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NXP Communicator

Introducing NXP's
QorIQ LX2160A Processor Family

Multicore Communications Processor - the highest performance member of the Layerscape family.

Communicator Finalization Date: September, 2018

LX2160A Product Summary

NXP began alpha sampling of the **QorIQ Layerscape LX2160A** processor family in May 2018 and is now widely available. As of October 15, 2018, the reference design board LX2160A-RDB is also generally available.

The highest performance member of the Layerscape family, the LX2160 addresses network function virtualization (NFV), mobile edge computing, 5G packet processing, storage, and industrial applications. With the low power of FinFET process technology, 16 high-performance Arm® Cortex®-A72 cores, large caches, accelerators to 100Gbps, 100 Gigabit Ethernet, and PCIe Gen4, the Layerscape LX2160A SoC enables machine learning, cloud-like computing, and NFV at the network edge for greater application responsiveness.

Product Specification Highlights

- 16x ARM® Cortex®-A72 cores deliver >224,000 CoreMarks® of compute performance
- High speed up to 2.2GHz

- **Purpose-built for 5G networking applications**
  - 24 SerDes lanes at up to 25 Gbps supporting
    - 18 Ethernet controllers with support for 1, 2.5, 10, 25, 40, 50 and 100 Gbps
    - PCIe Express Gen4
  - Hardware Ethernet L2 Switch, supporting 130Gbps switching capacity
  - DPAA2 with 100Gbps of decompression/compression acceleration and 50Gbps SEC for processor offload during packet processing.

- **High-computing nodes capabilities at low power**
  - 16 cores at 2.2GHz at 0.8V – outstanding performance-per-watt ratio.
  - 6x PCIe Gen4.0 controllers and 4x SATA3.0 controllers for high performance and SSD connectivity.
  - 2x eSDHC, 2x CAN, FlexSPI, 3x SPI, 8x IIC, and 4x UARTs for low speed peripherals.

- **Hardware virtualized environments**
  - Increase software flexibility with advanced hardware virtualization and virtualization software solutions
  - Two PCIe Gen 4.0 8-lane controllers supporting SR-IOV for network interface cards
  - Simplify I/O virtualization with I/O MMU for access to memory sharing
  - Secure VM communication with hardware enabled I/O port, core and memory level partitioning
  - Support for KVM and Linux containers

Targeted Applications

- **Industrial computing**
  - Industrial single board computers, factory and process automation, test and measurement, data collection cards, industrial gateway, industrial networking
- **Service provider**
  - Wired and wireless 5G base stations, access and edge routers
- **Data center**
  - Storage controller
  - Smart NICs
- **Aerospace, defense and government**
  - SBCs, ruggedized or highly secure routers, avionics networking, UAV, data recorder

Development Tools Summary

The QorIQ® LX2160A reference design board provides a comprehensive platform that enables design and evaluation of the LX2160A processor. It comes pre-loaded with a board support package (BSP) based on a standard Linux kernel.

- Enables network intelligence with the next generation Datapath (DPPA2) which provides differentiated offload and a rich set of IO, including 10GE, 25GE, 40GE and PCIe Gen4.
- Delivers unprecedented efficiency for new virtualized networks
- Supports designs in 5G packet processing, network function virtualization, storage controller, white box switching, network interface cards, and mobile edge computing.

The rich ecosystem provided by the powerful combination of NXP's strong legacy of networking expertise and ARM's rapidly growing development base delivers the best of both worlds. All QorIQ Layerscape series devices are supported by NXP's extensive third-party ecosystem, the largest and most established in the communications market.

In conjunction with NXP's expertise and worldwide support infrastructure, this broad ecosystem helps customers accelerate their migration from non-NXP solutions and from legacy NXP devices, preserve investment costs and reduce time to market.

