i.MX 8ULP CROSSOVER APPLICATIONS PROCESSORS

OVERVIEW

i.MX 8ULP crossover applications processors integrate EdgeLock® secure enclave and µPower (micro power) technologies for the intelligent aware Edge. These processors feature a more granular, low-power implementation, with over 20 power management modes.

TARGET APPLICATIONS

- Smart home controls
- Wearables
- IoT edge solutions
- Portable patient monitoring
- Building automation
- Portable scanners and printers
- e-Readers
- EV wall chargers
- Medical Devices
- Base station control equipment

The i.MX 8ULP family of crossover processors debuts NXP's latest security and µPower technologies for the intelligent aware edge.

The implementation of innovative Energy Flex architecture in the i.MX 8ULP family combines heterogeneous domain computing (independent applications processor and real-time domains with a separate low-power multimedia domain), design techniques, and unique features of 28 nm FD-SOI process technology to deliver as much as 75% improved energy efficiency over its predecessor.

Heterogeneous domain computing (HDC) provides more discrete separated domains for power efficiency — bus, clocks, OS — separating the application domain and the real-time domain.

Embedded in these applications processors is a dedicated µPower management subsystem anchored by an internal NXP-built RISC-V core. It can govern more than 20 different power mode configurations across processing domains to deliver exceptional energy efficiency — from full power

to as low as 30 microwatts. The range of power-mode options empower an energy-conscious design approach by customizing application-specific power profiles to dramatically reduce wasted power for a greener edge. The Energy Flex architecture can also extend battery life, a valued feature of consumer and industrial wearable and other portable devices.

Building on NXP's strong history of providing turnkey security solutions, the i.MX 8ULP family features the EdgeLock secure enclave, a pre-configured security subsystem that simplifies implementation of complex security technologies and helps designers avoid costly implementation errors.

This integrated on-chip security features autonomous management of security functions, including run-time attestation, silicon root of trust, reusable certifications, trust provisioning, and fine-grain key management augmented by extensive crypto services for advanced attack resistance. Going further, the secure enclave tracks and intelligently manages power transitions when end-user applications are running on the device to help prevent new attack surfaces from emerging.

NXP EdgeLock® 2GO service enables secure provisioning of IoT devices by installing keys and certificates for various applications securely into devices while maintaining the credentials up to date during the entire device life-cycle.

Targeted toward consumer and industrial edge devices and wearables, the i.MX 8ULP family features NXP's advanced

implementation of the Arm® Cortex®-A35 core running at 800MHz for industrial applications*, an Arm Cortex-M33 core, as well as 3D and 2D graphics processing units (GPUs). Purposefully designed for a more intuitive, secure, and useful edge, the products integrate a Cadence® Tensillica® HiFi 4 DSP and/or Fusion DSP for voice, sensor, and machine learning processing. The i.MX 8ULP processors are supported by NXP's companion power management ICs (PMICs).

*For higher frequencies please contact the NXP team.

FEATURES

- **Arm Cortex-A35 —** The Arm core enhances the capabilities of portable, connected applications by fulfilling the ever-increasing power-efficiency MIPS needs of operating systems and applications.

- **Heterogeneous domain computing architecture —** A rich operating system, such as Linux®, runs on the dual Cortex-A35 cores and an RTOS runs on the Cortex-M33 core, while a separate HiFI 4 DSP enables any advanced audio/voice processing. A real-time domain includes an optional Fusion DSP to support low-power keyword detect.

- **Multilevel memory system —** The multilevel memory system of the Cortex-A35 processor is based on the L1 instruction and data caches, L2 cache, and internal and external memory. The processors support many types of external memory devices, including LPDDR3, LPDDR4, LPDDR4x, up to OctalSPI including SPI-NAND, and managed NAND, including eMMC rev. 5.0.

- **Power efficiency —** A power management subsystem (µPower) with dedicated RISC-V core allows the SoC to operate optimally in both active and low-power modes.

- **Advanced security —** The EdgeLock secure enclave enables autonomous management of security functions, including runtime attestation, silicon root of trust, reusable certifications, trust provisioning, and fine-grain key management augmented by extensive crypto services for advanced attack resistance.

- **Graphics —** The multimedia performance of each processor is enhanced by a multilevel cache system, Arm Neon™ MPE (Media Processor Engine) coprocessor, a programmable smart DMA (SDMA) controller. Each processor provides a single integrated GPU that supports an OpenGL® ES 3.1, Vulkan®, OpenVG™ 1.1, OpenCL™ 2.x and OpenVG™ 1.1 3D graphics accelerator, as well as a separate and 2D graphics accelerator.

- **Display interface —** Each processor provides up to a 4-lane MIPI DSI, as well as a parallel RGB interface (DPI/DBI)

- **Camera interface —** MIPI CSI-2 lane interface

- **Interface flexibility —** Each processor supports connections to a variety of interfaces: high-speed USB on-the-go with PHY, high-speed USB host with PHY, multiple expansion card ports (high-speed MMC/SDIO host and other), two single-ended-input 12-bit ADC/DACs, I2S audio interface, and a variety of other popular interfaces (such as UART, I²C).

SOFTWARE AND TOOLS

The i.MX 8ULP processor supported by an evaluation kit (EVK) comes with an SD card pre-installed with the Linux® operating system. Also offered are the Android™ OS, as well as FreeRTOS for the Cortex-M4 core. Display and other accessory boards and the supported PMIC are also available to purchase separately on nxp.com/imx8ulp.

i.MX 8ULP DUAL/SOLO APPLICATIONS PROCESSOR BLOCK DIAGRAM
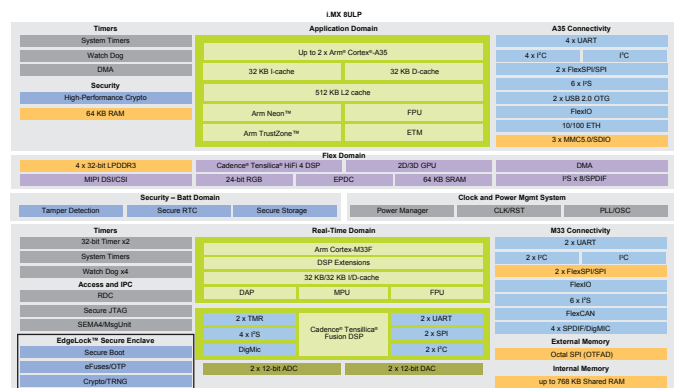
Broad partner ecosytem

NXP builds technology alliances to enable better customer solutions and faster time-to-market. Partner solutions include:

- Tool chains
- Software
- Codecs
- Middleware/applications
- Embedded board solutions
- Design services
- System integrators
- Training

Join fellow i.MX developers online at www.imxcommunity.org

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Product Longevity