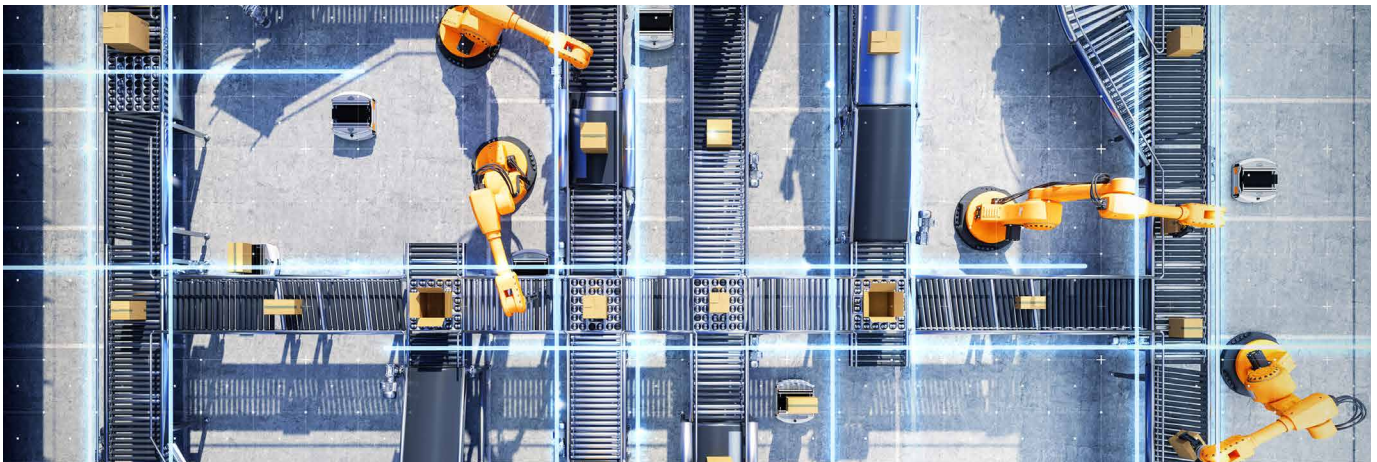


# NXP i.MX 95 applications processor family for the secure connected edge



The i.MX 95 applications processor family enables a broad range of edge applications in automotive, industrial, networking, connectivity, advanced human-machine interfaces applications and more.

The i.MX 95 family combines high-performance compute, immersive Arm® Mali™-powered 3D graphics, the innovative NXP Neutron neural processing unit (NPU) accelerator for machine learning, high-speed connectivity, and safety and security features alongside integrated EdgeLock® secure enclave. It was developed in compliance with automotive ASIL-B and industrial SIL-2 functional safety standards, through NXP SafeAssure®.

In order to better analyze the environment and make intelligent decisions locally, the next wave of edge applications require advanced processing and machine learning capabilities. The i.MX 95 family is the first i.MX applications processor family to integrate NXP's eIQ® NPU and a new image signal processor (ISP) developed by NXP.

## Target Applications

- Automotive — Connectivity domain controller, in-vehicle infotainment, ecockpit, software-defined radio, occupant monitoring system, blindspot monitoring system, multi-camera monitoring
- Aviation — Communication and navigation systems, real-time network airborne systems, passenger seatback entertainment
- Industrial — Gateway, scanner, printer, ruggedized Human-Machine Interfaces (HMI), factory automation, robotic controller, machine visual inspection, digital kiosk, digital signage, vision payment systems, industrial PCs
- Medical — Pumps/respirator/clinical monitoring
- IoT — Smart appliances, video/audio conferencing, IP phones, smart shopping carts, home automation control gateway

## Optimized heterogeneous compute

The i.MX 95 family is a heterogeneous multicore with three types of cores optimized for three types of domains. Up to six Arm Cortex®-A55 cores deliver high performance to the application domain. The Arm Cortex M7 and Arm Cortex M33 enable two independent real-time domains. The Arm Cortex M7 is for high-performance real-time use and the Arm Cortex M33 is for safety and low-power use.

## Safety architecture

The i.MX 95 family is designed to enable ISO 26262 ASIL-B and SIL-2 IEC 61508 compliant platforms with the safety domain providing a critical capability for many automotive and industrial applications. Platforms based on i.MX 95 ensure safety-essential actions in a vehicle, like voice warnings, instrumentation and cameras, meet high reliability standards set by automotive OEMs. Similarly, in industrial factory automation platforms, the functional safety domain ensures that an industrial control system always returns to a pre-determined state, even when the rest of the system fails.

## Machine vision capabilities

The i.MX 95 family enables machine vision through its integrated eIQ Neutron NPU as part of a vision processing pipeline for use with multiple camera sensors or network-attached smart cameras. The i.MX 95 SoC integrates an NXP ISP supporting a wide array of imaging sensors to enable vision-capable industrial, robotics, medical and automotive applications. The Arm Mali GPU delivers a rich, vibrant graphics user experience scaling from multi-display automotive infotainment centers to industrial and IoT HMI based applications. The i.MX 95 applications processors contain a 4-lane MIPI-DSI capable of supporting 4kp30 or 3840x1440p60 resolution, and a 2x 4-lane or 1x 8-lane LVDS display interface capable of 1080p60 resolution.

