

AX150

Automotive Applications Processor

Overview

The AX150 processor family is a high-performance automotive applications platform designed to help OEMs and Tier 1s build next-generation eCockpit systems with advanced compute, graphics, AI, multimedia, and functional safety in a single device.

It combines a powerful heterogeneous processing architecture with 8x ARM Cortex-A55 CPUs in the primary application cluster and an additional 4x ARM Cortex-A55 CPU cluster, together with an IMG PowerVR 9XM GPU, a dedicated Neural Network Processing Unit (NPU), and an integrated Image Signal Processor (ISP) to support the growing performance demands of intelligent cockpit platforms, rich human-machine interfaces, vision-enabled features, and immersive in-vehicle user experiences.

To enable flexible and cost-effective system integration, AX150 also incorporates a broad set of high-speed and automotive interfaces, including PCIe 3.0, USB 3.0, Gigabit Ethernet TSN, CAN-FD, MIPI CSI, MIPI DSI, LVDS, eMMC, SD/SDIO, QuadSPI/OctalSPI, SPI, UART, and I²C.

For multimedia-rich cockpit designs, the platform supports advanced audio, camera, display, and video processing capabilities, including multiple SPDIF and I2S/TDM interfaces, MIPI camera inputs, MIPI DSI and LVDS display outputs, and H.264/H.265 video encode/decode support.

For safety-critical functions, AX150 integrates a dedicated on-chip safety island based on Cortex-R5F cores operating in dual-core lock-step mode, along with a separate RTC and system control domain for low-power operation, reset and power management, and secure storage.

With its multi-domain architecture, high-performance application processing, integrated AI and imaging capability, rich multimedia support, and built-in

safety foundation, AX150 provides a scalable and practical solution for modern digital cockpit designs.

Target Applications

AX150 processor is targeted for the following applications:

- eCockpit
- Virtual Cluster
- Infotainment

Key Features

AX150 processor consists of three independent functional domains:

- Applications Processing Domain
- Highly Reliable Safety Domain
- Low Power RTC and Safety Control Domain

Applications Processing Domain

CPU1

- 8x ARM Cortex-A55 CPU, 2.3GHz
- 32KB/32KB L1 I/D-Cache per core
- 128KB L2 Cache per core
- 1MB L3 Cache
- Support In-line ECC

CPU2

- 4x ARM Cortex-A55 CPU, 2.0GHz
- 32KB/32KB L1 I/D-Cache per core
- 128KB L2 Cache per core
- 512KB L3 Cache
- Support In-line ECC

Secure Processor

- ARM Cortex-R5 in DCLS mode
- 32KB/32KB L1 I/D-Cache
- 128KB TCM
- ECC on Cache & TCM

Multi-Purpose Processor

- ARM Cortex-R5 in DCLS mode
- 32KB/32KB L1 I/D-Cache
- 128KB TCM
- ECC on Cache & TCM

NPU

- High efficiency Neural Network Processing Unit

ISP

- High efficiency Image Signal Processing

ADC

- 12-bit SAR ADC, 5M Samples/s
- 4 Analog Input Channels

Audio Interface

- 4x SPDIF
- 6x single-channel I2S/TDM
- 2x multi-channel I2S

Camera Interface

- 2x 4-lane MIPI-CSI Interface, support 4 virtual channels
- 1x 8-bit Parallel CSI Interface

Display Interface

- 2x 4-lane MIPI-DSI Interface
- 4x LVDS Display Interface

GPU Core

- IMG PowerVR 9XM GPU

Internal Memory

- 8MB System RAM

DRAM Interfaces

- Support LPDDR4/LPDDR4x
- Optional In-line ECC

VPU Cores

- H.264 Video Encoder/Decoder
- H.265 Video Encoder/Decoder

High-Speed Interfaces

- 2x USB3.0
- 2x PCIe3.0 RC/EP Dual Role

Storage Interface

- 2x eMMC5.1
- 2x SD3.0/SDIO
- 1x QuadSPI/OctalSPI

Peripherals

- 1x Giga-bit Ethernet TSN
- 4x SPI
- 8x UART
- 12x I2C
- GPIO
- PWM
- Watchdog
- Timer

