

# FastLinQ 41000 Series

## 8th Generation 25G/10GE Ethernet Controllers



- Single-, dual-, and quad-port 10GbE applications
- Single- and dual-port 25GbE applications
- Hardware-based iSCSI and FCoE offloads
- Secure firmware update process with private/public key encryption technology prevents hackers from altering adapter
- Low-power, single-chip solution with adaptive voltage scaling
- Universal RDMA, RoCE, RoCEv2 and iWARP
- VXLAN, NVGRE, GRE, and GENEVE tunneling offloads
- T10 Protection Information
- SR-IOV and NPAR support

### OVERVIEW

FastLinQ® 41000 Series Ethernet Controllers are an eighth-generation solution designed for high-volume, converged network applications. The QL41000 Series Controllers support speeds of 25Gbps and 10Gbps and enable single root I/O virtualization (SR-IOV), universal Remote Direct Memory Access (RDMA) over converged Ethernet (RoCE), iSCSI, Fibre Channel over Ethernet (FCoE), and data center bridging (DCB). They also support PCI Express® (PCIe®) Gen3, along with embedded virtual bridging and other switching technologies for virtual machine (VM)-to-VM switching.

The FastLinQ 41000 Series is a complete solution that enables leading-edge features for the enterprise and cloud (independent of server form-factor), while significantly accelerating network performance. This controller enables stateful and stateless offloads, and includes advanced features such as network virtualization offload, storage offloads, secure firmware update with private/public key encryption, and FastLinQ SmartAN™ for simplified connectivity to switches without user intervention.

The QL41000 Series Controllers include support for quad-port, dual-port, and single-port 25GbE and 10GbE applications. CNAs support iSCSI

and FCoE hardware-based offload. FastLinQ 41000 Series Controllers integrate four IEEE 802.3-compliant MACs and support the network controller-sideband interface (NC-SI). Host-to-baseboard management controller (BMC) communication is also supported on top of the NC-SI to permit high-speed communication between the local host and the BMC or management controller (MC).

FastLinQ 41000 Series Controllers enable fully offloaded networked storage using block-based storage (iSCSI or FCoE) and file-based storage (CIFS or NFS). RDMA applications and use cases are supported with RoCE and Internet wide area RDMA protocol (iWARP), with support for all offload traffic types on each of the ports. Offloading results in superior storage and networking performance, as well as low CPU use, which in turn results in significant system-level power savings.

FastLinQ 41000 Series Controllers are designed for PCIe Gen3 and are also compatible with the *PCI Express Base Specification*, revisions 2.1 and 1.1. PCIe supports MSI and MSI-X capabilities. Each port supports multiple physical functions.

FastLinQ 41000 Series Controllers support IEEE 1588 precision timing protocol (PTP) and IEEE 802.1AS, providing a method of synchronization between *master* and *slave* clocks over a LAN.

## Network Interfaces

### Blade and Dense Servers

- 10GBASE-KR
- 25GBASE-KR

### Rack, Tower, and Dense Servers

- SFF8431 Annex E 10GbE (direct attach copper)
- 10GBASE-SR
- 25GBASE-CR
- 25GBASE-SR

## Boot Support

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

## iSCSI

- Offloaded full Host Bus Adapter (HBA) function iSCSI initiator
- Performance of up to 2.9 million iSCSI IOPS
- iSCSI crash dump support

## FCoE

- Offloaded full HBA function FCoE initiator
- Performance of up to 3.6 million FCoE IOPS
- Technical Committee T11 in the *Fibre Channel - Link Services* (FC-LS) specification's N\_Port ID virtualization (NPIV) on Linux, Windows, and VMware

## Universal RDMA

- Support for RoCE, RoCEv2, Windows Server Message Block (SMB) Direct, Windows Server Storage Spaces Direct (S2D), iSCSI Extensions for RDMA (iSER), NFS over RDMA (NFSoverRDMA), Non-volatile Memory Express over Fabric (NVMe-oF), and iWARP
- Hardware-based direct data placement in application buffers without CPU intervention (for user and kernel modes)
- Low latency

