

# Marvell® Scalable mGig AQC113/AQC114/AQC115/AQC116

PCIe 4.0 10GbE, 5GbE, 2.5GbE & 1GbE Scalable mGig Ethernet Controllers

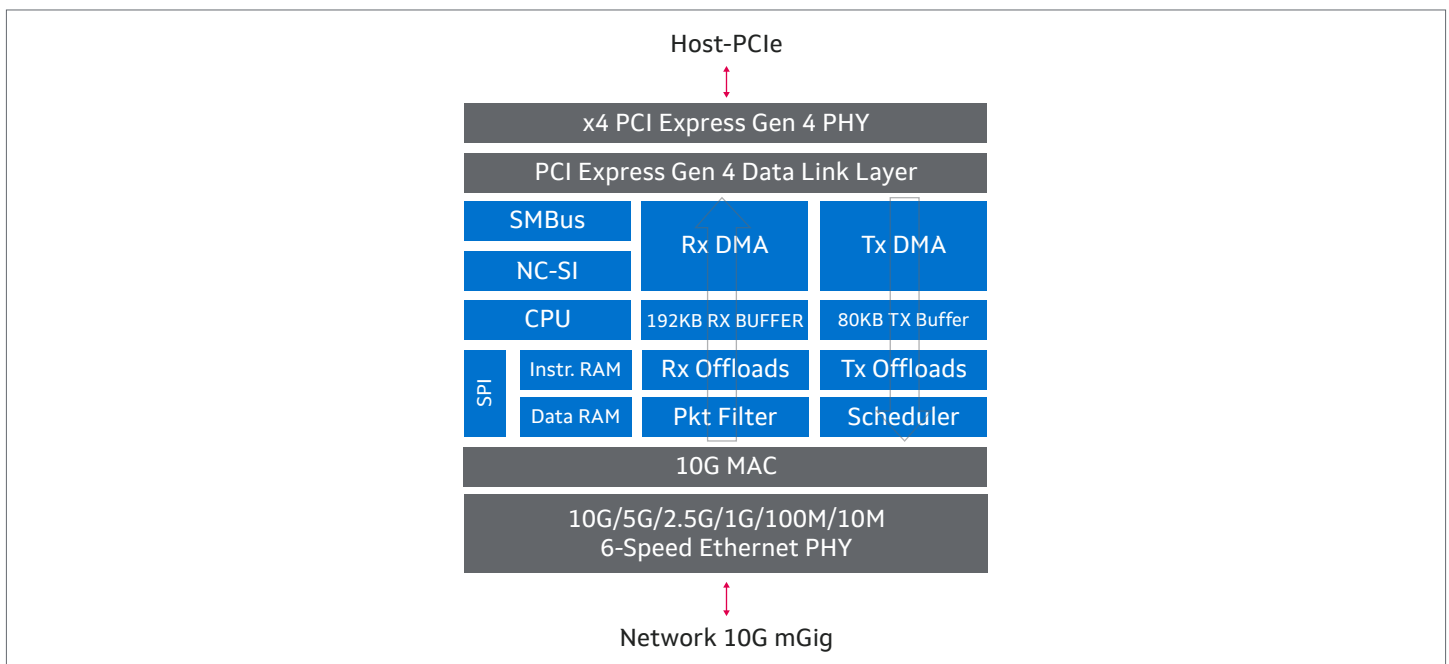
## Overview

The Marvell® AQC113/AQC113C/AQC113CS/AQC114CS/AQC115C/AQC116C devices comprise a high-performance, Scalable mGig, Ethernet MAC+PHY Controllers designed to support the following network rates: 10GBASE-T/5GBASE-T/2.5GBASE-T/1000BASE-T/100BASE-TX/10BASE-Te. When equipped with a PCI Express Gen 4 x4, this family of Scalable mGig Ethernet MAC+PHY Controllers easily handle the 10 GbE line-rate performance. The AQC113, AQC113C, AQC113CS, AQC114CS, AQC115C, AQC116C device family combines a mGig Ethernet MAC Controller with a full-reach, low-power, high-performance, multi-gigabit, single-port Gen 4 Ethernet Alaska PHY transceiver into a single, monolithic device that is designed using the latest 14nm, multi-gate, FinFET process technology.

