



A9SE Sports and Flying Camera Processor

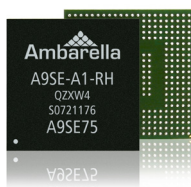
Overview

The Ambarella A9SE SoC family delivers broadcast-quality digital video to a new generation of versatile sports and flying camera applications.

A9SE models range from low-power 1080p30 mainstream video processors up to high-performance systems supporting the 4K Ultra HD (UHD) encode standard, transcode, Wi-Fi capability and remote control.

The top-performing high-definition A9SE75 H.264 codec delivers recording at up to 4K x 2K resolution (encode and transcode), supports fast-action capture with loop recording for transmission over Wi-Fi to remote view finders, as well as remote control by handheld devices.

The A9SE75 SoC also includes a powerful 800 MHz dual-core Cortex-A9 ARM CPU that can be used to run flight control and optical flow algorithms for flying cameras, as well as a high-performance digital signal processing (DSP) subsystem with an Ambarella image sensor pipeline (ISP) and a dedicated hardware engine for 3D image stabilization.



The 28 nm Ambarella A9SE SoC Device.

Key Features

Flexible Low-Power Platform

- Dual-core ARM Cortex-A9 800 MHz CPU with 1-MByte L2 cache
- Fast Boot ThreadX/Linux Dual OS
- 28-nm low-power CMOS Process

High Resolution and Frame Rate Image Processing

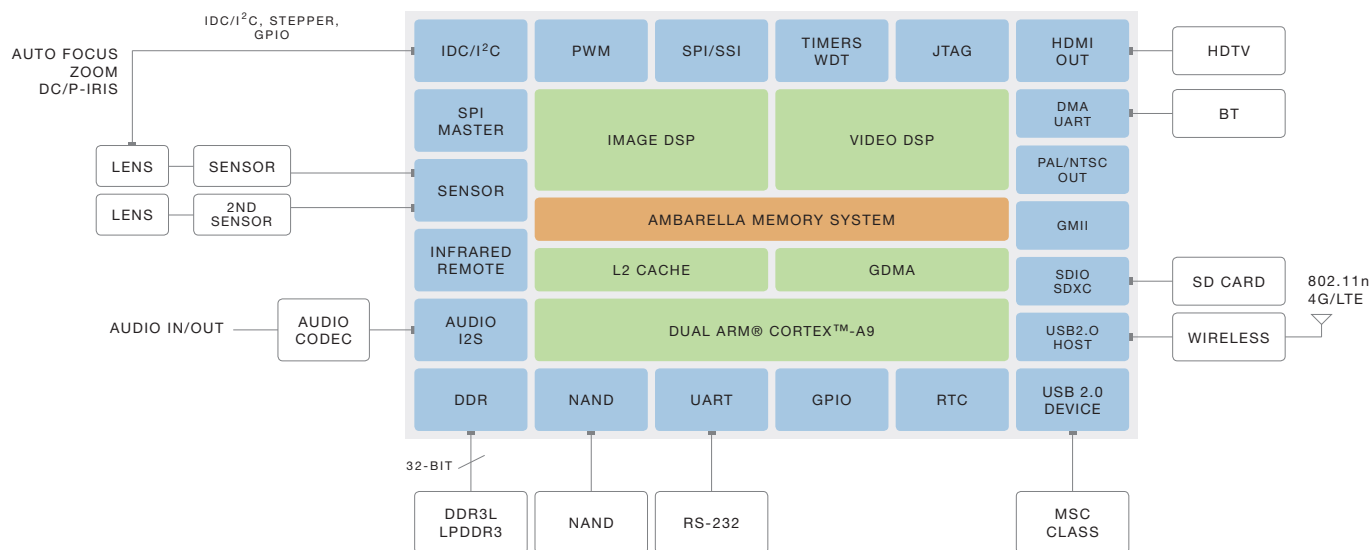
- Up to 240 MPixel/s input pixel rate
- Encode performance up to 4Kp30 + 720p30
- 3D Electronic Image Stabilization (EIS) with rolling shutter correction
- 3D noise reduction (Motion Compensated Temporal Filter, or MCTF)
- Secondary sensor input for flying camera optical flow

Wireless Connectivity and Video Streaming Options

- USB Host for 4G Module Connectivity
- DMA UART for Bluetooth (BT) Module Connection
- Dual Encode for On-The-Fly Mobile Resolution Stream

Block Diagram

The diagram below illustrates a sports or flying camera design based on the Ambarella A9SE device.



General Specifications

Processor Cores

- Dual core ARM® Cortex™-A9 up to 800 MHz
- 32 KB / 32 KB I/D and 1 MB L2 Cache
- AES / 3DES / SHA-1 / MD5 Cryptography Engine
- Ambarella Image and Video DSPs

Sensor and Video I/O

- Two independent sensor interfaces
 - Primary: Up to 12-lane SLVS / Sub-LVDS, 4-lane MIPI CSI, or parallel LVC-MOS / LVDS
 - Secondary: One-lane MIPI CSI
- Two logical channels to drive three video output ports
 - 24-bit RGB out
 - HDMI® v2.0 with PHY out
 - PAL / NTSC composite SD video out

CMOS Sensor Processing

- 32 MPixels maximum resolution
- Lens shading, fixed pattern noise correction
- Multi-exposure HDR (line-interleaved sensors)
- Wide Dynamic Range (WDR) local exposure

Image Processing

- 3D motion-compensated noise reduction (MCTF)
- Adjustable AE / AWB / AF
- Lens geometric distortion correction (Dewarp)
- Chromatic aberration correction
- Defect pixel correction
- Geometric and chroma lens distortion correction
- Back-light compensation
- 3D Electronic Image Stabilization (EIS) with rolling shutter correction
- Crop, mirror, flip, 90° / 270° rotation

Video Encoding

- Broadcast-quality H.264 full high-definition (HD) video encoding and decoding
- Simultaneous 4Kp30 + 720p30
- Other formats such as 1440p60, 1080p120, 720p240
- Multiple CBR and VBR rate control modes

Memory Interfaces

- LPDDR2 / LPDDR3 / DDR3 / DDR3L up to 660 MHz
- 16-bit / 32-bit data bus
- Up to 1-GByte capacity
- Two SD controllers, including SDXC™ / UHS-1 support
- NAND flash, 4-bit and 8-bit SLC with ECC
- Boot from SPI-NOR, NAND flash, USB or eMMC

Peripheral Interfaces

- Two USB 2.0 ports with Device and Device / Host w / PHY
- Multiple SSI / SPI, IDC / I²C, and UART
- Gigabit Ethernet controller: GMII/MII PHY interfaces, up to 1Gbps
- Many GPIO ports, multiple PWM, Steppers, IR, ADC
- Watchdog Timer, multiple general purpose timers, JTAG, I2S

Physical

- 28-nm low-power CMOS
- Operating temperature: -20°C to +85°C
- LFBGA package with 404 balls, 15x15 mm, 0.65 mm pitch

A9SE Sports and Flying Camera Development Platform

The A9SE Sports And Flying Camera Development Platform contains the necessary tools, software, hardware and documentation to develop a small form factor, wearable or flying camera module.

Evaluation Kit (EVK)

- A9SE main board with connectors for sensor/lens board, peripherals
- Sensor board: Omnivision, Sony, and others
- Data sheet, 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 with programmer's guide, application notes

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