

LS1046A and LS1026A Family Update: April 19th, 2023

Changes since previous update are in pink

Highlights:

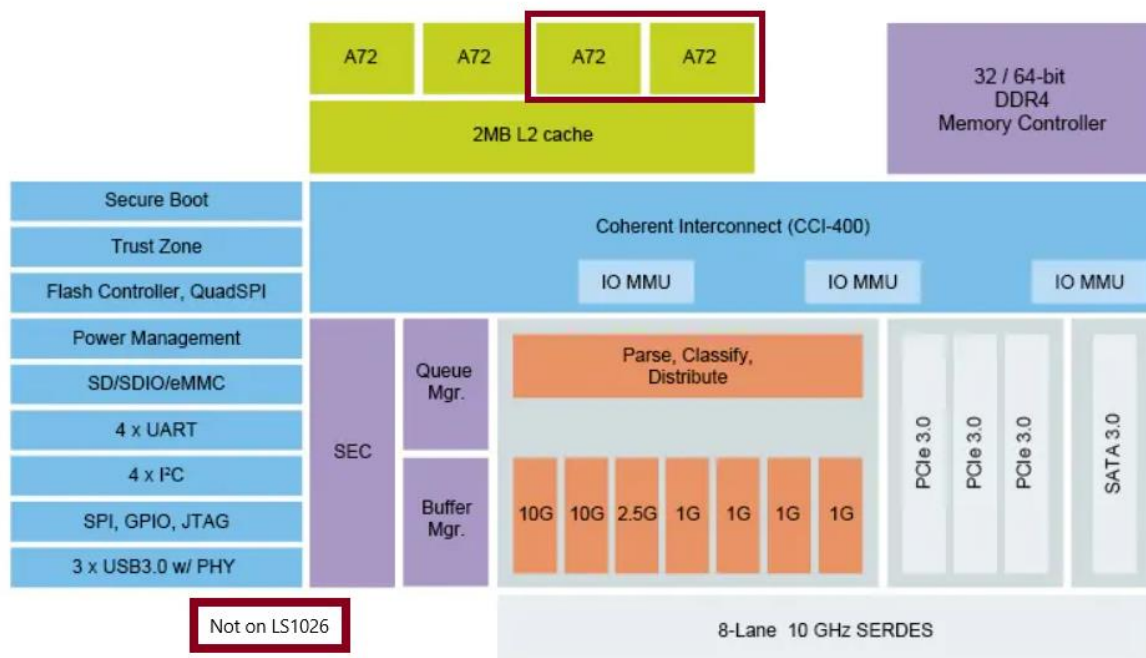
The longevity on the LS1046A and LS1026A product family has been extended to 2035. Due to continued success of this product, we have decided to extend the longevity program associated with this product family and the product will have guaranteed availability until Feb 2035. This will ensure that the customers starting new programs in the upcoming years will be assured availability during the production of their new program. More info can be found [here](#).

Product Summary:

The LS1046A is a cost-effective, power-efficient, and highly integrated system-on-chip (SoC) design that extends the reach of the NXP value-performance line of QorIQ communications processors. Featuring power-efficient 64-bit Arm® Cortex®-A72 cores with ECC-protected L1 and L2 cache memories for high reliability, running up to 1.8 GHz.

The LS1046A and LS1026A processors are perfectly suited for a range of embedded applications such as enterprise routers and switches, linecard controllers, network attached storage, security appliances, virtual customer premise equipment (vCPE), service providers gateways, and single board computers.

LS1046A Block Diagram:



Target Market:

- Enterprise routers and switches
- Linecard controllers
- Network attached storage
- Security appliances
- Virtual customer premise equipment (vCPE)
- Service providers gateways
- Single board computers

LS1046A Feature List:

- Four 32-bit/64-bit Arm® Cortex®-v8 A72 CPUs
 - Arranged as a single cluster of four cores sharing a single 2 MB L2 cache (LS1046A: 4 cores, LS1026: 2 cores)
 - Up to 1.8GHz operation
 - Single-threaded cores with 32 KB L1 data cache and 48 KB L1 instruction cache
- Hierarchical interconnect fabric, up to 700MHz operation
- One 32-bit/64-bit DDR4 SDRAM memory controller, ECC and interleaving support, up to 2.1GT/s, support for x8 and x16 devices
- Data Path Acceleration Architecture (DPAA)
 - Packet parsing, classification, and distribution (FMan)
 - Queue management for scheduling, packet sequencing, congestion management (QMan)
 - Hardware buffer management for buffer allocation and de-allocation (BMan)
 - Cryptography acceleration (SEC)
 - IEEE 1588™ support
- Two RGMII interfaces
- Eight SerDes lanes for high-speed peripheral interfaces
 - Three PCI Express 3.0 controllers
 - One Serial ATA (SATA 6 Gbit/s) controller
 - Up to two XFI (10 GbE) interfaces
 - Up to five SGMII interfaces supporting 1000 Mbps,
 - Up to three SGMII interfaces supporting 2500 Mbps
 - Up to one QSGMII interface
 - Supports 10GBase-KR, 1000Base-KX
- Additional peripheral interfaces
 - 1 QSPI controller, SPI controller
 - Integrated Flash Controller (IFC) supporting NAND and NOR flash
 - Three high-speed USB 3.0 controllers with integrated PHY
 - One Enhanced Secure Digital Host Controller
 - supporting SD 3.0, eMMC 4.4, and eMMC 4.5
 - Four I2C controllers
 - Two 16550-compliant DUARTs and six low-power UARTs (LPUARTs)
 - General purpose IO (GPIO), eight Fleximers
 - One Queue Direct Memory Access Controller (qDMA)
 - One Enhanced Direct Memory Access Controller (eDMA)
 - Global programmable interrupt controller (GIC)
 - Thermal monitoring unit (TMU)
- 780 FC-PBGA package, 23 mm x 23 mm

Difference between family members:

| | LS1026 | LS1046 |
|--------------------------------|--------|--------|
| A72 Cores | 2 | 4 |
| Power (1800MHz at 85C Thermal) | 10.2W | 12.3W |

Longevity:

The LS1046A and the LS1026A are covered under the NXP Product Longevity Program. The products are guaranteed available until 2035. Additional details [here](#).

Layerscape Linux Enablement

- LS1046/26A is supported in the Layerscape Linux Distribution POC (Layerscape SDK). Latest Rev. L5.15.71-2.2.0, released 17 Feb 2023.
- LTS kernel v5.15.52 supporting Preempt RT Kernel v5.15.71
- Bootloader: U-Boot v2022.04 update
- Toolchain: gcc: glibc-2.35, binutils2.38, gdb-11.2
- DPDK 21.11, supporting L2fwd, L3fwd, L2fwd-crypto and ipsec-gw application, OVS-DPDK 2.17.
- OPTEE
- More info can be found [here](#).

LS1046A Gateway ASK:

The NXP ASK (Applications Solutions Kit) Software package for the LS1046A processor turns the LS1046A into a mostly autonomous ISO layer 3 packet processing system, offering many NO-CPU-NEEDED ethernet routing & switching fast paths so that the ARM A72 CPUs can be harnessed to make applications that provide differentiation and extra features for your customers. These OpenWRT based ASK software packages significantly shorten embedded networking device software design cycle and achieve quicker time to market since embedded designers and network software designers can focus on differentiating features since the NXP ASK software provides a trustworthy embedded networking router platform.

More information can be found [here](#).

Benefits:

- Delivers 20 Gbps (called Line Rate for the LS1046A) performance at less than 5% total CPU loading and provides flexibility to offload current and future bandwidth hungry applications. This is about 20x the networking performance boost relative to linux performance.
- Support for Secure boot and Trusted Environment with High-performance SEC Engine and Gigabit Encryption
- Easy to port and integrate third-party software stacks. Significantly reduces software design cycle. Ensures ample headroom for run-time services even during peak performance
- Commercial support packages gives customer direct access to R&D. Faster time to market.

Reference Design:

The LS1046A reference design board (RDB) is a high-performance computing, evaluation, and development platform that supports the Layerscape LS1046A architecture processor. The LS1046ARDB board supports the Layerscape LS1046A processor and is optimized to support the DDR4 memory and a full complement of high-speed SerDes ports. More info can be found [here](#).