Marvell Scalable mGig controllers are compliant with both the IEEE® 802.3an/bz standard and the NBASE-T™ Alliance PHY Specification to perform all of the physical layer functions required to implement transmission over 100 meters of twisted pair (TP) cabling.

Marvell Scalable mGig controllers integrates the following key features of Energy Efficient Ethernet (EEE), Precision Time Protocol (PTP)/1588v2, Synchronous Ethernet (Sync-E), a hardware-security enabled boot function†, support for the Network Controller Sideband Interface (NC-SI), support for multi-purpose I/Os AQC113-AQC116C, support for all PoE standards up to 100W, and support for jumbo packets up to 16KB in all operating modes. The AQC113, AQC113C, and AQC113CS devices in this family support all six network rates (10G and down to the lowest rates), while the AQC114CS devices support five network rates (5G and down to the lowest rates), and the AQC115C (2.5G and down to the lowest rates), and AQC116C (1G and down to the lowest rates) devices support three network rates. AQC113 device is a scalable mGig, single-port device, and these are housed in a compact 12 mm x 14 mm, 0.8 mm pitch, 224-pin, flip-chip Ball Grid Array (FCBGA) package. All of the AQC113C, AQC113CS, AQC114CS, AQC115C, and AQC116C devices are pin-compatible, multigigabit, single-port PHYs, and all of these devices are housed in a compact 7 mm x 7 mm, 0.8 mm pitch, 64-pin, flip-chip Chip Scale (FCCSP) package.

## Block Diagram



## Key Features

Features	Benefits
Single-chip solution	<ul style="list-style-type: none"><li>• Integrated PCIe, MAC+PHY minimizes board space and power usage</li></ul>
PCI Express Gen4, Gen3 or Gen2	<ul style="list-style-type: none"><li>• Supports line rate up to 16.0 GT/s, 8.0GT/s and 5.0GT/s per lane</li></ul>
Supported bus width	<ul style="list-style-type: none"><li>• Supports Gen 4 x1, Gen 3 x4, Gen 3 x2, or Gen 3 x1</li></ul>
Message-Signaled Interrupts (MSI and MSI-X) and legacy INTx PCIe interrupts	<ul style="list-style-type: none"><li>• Improves CPU utilization and network performance</li></ul>
Sideband SMBuse interface (Slave SMBus interface)	<ul style="list-style-type: none"><li>• Communication and management function</li></ul>
Hardware-security enabled boot function	<ul style="list-style-type: none"><li>• S devices support eFuse key hash programmed into the chip providing a secured boot feature for those devices running under a security-oriented operating system</li></ul>
External SPI FLASH interface with optional FLASH-less operation	<ul style="list-style-type: none"><li>• Reduce BOM cost as one or no FLASH devices required</li><li>• Enables firmware download/upgrade and FLASH image loading during manufacturing</li></ul>

PHY Features	Benefits
Integrated Marvell Alaska PHY featuring NBASE-T technology	<ul style="list-style-type: none"><li>• Incorporates Marvell's Alaska PHY technology that delivers 10 GbE network connectivity speed through Cat 6a. It delivers 5 GbE and 2.5 GbE network connectivity speeds through 100 meters of Cat 5e, or better cabling, enabling higher data rates with zero change to legacy cabling</li></ul>
Energy Efficient Ethernet (EEE) support	<ul style="list-style-type: none"><li>• PHY power savings</li></ul>
Advanced cable diagnostics	<ul style="list-style-type: none"><li>• On-chip high-resolution cable analyzer</li></ul>
Audio Video Bridging (AVB) and PTP/1588v2	<ul style="list-style-type: none"><li>• Management of time-sensitive traffic packets</li></ul>

