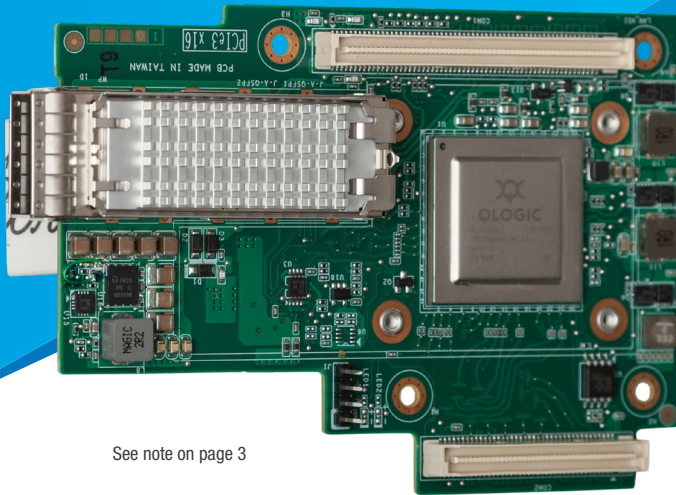


# FastLinQ QL45631HOCU

Single-port 100Gbps QSFP28 OCP  
Intelligent Ethernet Adapter



See note on page 3

- Industry’s most powerful 100GbE adapter delivers the best price and performance ratio
- FastLinQ® SmartAN™ for simplified connectivity with 100G switches without user intervention
- Secure firmware update process with private and public key encryption technology prevents malware injection and reduces attack surface
- Increase VM density and accelerate multitenant networks with full offload for tunneling protocols
- Orchestrate and manage hyperscale OpenStack® deployments with cloud-enabled management framework

## OVERVIEW

QL45631HOCU Intelligent Ethernet Adapters leverage the Cavium™ seventh-generation technology to deliver true 100 Gbits per second Ethernet (100GbE) performance. Integrated, advanced networking 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 FastLinQ QL45631HOCU enables organizations to achieve new levels of performance in physical, virtual, and cloud environments.

IEEE specifications 100GBASE-CR4 for direct attach copper (DAC) and 100GBASE-SR4 for multimode fiber (MMF) enable network bandwidth to be cost-effectively scaled. The specifications support next-generation server and storage solutions residing in cloud and Web-scale data center environments. Cavium is a leading innovator driving 100GbE technologies across both enterprise and cloud market segments.

The FastLinQ QL45631HOCU 100GbE adapter delivers advanced Ethernet solutions that are specifically designed to meet requirements from leading enterprise and cloud providers. Features that collectively deliver the most advanced 100GbE adapter include:

- Accelerate the most demanding telco NFV workloads with the Data Plane Development Kit (DPDK) high-speed packet processing engine

- Cutting-edge server virtualization technologies—single-root I/O virtualization (SR-IOV) and NIC partitioning (NPAR)
- Network virtualization offloads:
  - Virtual Extensible LAN (VXLAN)
  - Generic Network Virtualization Encapsulation (GENEVE)
  - Generic Routing Encapsulation (GRE)
  - Network Virtualization using Generic Routing Encapsulation (NVGRE)

### REDUCE CAPITAL EXPENDITURE AND OPERATING EXPENSE

QL45631HOCU 100GbE technology delivers better price-per-gigabit ratio versus 40GbE. 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.

### HIGH-DENSITY SERVER VIRTUALIZATION

The latest hypervisors and multicore systems use several technologies to increase the scale of virtualization. QL45631HOCU 100GbE technology supports:

- VMware® NetQueue
- Windows® Hyper-V® Virtual Machine Queue (VMQ)

**HIGH-DENSITY SERVER VIRTUALIZATION** *(continued)*

- Linux® Multiqueue
- Windows, Linux, and VMware switch-independent 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 100Gbps 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 GRE, NVGRE, VXLAN, and GENEVE. Although overlay networks can resolve virtual Local Area Network (VLAN) limitations, native stateless offload engines are bypassed, which places a higher load on the system's CPU. QL45631HOCU 100GbE 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, QL45631HOCU 100GbE technology supports VMware NSX® and Open vSwitch (OVS).

**HYPERSCALE ORCHESTRATION WITH OPENSTACK**

QL45631HOCU 100GbE technology supports the OpenStack open source infrastructure for constructing and supervising 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. Cavium'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, QL45631HOCU 100GbE 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, reducing capital expenditure and operating expenses, and enhancing business and network services agility. Cavium 100GbE technology is integrated into the DPDK, and can deliver up to 68 million packets per second to host the most demanding NFV workloads.

