

# A12A

HD Automotive Camera SoC

## Key Features

### Unparalleled Performance

- Full HD at 60fps or quad HD 4MP at 30fps
- Dual-channel quad HD at 30fps
- Electronic image stabilization (EIS)

### Superior Image Quality

- Advanced night vision for low-light conditions
- Full-resolution oversampling
- Dynamic range (WDR and HDR) engine
- Automotive smart auto exposure (AE)

### Advanced Features

- Advanced driver assistance system (ADAS)
- WiFi and 4G / LTE connectivity support



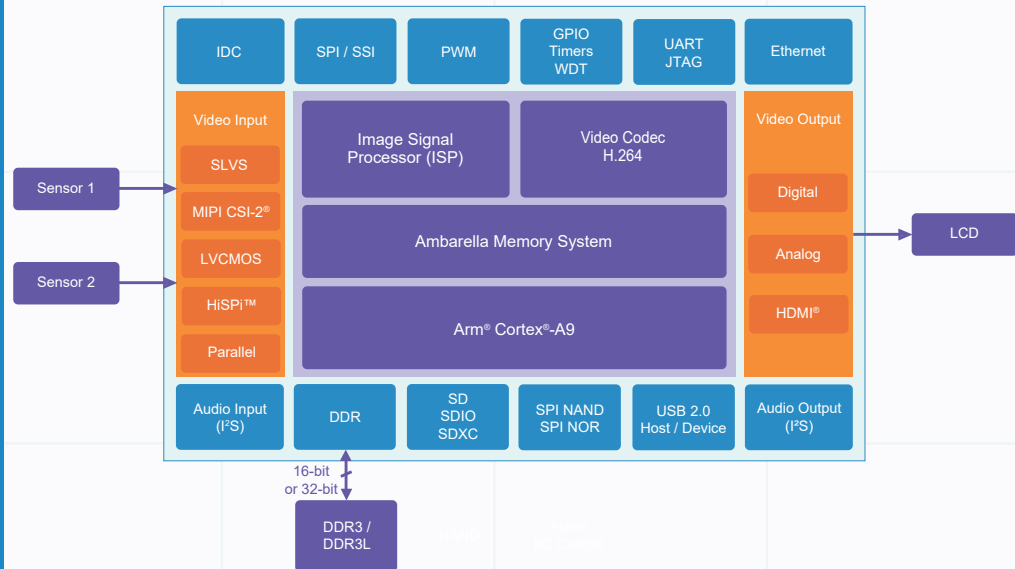
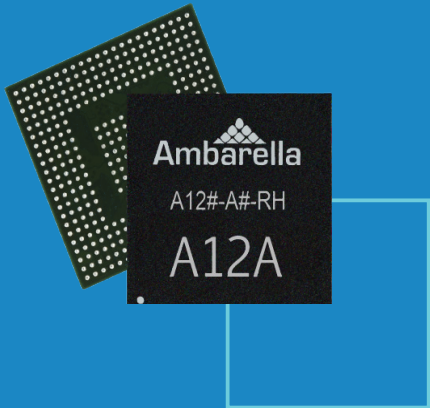
## Overview

The A12A system on chip (SoC) family enables single-channel quad HD (4MP, 1440p) at 30fps, full 1080p HD at up to 60fps, and dual-channel quad HD at 30fps, providing support for video recording through the front windshield, as well as through the rear window or inside the vehicle.

The A12A's combination of advanced image processing, high dynamic range (HDR), 3D noise filtering, smart auto exposure (AE), and full-resolution oversampling provides superior image quality, allowing the capture of license plates and other key details, even in low-light conditions. The increased resolution enables users to capture images using a wide field of view (FoV), while maintaining a high level of detail throughout the images.

The A12A SoC includes a high-speed 792-MHz Arm® Cortex®-A9 CPU with Neon™ DSP extensions to support advanced analytics algorithms, including lane departure and forward collision warning systems.

A12A enables WiFi connectivity for reviewing the captured video clips on iOS and Android devices, as well as an interface to 4G / LTE modems for remote viewing or cloud storage of the video. The software development kit (SDK) leverages Ambarella's multi-stream encoding capability for full HD video recording while simultaneously sending a second stream to another device.



A12A Block Diagram

# General Specifications

## Image Sensor Interface

- 500 MPixel/s sensor data input
- LVDS, sub-LVDS, SLVS / MLVS
- LVC MOS, Parallel, MIPI®, HiSPi™

## High Performance Automotive Video Engine

- Quad HD 4MP at 30fps, full 1080p HD at 60fps
- Simultaneous encode of two high-resolution quad HD 4MP at 30fps streams for front and rear cameras
- Advanced night vision with super-resolution oversampling, 3D noise filters, and dynamic tone mapping
- Real-time geometric distortion correction (dewarp) filter
- Advanced automotive dynamic range engine with local exposure, highlight, and tone adjustment
- Automotive smart auto exposure (AE) with scene detection, object detection, and dynamic AE
- Continuous looping, motion detection, and event-based / emergency video

## Powerful CPU for Advanced Driver Assistance

- Arm® Cortex®-A9 up to 792 MHz
- 32 KB / 32 KB I/D and 128 KB L2 cache
- AES / 3DES / SHA-1 / MD5 cryptography engine
- Ambarella image and video DSPs
- Lane departure warning system (LDWS)
- Forward collision warning system (FCWS)
- Forward car movement detection (FCMD)
- Low light warning (LLW)

## File Formats

- Audio: AAC (two-channel LC, HEAAC, HEAAC v2), ADPCM / LPCM / PCM
- Photo file: JPG

## Advanced Video and Display Processing

- BP / MP / HP H.264 level 5.0 and MJPEG encode
- Crop, mirror, scale, functions, and LCD rotation
- Alpha-blending on-screen display (OSD), text, and overlays
- Multiple video output (VOUT) ports

## Memory Interfaces

- DDR3 / DDR3L up to 600 MHz
- 16-bit / 32-bit data bus
- Three SD controllers with SDXC SD™ card
- NAND flash and SLC with ECC
- Boot from SPI NOR, SPI-EEPROM, NAND flash, USB, or eMMC

## Peripheral Interfaces

- Two USB 2.0 ports with device and device / host with PHY
- Multiple SSI / SPI, I<sup>2</sup>C / IDC, and UART
- Multiple PWM, stepper, and ADC channels
- Numerous GPIO ports, PWM, steppers, IR, and ADC
- Watchdog timer, multiple general-purpose timers, JTAG, and I<sup>2</sup>S

## Physical

- 28 nm low-power CMOS
- Two LFBGA packages available:
  - 404 balls, 15x15 mm, 0.65 mm pitch
  - 256 balls, 11x11 mm, 0.65 mm pitch
- Operating temperature: -20°C to +85°C or -40°C to +105°C

## A12A HD Camera Development Platform

The A12A automotive camera development platform contains the necessary tools, software, hardware, and documentation to develop a small form-factor automotive camera.

### Evaluation Kit (EVK)

- A12A main board with connectors for sensor / lens board and peripherals
- Sensor board: OmniVision, Sony, and others
- Datasheet, BOM, schematics, and layout
- Reference application with C source code

### Software Development Kit (SDK)

- Dual OS ThreadX / Linux with patches, drivers, tools, and application source code
- Royalty-free libraries for ISP, 3A, dewarp, and codecs
- Image tuning and manufacturing calibration tools
- Detailed documentation, including a programmer's guide and more

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