## Ethernet Specifications

### I/O Virtualization

- SR-IOV
- NetQueue
- Dynamic virtual machine queue (DVMQ)
- Multiqueue support
- Switch-dependent and -independent NIC partitioning (NPAR)

### Tunneling Offloads

- Virtual Extensible LAN (VXLAN)
- Network Virtualization using Generic Routing Encapsulation (NVGRE)
- Generic Network Virtualization Encapsulation (GENEVE)
- Generic Routing Encapsulation (GRE)

### Network Teaming, Failover, and Load Balancing

- Switch independent
- Switch dependent (IEEE 802.3ad link aggregation control protocol [LACP] and generic trunking [GEC/FEC])

### Compliance

- IEEE Specifications
  - 802.3-2015 (1Gb, 10Gb and 25Gb Ethernet flow control)
  - 802.3-2015 Clause 52 (10Gb Ethernet optical)
  - SFF8431 Annex E (10Gb Direct Attach Copper)
  - 802.1ax (Link Aggregation)
  - 802.1Qbb (Priority-based Flow Control)
  - 802.1Qaz (DCBX and ETS)
  - 802.1q (VLAN)
  - 802.1AS/1588-2008 PTPv2
  - 802.3by-2016 (25G Ethernet)
- Other Specifications
  - IPv4 (RFQ 791)
  - IPv6 (RFC 2460)
  - 1588-2002 PTPv1 (Precision Time Protocol)

## Compliance

- RoHS compliant

## Data Integrity

- ECC and byte parity protection
- T-10 CRC

## Tools and Utilities

- QLogic® Control Suite integrated network adapter management utility (CLI) for Linux and Windows
- QConvergeConsole® (QCC) integrated network management utility (GUI) for Linux and Windows
- QCC Plug-ins for vSphere (GUI) and ESXCLI plug-in for VMware
- QCC PowerKit 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
- NC-SI
- Serial gigabit media independent interface (SGMII) for 1Gb BMC interconnect
- Wake-on-LAN (WoL)
- Comprehensive diagnostic and configuration software suite:
  - Management Component Transport Protocol (MCTP) over PCIe vendor-defined messages (VDM)
  - MCTP over system management bus (SMB)
  - SMB and reduced media-independent interface (RMII)
  - Host-to-BMC communication

## DCB

- Enhanced Transmission Selection (ETS) (IEEE 802.1Qaz)
- Priority-based Flow Control (PFC) (IEEE 802.1Qbb)
- Up to four traffic classes
- Data Center Quantized Congestion Notification (DCQCN)/Explicit Congestion Notification (ECN)

## Host Bus Interface Specifications

### Bus Interface

- PCIe 3.1 x8 (8GTps), 2.1 (5GTps), and 1.1 (2.5GTps)

## Board Firmware Features

- Secure firmware update process
- Smart Auto Negotiation (FastLinQ SmartAN)

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

### Packaging

- 19mm × 19mm
- 525 pins
- Ball pitch: 0.8mm

### Ordering Information

#### 41000 Series AVS Controllers<sup>1</sup>

- QL41101A-A2G: Single-port 10GbE
- QL41102A-A2G: Dual-port 10GbE
- QL41104A-A2G: Quad-port 10GbE
- QL41201A-A2G: Single-port 25GbE/10GbE
- QL41202A-A2G: Dual-port 25GbE/10GbE
- QL41262A-A2G: Dual-port 25GbE/10GbE CNA
- QL41162A-A2G: Dual-port 10GbE CNA

#### 41000 Series Non-AVS Controllers<sup>1</sup>

- QL41101-A2G: Single-port 10GbE
- QL41102-A2G: Dual-port 10GbE
- QL41104-A2G: Quad-port 10GbE
- QL41201-A2G: Single-port 25GbE/10GbE
- QL41202-A2G: Dual-port 25GbE/10GbE
- QL41262-A2G: Dual-port 25GbE/10GbE CNA
- QL41162-A2G: Dual-port 10GbE CNA

<sup>1</sup> AVS = adaptive voltage scaling



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