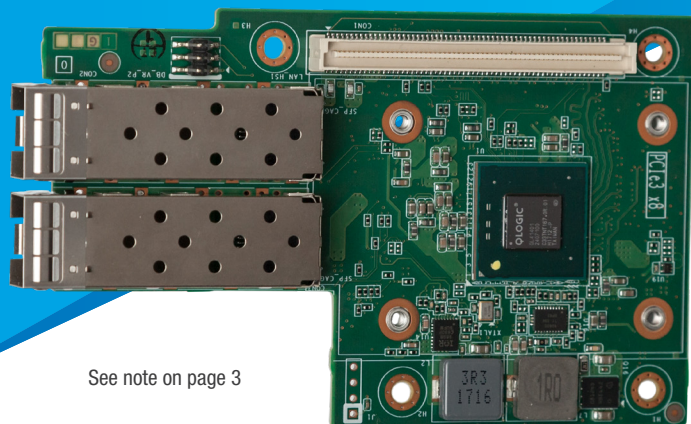# FastLinQ QL41232HOCU-CI

Dual-port 25G/10G SFP28 OCP
Intelligent Ethernet Adapter with Universal RDMA

See note on page 3

- Industry's most powerful 25GbE adapter delivers the best price and performance ratio compared to 10GbE

- FastLinQ® SmartAN™ for simplified 10G/25G DAC or optical switch connectivity without user intervention

- Universal RDMA—Delivers the ultimate choice and flexibility with concurrent support for RoCE, RoCEv2, and iWARP technologies

- Secure firmware update process with private and public key encryption technology prevents hackers from altering adapter

- Increase VM density and accelerate multitenant networks with full offload for tunneling protocols

OVERVIEW

Cavium offers a dual-port 25/10GbE OCP Intelligent Ethernet Adapter with Universal RDMA offloads for Open Compute Project (OCP) servers. The dual-port QL41232HOCU-CI adapter leverages the Cavium long-standing industry leadership in Ethernet, providing the highest level of performance, efficiency, and scalability for Open Compute server and storage applications in Web 2.0, enterprise data centers, and cloud infrastructure.

For more effective use of the bandwidth, the FastLinQ Intelligent Ethernet Adapter from Cavium offers switch-independent NIC partitioning (NPAR), which enables segmentation of each 25/10GbE port into four 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. Cavium's cutting-edge server and network virtualization features—Virtual Extensible LAN (VXLAN), Network Virtualization using Generic Routing Encapsulation (NVGRE), Genetic Routing Encapsulation (GRE), and Generic Network Virtualization Encapsulation (GENEVE) tunneling offloads—deliver the most advanced 25/10GbE adapter. The FastLinQ QL41232HOCU-CI Intelligent Ethernet Adapter is the solution of choice for workload-intensive computing environments, providing a reliable, high-performance 25/10GbE connectivity solution.

FEATURES
- Dual-port 25G/10G connectivity for OCP servers
- Backward compatibility with 10GbE infrastructure for complete investment protection
- x8 PCI Express® (PCIe®) 3.0 (8GTps) support
- Accelerate the most demanding telco NFV workloads with the Cavium data plane development kit (DPDK) high-speed packet processing engine
- Orchestrate and manage hyperscale OpenStack® deployments with Cavium cloud-enabled management framework
- Universal remote direct memory access (RDMA) technologies—RDMA over Converged Ethernet (RoCE), RoCEv2, and Internet wide area RDMA protocol (iWARP)
- VXLAN, NVGRE, GRE, and GENEVE tunneling offloads
- Network boot support:
  - iSCSI remote boot
  - Preboot Execution Environment (PXE) 2.0

FEATURES (*continued*)

- MSI and MSI-X support
- IPv4 and IPv6 offloads
- PCI-SIG® single root I/O virtualization (SR-IOV) support
- Comprehensive stateless offloads
- Receive side scaling (RSS)
- Transmit side scaling (TSS)
- Jumbo frame support up to 9,600 bytes
- Network teaming, failover, and load balancing:
  - Switch-independent teaming modes
  - Switch-dependent teaming modes—link aggregation control protocol (LACP) and generic trunking
- Data center bridging (DCB)

ACCELERATE ANY NETWORK WITH UNIVERSAL RDMA OFFLOAD

The Cavium QL41232HOCU-CI 25/10GbE Adapter supports 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. The QL41232HOCU-CI 25/10GbE Adapter has the unique capability to deliver Universal RDMA that enables RoCE, RoCEv2, and iWARP. Cavium Universal RDMA and emerging low-latency I/O bus mechanisms such as Network File System over RDMA (NFSoRDMA), and NVMe Express® (NVMe™) over Fabric (NVMe-oF) allow customers to accelerate access to data. Cavium'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. The Cavium QL41232HOCU-CI 25/10GbE Adapter supports:

- 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 (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 25Gbps bandwidth per port. Public and private cloud-virtualized server farms can now achieve 2.5 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 virtual local area network (VLAN) limitations, native stateless offloading engines are bypassed, which places a higher load on the system's CPU. The Cavium QL41232HOCU-CI 25/10GbE Adapter efficiently handles 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, the Cavium QL41232HOCU-CI 25GbE Adapter supports VMware NSX® and Open vSwitch (OVS).