Features:

- Memory:
 - Supports data rate up to 2100 MT/s
 - Supports 8 GB DDR4 SDRAM memory
 - Provides one 288-pin DDR4 DIMM connector
 - DIMM connector supports unbuffered X72 8 GB dual rank
 - SDHC port connects directly to an adapter card slot with 4GB eMMC memory device
 - One 512 MB SLC NAND flash with ECC support (1.8 V)
 - CPLD connection: 8-bit registers in CPLD to configure mux/demux selections
 - Support two 64 MB onboard QSPI NOR flash memories
- USB:
 - Two USB 3.0 controllers with integrated PHYs
 - One USB1 3.0 port is connected to a Type A host connector
 - One USB1 3.0 port is configured as On-The-Go(OTG) with Micro-AB connector
 - One USB2.0 is connected to miniPCle connector
- Ethernet:
 - Supports SGMII 1G PHYs at Lane 2 and Lane 3
 - Supports SFP+ module with XFI retimers
 - Supports AQR106/107 10G PHY with XFI/2.5G SGMII
- PCIe and SATA:
 - Mini PCIe express x1 (Gen1/2/3) card
 - Standard PCIe x1 (Gen1/2/3) card
 - One SATA 3.0 connector
- Reference Design Board available for \$1450.



LS1046A Freeway Board

The LS1046A Freeway board (FRWY) is a high-performance computing, evaluation, and development platform that supports the QorIQ LS1046A architecture processor capable of support more than 32,000 CoreMark performance. The FRWY-LS1046A-TP includes the Coral Tensor Flow Processing Unit that offloads AI/ML inferencing from the CPU to provide significant boost for AI/ML applications. The FRWY-LS1046A-TP includes one M.2 TPU module and more modules can easily be added including USB versions of the module to scale the AI/ML performance. More info can be found [here](#).

Features:

- Core Complex: LS1046A – 2/4-core Arm® Cortex®-A72 cores @ 1.6GHz
- Networking Elements:
 - 2x M.2 slots – Wi-Fi, 4G/LTE, SSD
 - 4x 1GE Ethernet
 - Mikro-Click for expansion – NFC, Sensors, BLE/ZigBee, LoRa etc
- Basic Peripherals:



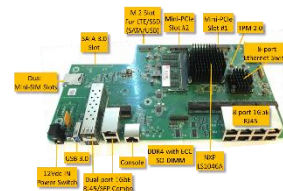
- 4GB DDR4 with ECC @ 2.1GT/s
- 4Gb NAND FLASH
- 64MB QSPI FLASH
- 2x USB3.0 (host)
- Micro SD – Linux, Demo SW, Videos
- Additional Features:
 - Expansion Headers - I2C, SPI, Clocks, Interrupts, GPIO
 - Passive cooling heat sink (no fan)
 - Support LSDK / OpenWRT / Ubuntu / EdgeScale

Customer board-level solutions:

- TQ-Group, Embedded Starterkit STKLS10xxA. More info can be found [here](#).
- MicroSys, Miriac™ SBC-LS1046A, Single Board Computer based NXP QorIQ LS1046A CPU. More info can be found [here](#).
- MicroSys, Miriac™ MPX-LS1046A, System on Module based on NXP QorIQ LS1046A CPU. More info can be found [here](#).
- TQ-Group, Embedded Module TQMLS1046A: Embedded Quad Cortex®-A72 Module based on LS1046A. More info can be found [here](#).
- Scalys TrustBox Edge EdgeX: high-grade secure edge computing platform for Edge computing, Machine Learning and AI operations close to the edge. TrustBox EdgeXL comes pre-loaded with Open Enclave SDK and is Edge Certified. More info can be found [here](#).
- X-Speed SDWAN Access Gateway based on NXP LS1046A. More info can be found [here](#).
- X-Speed LX1046A – Mid-range network processing platform based on NXP LS1046A. More info can be found [here](#).



- Conclusive Devices Single Board Computer WHL-LS1 Series based on NXP LS1046A. More info can be found [here](#).
- Accton LS1046A Carrier uCPE & Enterprise SDWAN Platform 2018. More info can be found [here](#).
- Hawkeye LS1046A Carrier Thin CPE & Enterprise SDWAN. More info can be found [here](#).
- XES, XPedite6401 XMC/PrPMC mezzanine module that supports an NXP QorIQ LS1043A processor with four 64-bit ARM Cortex-A53 cores operating at up to 1.6 GHz and up to 8 GB of DDR4-1600 ECC SDRAM memory. More info can be found [here](#).



Partner Software:

- Green Hills software, Multi IDE. More info can be found [here](#).
- Wind River, Diab Compiler. More info can be found [here](#).
- winIDEA, IDE, Debug and trace tool. More info can be found [here](#).
- Segger, Embedded Studio. More info can be found [here](#).

Debugger:

- Green Hills Software, Debugger. More info can be found [here](#).
- Asset, SourcePoint debugger. More info can be found [here](#).

Operating Systems:

- Integrity Real-Time Operating System, more information can be found [here](#).
- DDC-I Deos, more information can be found [here](#).

