- **I/O Virtualization and Multitenancy**
  - SR-IOV (up to 192 virtual functions)
  - NIC extended partitioning (NPArEP) (up to 16 physical functions)
  - Genetnic Routing Encapsulation (GRE) and NVGRE packet task offloads
  - VXLAN packet task offloads

- **Compliance**
  - PCI Express Base Specification, rev. 3.1
  - PCI Express Card Electromechanical Specification, rev. 3.0
  - PCI Bus Power Management Interface Specification, rev. 1.2
  - Advanced Configuration and Power Interface (ACPI), v2.0

**Ethernet Specifications**

- **Throughput**
  - 10Gbps 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 (up to 208 dynamic queues), and Linux Multiqueue
  - RDMA

**Tunneling Offloads**

- VXLAN
- NVGRE
- GENEVE

**Compliance**

- **IEEE Specifications:**
  - 802.3-2015 (1Gb and 10Gb Ethernet Flow Control)
  - 802.3-2015 Clause 52 (10Gb Ethernet Optical)
  - SFF8431 Annex E (10Gb Direct Attach Copper)
  - B02.3ad (Link Aggregation)
  - B02.1Tbb (Priority-based Flow Control)
  - B02.1Qaz (DCBX and ETS)
  - B02.1q (VLAN)
  - IPv4 (RFC 791)
  - IPv6 (RFC 2460)
  - 1588-2002 PTPv1 (Precision Time Protocol)
  - 1588-2008 PTPv2

**Management Tools and Device Utilities (continued)**

- QCC PowerKit (Windows PowerShell® cmdlets) for Linux and Windows
- Native OS management tools for networking

**Boot Support**

- Unified extensible firmware interface (UEFI)
- Pre-execution environment (PXE) 2.0
- FCoE boot from SAN
- iSCSI remote boot

**APIs**

- SNIA HBA API v2, and SMI-S

**Operating Systems**

- For the latest applicable operating system information, see [http://driverdownloads.qlogic.com](http://driverdownloads.qlogic.com)

**Physical Specifications**

- **Ports**
  - Dual 10Gbps Ethernet: SFP+ cages

- **Form Factor**
  - Low-profile PCIe card 167.65mm × 68.90mm (6.60in. × 2.71in.)

**Environment and Equipment Specifications**

- **Temperature**
  - Operating: 0°C to 55°C (32°F to 131°F)
  - Storage: –40°C to 65°C (–40°F to 149°F)

- **Humidity (Relative, Non-condensing)**
  - Operational: 10% to 80%
  - Non-operational: 93% maximum at 65°C

**Connectivity**

<table>
<thead>
<tr>
<th>Rate</th>
<th>DAC</th>
<th>SR FOC</th>
<th>AOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>10G</td>
<td>7</td>
<td>400 OM4 300 OM3</td>
<td>30</td>
</tr>
</tbody>
</table>

DAC = Direct attach cable
SR FOC = SR fiber optic cable
AOC = Active optic cable

**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

**Note:**
All advertised features are enabled in the hardware. Actual feature availability is dependent on software driver releases. See the release notes. Picture may not be representative of the final shipping product.
### Agency Approvals—Safety

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

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

### Agency Approvals—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**
- EN55032
- 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

**QL41112HFCU-DE**
- 540-BBYK full-height bracket installed
- SFP+ cage for DAC connectivity
- Can also be used with industry-standard 10G optical modules provided by customer (optical modules not included)

**QL41112HLCU-DE**
- 540-BBZI low-profile bracket installed
- SFP+ cage for DAC connectivity
- Can also be used with industry-standard 10G optical modules provided by customer (optical modules not included)