**TRUSTED, SECURE, RELIABLE, AND INTEROPERABLE**

QL45631HOCU 100GbE technology adheres to standards that ensure interoperability with a wide range of network solutions. Using advanced technologies based on mature software stacks, enterprise-class data centers can confidently deploy reliable, high-performance networks.

Cavium adapters are secure by design. Through public and private key encryption technology, the adapter enforces a process for secure firmware updates that prevents hackers from altering the code running on the adapter.

## Host Bus Interface Specifications

### Bus Interface

- PCI Express® (PCIe®) Gen 3 x16, Gen 2 x16 (electrical), Gen 1 x16 (electrical); x16 (physical connector)

### Host Interrupts

- MSI-X

### I/O Virtualization

- SR-IOV (up to 120 virtual functions)
- NPAR (up to 8 physical functions)

### 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

## Ethernet Specifications

### Throughput

- 100Gbps port line rate

### 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) (VMware)
- Generic receive offload (GRO) (Linux)
- Receive segment coalescing (RSC) (Windows)
- Receive side scaling (RSS)
- Transmit side scaling (TSS)
- Interrupt coalescing
- VMware NetQueue, Microsoft® Hyper-V VMQ (up to 160 queues), and Linux Multiqueue
- RDMA

### Network Virtualization

- GRE
- VXLAN
- NVGRE
- GENEVE

## Compliance

- IEEE Specifications:
  - 100GBASE-CR4 (Direct Attach Copper)
  - 100GBASE-SR4 (Multimode Fiber)
  - 802.1AS (Precise Synchronization)
  - 802.1AX-2008 (Link Aggregation)
  - 802.1p (Priority Encoding)
  - 802.1Q (VLAN)
  - 802.1Qau (Congestion Notification)
  - 802.1Qaz (DCBX/Enhanced Transmission Selection)
  - 802.1Qbb (Priority-Based Flow Control)
  - 1588-2002 PTPv1 (Precision Time Protocol)
  - 1588-2008 PTPv2
- Other specifications:
  - IPv4 (RFC 791)
  - IPv6 (RFC 2460)

## Board Firmware Features

- Secure Firmware Update process
- Smart Auto Negotiation (FastLinQ SmartAN)
- Forward error correction (FEC) support:
  - Reed-Solomon FEC (RS-FEC)
  - Fire Code FEC (FC-FEC)

## RDMA Specifications

### Converged Ethernet

- RoCE
- RoCE v2
- iSER
- Storage over RDMA:
  - NFSoRDMA
  - SMB Direct
  - Storage Spaces Direct (S2D)
  - NVMe-oF
  - pvRDMA

## Tools and Utilities

### Management Tools and Device Utilities

- QLogic Control Suite™ integrated network adapter management utility (CLI) for Linux and Windows
- QConvergeConsole PowerKit (Windows PowerShell®) cmdlets 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

## Management Tools and Device Utilities (continued)

- Pre-boot unified extensible firmware interface (UEFI) Device Configuration pages in system BIOS
- Native OS management tools for networking

## Boot Support

- Unified extensible firmware interface (UEFI)
- Pre-execution environment (PXE)
- iSCSI Remote Boot

## APIs

- SNIA HBA API v2
- SMI-S

## Operating Systems

- For the latest applicable operating system information, see <http://driverdownloads.qlogic.com>

## Physical Specifications

### Ports

- QL45631: Single 100Gbps Ethernet quad small form factor pluggable (QSFP28) cage
  - Supports CAUI-4 compliant QSFP modules for SR optics connectivity
  - Supports 100GBASE-CR4 QSFP for DAC connectivity.

### Form Factor

- OCP version 2.0
- Type 2 heatsink

### Cooling Requirements

- 350 LFM at 45°C (113°F)

## 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%

### Compliance

- RoHS compliant
- Halogen-free

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.

**Maximum Cable Distances**

- 5m DAC
- 30m active optical cables (AOC)
- 70m OM3 multimode fiber
- 100m OM4 multimode fiber

**Agency Approvals<sup>1</sup>—Safety**

**US and Canada**

- UL 60950-1
- CSA C22.2

**Europe**

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

<sup>1</sup> Agency approvals have not been authorized at the time of publication; this list is preliminary

**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**

- 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**

**QL45631HOCU-SP/BK/CK**

- QSFP28 cage for DAC, AOC, and SR optics connectivity (optical modules not included)
- Pack outs:
  - SP=Single Pack
  - BK=Bulk Kit
  - CK=Channel Kit



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