Partner BSP, Drivers and Middleware:

- ITTIA DB SQL, more information can be found [here](#).
- Borea PRISANK system platform, more information can be found [here](#).
- Wind VxWorks, more information can be found [here](#).

Training:

- MOVE.B LS1046A 5 day training course, can be found [here](#).

Web sites:

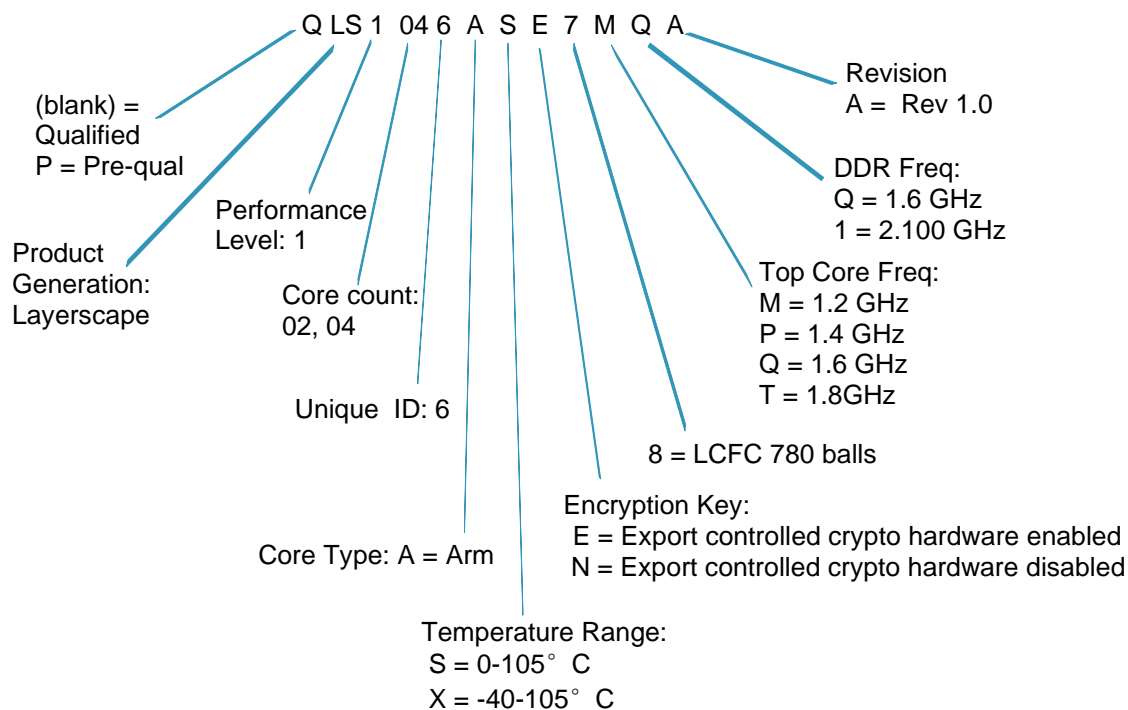
- Public web: <https://www.nxp.com/ls1046a> and <https://www.nxp.com/ls1046a-rdb>
- Confidential collateral is available to customers with NDA on External SharePoint site. Request access via your salesperson. Link to sharepoint is [here](#).

