



# A9 Ultra HD 4K Camera SoC

## Overview

The Ambarella A9 SoC enables development of the next generation of mirrorless, sports, and digital still cameras (DSCs) with leading-edge video features and exceptional still image quality.

In addition to 4K Ultra HD video resolution at 30 frames per second, the A9 supports high frame-rate video for capturing fast-action sports with 1080p video at 120 frames per second or 720p video at 240 frames per second.

The A9 includes dual core ARM® Cortex™-A9 CPUs providing the performance required for advanced applications including wireless connectivity to smartphones for video streaming or image sharing.



The 32 nm Ambarella A9 Ultra HD 4K SoC Device.

## Key Features

### Ultra HD 4K H.264 Encoder

- High Profile with B-frames for high efficiency

### Super High Frame Rate Modes

- 1080p120 and 720p240 for action videography

### Advanced Imaging

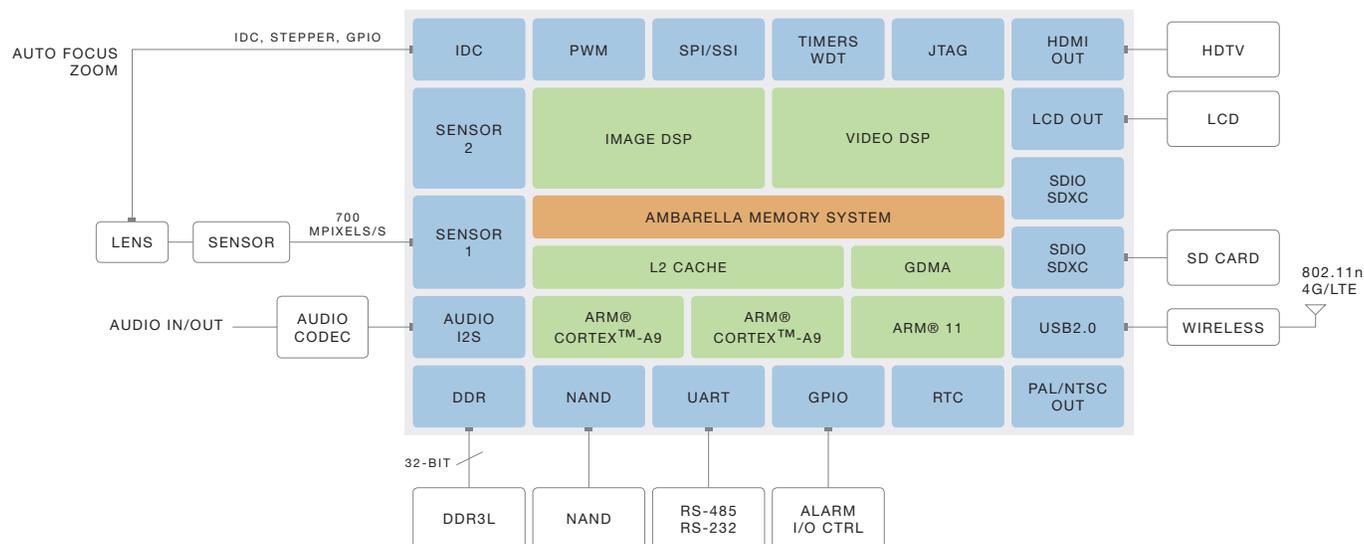
- 700Mpixels/s oversampling performance
- Multi-exposure HDR and WDR tone mapping
- Electronic image stabilization (EIS)
- Improved MCTF with advanced sharpening

### Wi-Fi™ Connectivity

- Remote viewfinder, playback
- Upload pictures and video to social media

## Block Diagram

Ambarella A9 Ultra HD 4K SoC System Diagram.





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## General Specifications

### Processor Cores

- Dual Core ARM® Cortex™-A9 @ up to 1 GHz
  - NEON™ and FPU acceleration
- Ambarella Image and Video DSPs
- Cryptography Engine

### Sensor and Video I/O

- Dual sensor interfaces
  - 12-lane SLVDS/HiSpi™/subLVDS, 4-lane MIPI™, or 16-bit
  - 1-lane SLVDS/MIPI
- BT.601/656/1120 video in and BT.656/1120 out
- 24-bit RGB out, HDMI® 1.4a with PHY out
- PAL/NTSC composite SD video out

### Front End Sensor Processing

- 32 MPixels maximum resolution
- 700 MHz maximum pixel rate
- Lens shading, fixed pattern noise correction
- Multi-exposure HDR
- WDR local exposure

### Video Encoding

- H.264 codec BP/MP/HP Level 5.1 and MJPEG
- Ultra HD 4K encode performance
- 1080p120, 720p240 modes
- Low bitrate/high quality encoding
- On-the-fly change of multiple encoding parameters
- Flexible GOP configuration
- Multiple CBR and VBR rate control modes

### Image Processing

- 3D motion compensated noise reduction (MCTF)
- Electronic Image stabilization (EIS)
- Adjustable AE/AWB/AF
- High quality polyphase scalars
- Crop, mirror, flip, 90° rotation

### Memory Interfaces

- DDR3/DDR3L
- 32-bit data bus
- Dual SMIO with SDXC SD™ Card Support
- NAND flash, SLC with ECC
- Boot from NAND, SPI EEPROM, USB or eMMC

### Peripheral Interfaces

- GMAC Ethernet with GMII / MII
- USB2.0 HS Device or Host w/PHY
- Multiple I2S, SSI/SPI, IDC, and UART
- Many GPIO ports, Multiple PWM, Steppers, IR, ADC
- Watchdog Timer, multiple general purpose timers, JTAG

### Physical

- 32nm Low Power CMOS
- <1W for 1080p60 encode
- <2W for Ultra HD 4K encode
- Operating temperature 0°C to 70°C
- TFBGA package with 404 balls, 15x15 mm, 0.65 mm pitch

## A9 Ultra HD 4K Camera Development Platform

The A9 Camera Development Platform contains the necessary tools, software, hardware and documentation to develop a state-of-the-art network-enabled Ultra HD camera design.

### Hardware Platform

- Main board with A9 and sensor board with C/CS mount lens
- Sensor: Aptina, OmniVision, Samsung, Sony—many choices available

### Software Development Kit (SDK)

- Royalty-free libraries for ISP, 3A, and codecs
- Demonstration DV/DSC camera application with full source code
- Extensive and fully documented middleware API library suite

### Documentation

- Programmer's guide, application notes, API documents
- SoC data sheet, BOM, schematics and layout files



## Contact [www.ambarella.com/about/contact/inquiries.html](http://www.ambarella.com/about/contact/inquiries.html)

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