MAC Features	Benefits
LSO, RSS, DCA and header checksum	<ul style="list-style-type: none"><li>• Increased network performance and lower host CPU utilization</li></ul>
Wake-on LAN (WoL) power management	<ul style="list-style-type: none"><li>• Supports lower power modes</li></ul>
Quality of Service (QoS) support	<ul style="list-style-type: none"><li>• Up to eight traffic classes and Data Center Bridging (DCB)</li></ul>
Jumbo Frames (up to 16 Kbytes)	<ul style="list-style-type: none"><li>• Improved network performance with reduced CPU utilization</li></ul>
IPv4/v6, IPv6/TCP, and IPv6/UDP checksum offload	<ul style="list-style-type: none"><li>• Offloads calculations and improved CPU usage</li></ul>
Internet Control Message Protocol (ICMP)	<ul style="list-style-type: none"><li>• Supports diagnostics, error and operational information messages</li></ul>
Address Resolution Protocol (ARP)	<ul style="list-style-type: none"><li>• Resolves network layer addresses into link layer addresses</li></ul>
Multicast Domain Name System (mDNS)	<ul style="list-style-type: none"><li>• Resolves host names to IP addresses</li></ul>
Transmission Control Protocol (TCP) Keepalives (KA)	<ul style="list-style-type: none"><li>• Supports link checking between devices</li></ul>

## Target Applications

**Feature:** Marvell FastLinQ Edge power leading -edge solutions for motherboards, PCs, Workstations, docking station, NAS, Router, Gateways and other embedded applications

**Drivers:** Windows 10 (32-bit/64-bit), Linux 3.10 and higher, FreeBSD 12, DPDK, VMware ESXi

**Utilities:** ROM programming and Windows Installer

**Boot Options:** UEFI and PXE

Device	Description	Ordering Part Number
<b>AQC113 (12 mm x 14 mm Package)</b>		
AQC113	6-Speed Commercial Temperature Grade, RoHS 6/6	AQC113-B0-C
AQC113	6-Speed Industrial Temperature Grade, RoHS 6/6	AQC113-B0-I
<b>AQC113C-AQC113CS-AQC114CS-AQC115C-AQC116C (7 mm x 7 mm Package)</b>		
AQC113C	6-Speed Commercial Temperature Grade, RoHS 6/6	AQC113C-B0-C
AQC113C	6-Speed Industrial Temperature Grade, RoHS 6/6	AQC113C-B0-I
AQC113CS	6-Speed Commercial Temperature Grade, RoHS 6/6	AQC113CS-B0-C
AQC113CS	6-Speed Industrial Temperature Grade, RoHS 6/6	AQC113CS-B0-I
AQC114CS	5-Speed Commercial Temperature Grade, RoHS 6/6	AQC114CS-B0-C
AQC114CS	5-Speed Industrial Temperature Grade, RoHS 6/6	AQC114CS-B0-I
AQC115C	4-Speed Commercial Temperature Grade, RoHS 6/6	AQC115C-B0-C
AQC115C	4-Speed Industrial Temperature Grade, RoHS 6/6	AQC115C-B0-I
AQC116C	3-Speed Commercial Temperature Grade, RoHS 6/6	AQC116C-B0-C
AQC116C	3-Speed Commercial Temperature Grade, RoHS 6/6	AQC116C-B1-C

\*6-Speed = 10G/5G/2.5G/1G/100M/10M

\*\*5-Speed = 5G/2.5G/1G/100M/10M

\*\*\*4-Speed = 2.5G/1G/100M/10M

\*\*\*\*3-Speed = 1G/100M/10M



To deliver the data infrastructure technology that connects the world, we're building solutions on the most powerful foundation: our partnerships with our customers. Trusted by the world's leading technology companies for 25 years, we move, store, process and secure the world's data with semiconductor solutions designed for our customers' current needs and future ambitions. Through a process of deep collaboration and transparency, we're ultimately changing the way tomorrow's enterprise, cloud, automotive, and carrier architectures transform—for the better.

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