HYPER-SCALE ORCHESTRATION WITH OPENSTACK

The Cavium QL41232HOCU-CI 25/10GbE Adapter supports the OpenStack open source infrastructure for constructing and supervising public, private, and hybrid cloud computing platforms. 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 autodiscovery technology.

ACCELERATE TELCO NETWORK FUNCTION VIRTUALIZATION (NFV) WORKLOADS

In addition to OpenStack, the Cavium QL41232HOCU-CI 25/10GbE Adapter 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's 25GbE technology is integrated into the DPDK and can deliver up to 36 million packets per second to host the most demanding NFV workloads.

TRUSTED, SECURE, RELIABLE, AND INTEROPERABLE

Cavium is an industry leader in 25GbE and was the first to demonstrate end-to-end interoperability for 25Gb and 100Gb Ethernet solutions. The QL41232HOCU-CI 25/10GbE Adapter adheres to standards that ensure interoperability with a wide range of network solutions. In addition, Cavium's technology provides an easy upgrade path to 100GbE networks that utilize multiple 25GbE lanes.

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) Gen3 x8, Gen2 x8 (electrical)

Host Interrupts
- MSI-X

I/O Virtualization
- SR-IOV (up to 192 virtual functions)
- NPAR (up to 16 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
- 25Gbps line rate per-port in 25GbE mode
- 10Gbps line rate per-port in 10GbE mode

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)
- RSS
- TSS
- Interrupt coalescing
- VMware NetQueue, Microsoft® Hyper-V VMQ, and Linux Multiqueue
- RDMA

Tunneling Offloads
- VXLAN
- NVGRE
- GENEVE
- GRE

Board Hardware Features
- Wake on LAN (WoL)
- Network Controller Sideband Interface (NC-SI)
- Pulse Width Modulation (PWM) switching voltage regulator
- Over temperature protection design compliance

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)

Compliance
- IEEE Specifications
  - *802.1AS (Precise Synchronization)*
  - *802.1ax-2008 (Link Aggregation)*
  - *802.1p (Priority Encoding)*
  - *802.1q (VLAN)*
  - *802.1Qaz (DCBX and ETS)*
  - *802.1Qbb (Priority-based Flow Control)*
  - *802.3-2015 (10Gb and 25Gb Ethernet Flow Control)*
  - *802.3-2015 Clause 52 (10Gb Ethernet Optical)*
  - *802.3by -2016 (25G Ethernet)*
  - *1588-2002 PTPv1 (Precision Time Protocol)*
  - *1588-2008 PTPv2*
- *SFF8431 Annex E (10Gb Direct Attach Copper)*
- Other Specifications
  - *IPv4 (RFQ 791)*
  - *IPv6 (RFC 2460)*

RDMA Specifications

Universal RDMA
- RoCE
- RoCEv2
- iWARP
- Storage over RDMA
  - SMB Direct
  - Storage Spaces Direct (S2D)
  - VMware Paravirtual RDMA (PVRDMA)
  - NVME-oF
  - NFSoRDMA

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

Management Tools and Device Utilities (*continued*)
- QConvergeConsole Plug-ins for vSphere® (GUI) and ESXCLI plug-in for VMware
- QConvergeConsole PowerKit (Windows PowerShell® cmdlets) for Linux and Windows
- Pre-boot unified extensible firmware interface (UEFI) Device Configuration pages in system BIOS
- Native OS management tools for networking

Boot Support
- UEFI
- PXE
- iSCSI remote boot

APIs
- SNIA HBA API v2
- SMI-S

Operating Systems
- For the latest applicable operating system information, see Cavium.com **Downloads**

Physical Specifications

Ports
- Dual-port 25/10Gbps Ethernet: SFP28 cages

Form Factor
- OCP version 2.0
- Type 1 heatsink

Cooling Requirements
- 220 LFM at 45°C (113°F)

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.

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
- Operating: 10% to 80%
- Storage: 5% to 90%

Compliance
- RoHS compliant

Connectivity

Rate	Cable and Maximum Distance (m)		
	DAC	SR FOC	AOC
10G	7	400 OM4 300 OM3	30
25G	5	100 OM4 70 OM3	30

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

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
- EN55032
- EN55024
- EN61000-3-2
- EN61000-3-3

1   Agency approvals have not been authorized at the time of publication; this list is preliminary.

Japan
- VCCI: Class A

New Zealand and Australia
- AS/NZS: Class A

Korea
- KC-RRA Class A

Taiwan
- BSMI CNS 13438

Ordering Information

QL41232HOCU-CI-BK Dual-port 25Gb OCP V2 Ethernet Network Adapter Card
- Cisco Product ID UCSC-OCP-QD25GF and UCSC-OCP-QD25GF=
- Ships in a bulk-packed box
- Ships without SFP28 optical transceivers installed

Follow us:

Corporate Headquarters   Cavium, Inc.   2315 N. First Street   San Jose, CA 95131   408-943-7100