Availability: October 2018

- Orderable part number: LX2160A-RDB
- Price $3,995

Product Overview

The QorIQ LX2160A processor is built on NXP's software-aware, core-agnostic DPAA2 architecture, which delivers scalable acceleration elements sized for application needs, unprecedented efficiency, and smarter, more capable networks. When coupled with ease-of-use facilities such as real-time monitoring and debug, virtualization, and software management utilities, the available toolkits allow for both hardware and software engineers to bring a complete solution to market faster than ever.

The LX2160A integrated multicore processor combines sixteen Arm® Cortex®-A72 processor cores with 24 lanes of the latest 25 GHz SerDes technology supporting high performance Ethernet speeds (10 Gbps, 25 Gbps, 40 Gbps, 50 Gbps, and 100 Gbps) and PCI express to Gen4 (16 Gbps). With the low power of FinFET process technology and common network and peripheral bus interfaces. The LX2160A is well suited for networking, telecom/datacom, wireless infrastructure, storage and military/aerospace applications.

The LX2160A processor is supported by a consistent API that provides both basic and complex manipulation of the hardware peripherals in the device, releasing the developer from the classic programming challenges of interfacing with new peripherals at the hardware level.

The LX2160A can be used for control and dataplane, in routers, switches, datacenter and enterprise-class storage systems, base stations and C-RANs, and general-purpose embedded computing systems. Like other QorIQ products, the LX2160A's high level of integration offers significant space, weight, and power benefits compared to multiple discrete devices. The data path architecture enables higher levels of performance and a more power efficient solution than traditional multicore chips. At the center of the software toolkit is the management complex; a set of processor cores along with trusted firmware that together provide a variety of low level services to user software. These services allow users to develop complex networking tasks without detailed knowledge of the DPAA2 hardware.

Features include:

This processor includes the following distinctive functions and features:

- ARM® Cortex®-v8 A72 (64bit) with the following capabilities:
  - Speeds up to 2.2 GHz at 0.8V
  - 48 KB L1 Instruction Cache and 32 KB Data Cache for each core (ECC protection)
- 8 MB Level 3 cache with ECC and on-chip memory module
- Two 72-bit (64-bit + ECC) DDR4 SDRAM memory controllers
  - ECC and interleaving support
  - Up to 3.2 GT/s
- Datapath acceleration architecture 2.0 (DPAA2)
- 24 SerDes lanes at up to 25 Gbps
- Ethernet interfaces supporting IEEE 1588
  - Up to 18 Ethernet MACs
  - Support for 10G-SXGMII (USXGMII)
  - Support for SGMII (and 1000Base-KX)
  - Support for XFI (and 10GBase-KR)
  - Support for CAUI4 (100G), CAUI2 (50G), 25G-AUI (25G)
  - Support for XLAUI4 (and 40GBase-KR4) for 40G
  - Support for two RGMII parallel interfaces
  - Energy-efficient support (802.3az)
- High-speed peripheral interfaces
  - Two PCIe Gen 4.0 8-lane controllers supporting SR-IOV
  - Four PCIe Gen 4.0 4-lane controllers
  - Four serial ATA (SATA 3.0) controllers
- Additional peripheral interfaces
  - Two USB 3.0 controllers with integrated PHY
  - Two enhanced secure digital host controllers
  - Two Controller Area Network (CAN) modules, optionally supporting Flexible Datarate
  - Flexible Serial Peripheral Interface (FlexSPI) and three Serial Peripheral Interface (SPI) controllers
  - Eight I2C controllers
  - Four UARTs
  - General Purpose IO (GPIO)

- Widely available now

Suggested Stocking Chart

Part Number	Product Description	Suggested Resale*	Suggested Stocking	Availability
PLX2160PC720ZA	LX2160A prototype, 2.0GHz, SEC and CAN-FD enabled, standard temp, Rev 1.0	$ 300.00	20	Now
LX2160A-RDB	LX2160 Reference Design	$ 3995.00	5	Now
LX2RDBKIT1-10-40	RDB kit with transceivers and cables for 10GE and 40GE	$ 150.00	3	Now
LX2RDBKIT2-25G	RDB kit with transceivers and cables for 25GE	$300	3	Now

*Pricing based on 1KU disty resale in 2018 for silicon. Board is 1 piece price. Silicon parts are pre-production so will not be added to the book until qualification.