## High speed connectivity

Edge platforms for Industry 4.0, automotive connectivity domain controllers, and IoT smart home gateways will benefit from the integrated 10-gigabit Ethernet plus two 1-gigabit Ethernet ports. Applications requiring timing synchronization over Ethernet, such as factory automation or wireless infrastructure, will leverage the Time Sensitive Networking (TSN) features of the Ethernet ports. capabilities. Adding wireless connectivity such as Wi-Fi, Bluetooth LE, satellite radio or 5G, is simple thanks to two independent PCIe ports, USB 3 port and integrated BSP-level drivers for NXP's wide array of wireless connectivity solutions.

## Advanced security, simplified

Security is an essential foundation for edge applications. The i.MX 95 family integrates a secure enclave to simplify implementation of security critical functions like secure boot, cryptography, trust provisioning and run-time attestation. Combined with NXP's [EdgeLock® 2GO](#) key management services, manufacturers can securely provision i.MX 95 SoC-based products for secure remote management of devices deployed in the field, including secure over-the-air updates (OTA). The i.MX 95 platform features a dedicated cryptographic engine with support for a wide range of standards to enable next-generation automotive V2X applications and more. On-the-fly memory encryption enables secure data processing to ensure privacy and security.

## Display and multimedia

The i.MX 95's [Arm Mali GPU](#) supports OpenGL® ES 3.2, Vulkan® 1.2, and OpenCL 3.0 to enable rich graphical experiences or compute acceleration. The independent 2D GPU is part of the real-time domain and can blend graphics overlays for conveying critical information in safety or real-time applications. Additionally, the display controller enables two independent display output streams. It is capable of image rotation (90°, 180°, 270°), image resize, color space conversion, copy, blend, ROP, scale, rotate, warp/de-warp, affine transformations, linear light and offers multiple pixel format support (GPU-Tile, Super-Tile, VPU-tile, RGB, YUV, RGBA), plus standard 2D-DMA operations.

## Enhanced reliability

The i.MX 95 platform contains error correcting codes (ECC) in most of the internal memories such as L1, L2, L3 caches of the Arm Cortex-A55, the tightly coupled memory of the Cortex-M33 and Cortex-M7, and internal on-chip memory. The LPDDR interface supports in-line memory correction for enhanced reliability of key application memory regions.

## Rich set of high-speed and memory interfaces

The i.MX 95 processors offer high-speed interfaces for connectivity and fast data transfer with USB 3.0, USB 2.0, 3x SD/SDIO 3.01, and 5x CAN-FD interfaces. It has 1x 10Gigabit Ethernet and 2x Gigabit Ethernet, each with IEEE, AVB, IEEE 1588 and TSN for precise, low latency control loops. The memory interfaces supported are 32-bit LPDDR5/LPDDR4X and eMMC 5.1.

## Automotive edge

An automotive ECU that consolidates vehicle network interfaces and all external wireless interfaces in one domain managed by single high-performance processor, is known as a connectivity domain controller. The security features of the i.MX 95 processors combined with high-speed connectivity, application processing performance, plus safety and real-time domains, enable the i.MX 95 SoC to be an essential module in the modern software-defined vehicle. With premium graphics capabilities from the Arm® Mali™ GPU combined with 2D graphics and safety capabilities, the i.MX 95 is a capable eCockpit or In-Vehicle Infotainment module, offering features such as surround-view parking assistance, in-car navigation, rear-view cameras, and essential dials and tell-tale lights.

## Industry 4.0

Featuring a flexible architecture with a safety and real-time domain, the i.MX 95 family of applications processors are optimized for machine vision with high-performance graphics and scalable connectivity with support for pre-emption and TSN. Command and control of automated production lines is enabled with ruggedized HMI featuring multiple displays, touch-screen control and real-time critical alerts.

## Internet of things

Vision-enabled devices are appearing in our lives as we leverage the power of AI to identify, classify and make decisions about the world around us. The i.MX 95 is used in IoT applications ranging from home gateways that manage discrete functions such as lighting, security, entertainment, and climate control to vision-enabled shopping cards that charge for groceries on the fly.

## Comprehensive software support

NXP's software enablement package includes Linux® and Android™ support so customers can modify the BSPs to their specific needs. NXP provides quarterly releases with the latest kernel patches and bug fixes.

NXP also provides precompiled packages for all advanced IPs to facilitate customers and offloading their workloads to these IPs. Additionally, NXP also supports FreeRTOS and commercial RTOS from partners to address real-time use cases.

NXP eIQ Neutron NPU and machine learning application development are supported by the award-winning [eIQ® ML Software Development Environment](#), a collection of libraries and development tools for building machine learning applications targeting i.MX applications processors and MCUs. The eIQ Toolkit leverages open-source technologies and is fully integrated into NXP's Yocto development environments, allowing the development of complete system level applications with ease.

Join fellow i.MX developers online at NXP [i.MX community](#).

## Hardware tools

The i.MX 95 evaluation kit (EVK) enables SoC evaluation and system prototyping. Accessory boards planned to facilitate i.MX 95 processors evaluation for applications such as camera modules and display panels. Integration of NXP wireless connectivity solutions enable easy development of Wi-Fi and Bluetooth capabilities.

## Package

The i.MX 95 family comes in two packages: 19 x 19mm, 0.7mm pitch; and 15 x 15mm, 0.5mm pitch

## Qualification levels

i.MX 95 applications processors support the following qualifications:

- Automotive temperature range (-40 °C to 125 °C Tj)
- Consumer application temperature range (0 °C to 95 °C Tj)
- Extended industrial temperature range (-40 °C to 125 °C Tj)
- Standard industrial temperature range (-40 °C to 105 °C Tj)

## Supply longevity

i.MX 95 processors will be part of the [NXP Product Longevity](#) program ensuring supply continuity that preserves your engineering investment for embedded designs for 15 years.

i.MX 95 block diagram