Highly Reliable Safety Domain

Safety CPU Core

- ARM Cortex-R5F 800MHz in DCLS mode
- 32KB/32KB L1 I/D-Cache
- 128KB TCM

Storage Interface

- 1x QuadSPI/OctalSPI

Audio Interface

- 2x Single-Channel I2S/TDM

Internal Memory

- 1MB System RAM
- 128KB ROM
- All memory with ECC enabled

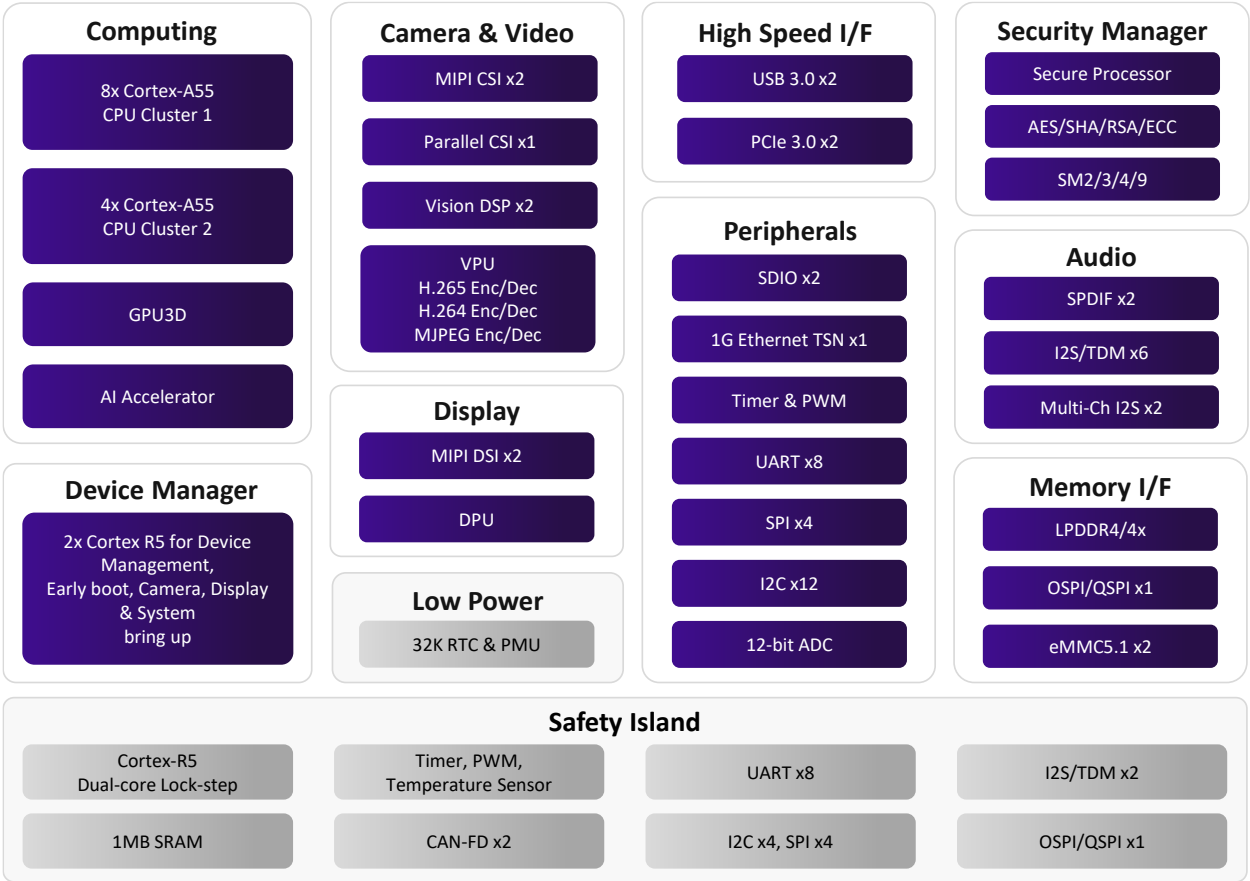
Peripherals

- 2x CAN-FD
- 4x SPI
- 8x UART
- 4x I2C
- GPIO
- PWM
- Temperature Sensor
- Watchdog
- Timer

Low Power RTC and System Control Domain

- 32KHz Oscillator
- Real-Time Clock
- System Power and Reset Control
- 2048-bit Secure Storage Register

Block Diagram



AX150 Block Diagram

Ordering Information

The following table provides detailed specifications for the AX150 Processor.

Part Number	Features	Package	Temperature	Notes
P151A21	8x A55 2.3GHz, 4x A55 2.0GHz, 3x R5, NPU, ISP, GPU, VPU, PCIe	21x21 FCBGA	-40 ~ 125°C T _j	AEC-Q100 Grade 2 (-40 ~ 105°C) HBM ESD Level 2 CDM ESD Level C1