NXP Support Ecosystem

NXP delivers a wide range of tools, run-time software, reference solutions and services to accelerate your designs.

- QorIQ LX2160A Reference Design Board– LX2160A-RDB
  - Processor
    - LX2160A, 16x Arm Cortex-A72 CPU, up to 2.2GHz
    - DIP switch setting can configure device for 8- and 12-core operation
  - Memory
    - Two DDR4 UDIMM to 3200MT/s
    - 32GB total capacity (16GB per UDIMM)
    - Flash: 128MB NOR, 128GB eMMC
  - Ethernet
    - One 40G Etherent QSFP+
    - Two 25G Ethernet SFP+
    - Two RJ45 10G Ethernet
    - Two RJ45 1G Ethernet
  - PCIe
    - One PCIe Gen4 x8 slot
    - One PCIe Gen4 x4 slot
  - Other IO
    - Four SATA3.0 connectors
    - One USB3.0 Type A connector
    - One USB3.0 micro AB connector
    - Monitoring of voltage, current, temperature, and power on I2C bus
- CodeWarrior Development Suites for Networked Applications
- Software development kit
  - Support for all IO, including 1GE, 10GE, 25GE, 40GE; PCIe as both Endpoint and Root complex
  - Yocto Project/Poky distributions
  - DPDK APIs and example applications
  - User space drivers for networking accelerator blocks and examples applications using them
  - Virtualization: KVM, Dockers, virtio-net
  - Uboot and UEFI bootloaders
  - Standard GNU tool chain
- Available CodeWarrior tool chain
  - CodeWarrior Development Software for ARM® v8 64-bit based QorIQ LS-Series Processors supporting LX2160A RDB is available. It features the next generation of CodeWarrior tools based on the Eclipse framework:
  - Release notes: https://www.nxp.com/products/processors-and-microcontrollers/additional-processors-and-mcus/codewarrior-development-suites-for-networked-applications:CW-DS-NETAPPS?tab=Documentation_Tab
  - Bare metal support for initialization, reset, debug, run control, flash programming.
  - Debug for u-boot, Linux kernel, and Linux applications.
  - CodeWarrior TAP, USB TAP supported.
- NXP VortiQa Application Software
  - AIS – Application Identification Software
  - Enterprise Software for Networking
  - OND – Open Network Director Software
- Professional Services & Support
  - Commercial Services
  - Linux SDK Support Package

- Reference Design Software (RDS) Support Package
- Turnkey solution development

Development Tools	Item/Version
Development System – LX2160ARDB	Now
LX2160ARDB Reference manual	nxp.com/lx2160a-rdb
LX2160ARDB Quick Start Guide	nxp.com/lx2160a-rdb
Schematics	nxp.com/lx2160a-rdb
Layout	nxp.com/lx2160a-rdb
Bill of materials	nxp.com/lx2160a-rdb
Linux BSP	Available at Distributor Extranet
CodeWarrior Development Suite for Networked Applications	nxp.com
IBIS	Available at Distributor Extranet
BSDL	Available at Distributor Extranet

Available Documentation

Document Type	Revision
Datasheet	Available at Distributor Extranet
Erratas	Available at Distributor Extranet
Reference Manuals	Available at Distributor Extranet
Fact Sheets	Available NXP.com

Documents on NXP.com or Distribution Extranet.

Public web page: https://www.nxp.com/products/processors-and-microcontrollers/arm-based-processors-and-mcus/qoriq-layerscape-arm-processors/layerscape-lx2160a-multicore-communications-processor:LX2160A

For more information on the LX2160A Family, please check http://www.nxp.com or Distributor Extranet at https://nxp1.sharepoint.com/teams/ext96/SitePages/Layerscape.aspx, the LX2160 Sharepoint site at https://nxp1.sharepoint.com/teams/ext204/ or contact Toby Foster at toby.foster@NXP.com with any questions.