Collateral

| Documentation | Version (on public web unless noted) |
|---|---|
| QorIQ LS1046A, LS1026A Data Sheet | Rev. 4, 06/2020 |
| QorIQ LS1046A Reference Manual | Rev. 3, 08/2021 |
| Updates to LS1046A Reference Manual, Rev. 3 | Rev 3.1, 03/2022 |
| LS1046A - LS1026A Processors Fact Sheet | Rev 1, 02/2020 |
| LS1046A Product Brief | Rev. 1, 11/2017 |
| LS1046A Security (SEC) Reference Manual | Rev. 0, 05/2017 |
| LS1046A DPAA Reference Manual | Rev. 0.1, 01/2018 |
| Interconnect Fabric for LS1046A | Rev. A, 01/2017, on sharepoint |
| LS1046A Chip Errata | Rev. 8, 02/2023, on sharepoint (link available on web) |
| Application Notes | Version |
| QorIQ LS1046A Design Checklist | Rev. 2, 06/2020 |
| Enabling 10GBase-KR on QorIQ Platforms | Rev. 0, 06/2020 |
| Ethernet Backplane Driver Support | Rev. 2, 10/2019 |
| Hardware and Layout Design Considerations for DDR4 SDRAM Memory Interfaces | Rev. 2, 07/2019 |
| Implementation of IEEE Standard 1149.6™ on QorIQ LS1046A/LS1026A Processor | Rev. 0, 04/2019 |
| Common Board Design for LS1046A, LS1043A and LS1088A Processors | Rev. 1, 11/2018 |
| Loading Boot Loader on LS1046ARDB through PCIe | Rev. 0, 11/2018 |
| Configure QSPI Bus Width and Frequency in Pre-Boot Loader Stage on QorIQ LS Series Processors | Rev. 0, 11/2018 |
| RAM Boot using CodeWarrior on LS1046ARDB | Rev. 0, 11/2017 |
| PBL Configuration using QCVS | Rev. 1, 11/2020 |
| DDR Interleaving for PowerQUICC and QorIQ Processors | Rev. 1, 06/2010 |
| SerDes Reference Clock Interfacing and HSSI Measurements Recommendations | Rev. 0, 05/2011 |
| Development Tools | Version (on public web unless noted) |
| LS1046A Reference Board Design | Reference Design Board Reference Manual, Rev. 3, 10/2021 |
| | Reference Design Board Errata, Rev. 1, 10/2021 |
| | Reference Design Board Getting Started Guide, Rev. 5, 10/2021 |

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| | LS1046A Reference Design Board Fact Sheet |
| | LS1046A – Interface Quick Reference, Rev 0, 08/2017 |
| FRWY-LS1046A Board | Layerscape FRWY-LS1046A Board Reference Manual, Rev. 1, 05/2020 |
| | FRWY-LS1046A Board Getting Started Guide, Rev. 1 — 05/2020 |
| | FRWY-LS1046A-AC Demo, Rev1.1, 07/ 2019 |
| | FRWY-LS1046A-PA Demo, Rev 1.1, 07/2019 |
| | Design Files- Schematic, BOM, Layout, Rev PA |
| CodeWarrior | V11.5.12 available on public web |
| 1046A Multicore Communications Processor Broadband Home Router Application Solutions Kit | ASK Loadable binaries for LS1046A, Rev 10.3.0B1, 09/2022 Available on Flexera |
| Software | Version |
| Layerscape Linux Distribution POC (LS SDK) | L5.15.71-2.2.0, released 17 Feb 2023 |
| IBIS Model | Available on sharepoint |

Part Number Decoder:



Production Part Numbers

These part numbers are orderable and shippable.

| Parts | Description |
|-------------------------------|--|
| LS1026ASE8MQA | 2xA72 64Bit ARM-1.2G DDR4-1.6G PCIe 1/10GbE SATA USB SEC 0-105C 23x23pkg |
| LS1026ASE8P1A | 2xA72 64Bit ARM-1.4G DDR4-2.1G PCIe 1/10GbE SATA USB SEC 0-105C 23x23pkg |
| LS1026ASE8Q1A | 2xA72 64Bit ARM-1.6G DDR4-2.1G PCIe 1/10GbE SATA USB SEC 0-105C 23x23pkg |
| LS1026ASE8T1A | 2xA72 64Bit ARM-1.8G DDR4-2.1G PCIe 1/10GbE SATA USB SEC 0-105C 23x23pkg |
| LS1026ASN8MQA | 2xA72 64Bit ARM-1.2G DDR4-1.6G PCIe 1/10GbE SATA USB 0-105C 23x23pkg |
| LS1026ASN8P1A | 2xA72 64Bit ARM-1.4G DDR4-2.1G PCIe 1/10GbE SATA USB 0-105C 23x23pkg |
| LS1026ASN8Q1A | 2xA72 64Bit ARM-1.6G DDR4-2.1G PCIe 1/10GbE SATA USB 0-105C 23x23pkg |
| LS1026ASN8T1A | 2xA72 64Bit ARM-1.8G DDR4-2.1G PCIe 1/10GbE SATA USB 0-105C 23x23pkg |
| LS1026AXE8P1A | 2xA72 64Bit ARM-1.4G DDR4-2.1G PCIe 1/10GbE SATA USB SEC -40-105C 23x23pkg |
| LS1026AXE8Q1A | 2xA72 64Bit ARM-1.6G DDR4-2.1G PCIe 1/10GbE SATA USB SEC -40-105C 23x23pkg |
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| LS1026AXN8T1A | 2xA72 64Bit ARM-1.8G DDR4-2.1G PCIe 1/10GbE SATA USB -40-105C 23x23pkg |
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