Overview

The AEC-Q100-qualified A9AQ SoC family provides an integrated single-chip solution for single and multi-camera electronic mirror, surround view, and video recording systems. The A9AQ’s combination of advanced image processing, High Dynamic Range (HDR), 3D Noise filtering, smart auto exposure, and high-resolution capability provide superior visibility even in low light or high contrast scenes. LED flicker mitigation dramatically reduces artifacts introduced by LED headlights and traffic signs.

The A9AQ’s multi-channel image processing removes the need for a dedicated ISP chip in every camera module, enabling highly compact camera modules while improving video quality, reducing power consumption, and lowering system cost. The A9AQ integrates a four-channel B6 de-serializer, removing the need for external de-serializer chips in multi-channel camera systems.

The SoC includes a high speed 800MHz dual-core ARM® Cortex®-A9 CPU with Neon DSP extensions to provide powerful processing performance for customer applications including advanced driver assistance features, user interface, and wireless networking.

For multi-camera parking assistance applications, the A9AQ’s on-chip H.264 encoder enables simultaneous recording of multiple camera streams as well as video streaming to smartphones over WiFi or through in-car 4G hotspots. It provides realistic 3D HD scene rendering using a dedicated image processing engine which provides de-warping and seamless stitching of video from multiple cameras.

A9AQ System Overview Diagram

Automotive surround-view video application with an Ambarella A9AQ SoC and four B6F serializer chips. (Note that more inputs are possible with additional B6N de-serializers.)
**Key Features**

**Highly Integrated Multi-Camera ECU**
- Eight camera input ports, including four-channel integrated de-serializer
- Multiple-channel 1MP or 2MP or single-channel 4K Ultra HD image processing (Up to 550 Mpixel/sec combined)
- Up to four video outputs, including integrated two-channel serializer

**Superior Image Quality**
- Advanced night vision for low light conditions
- Advanced LED Flicker mitigation
- Wide Dynamic Range (WDR) and High Dynamic Range (HDR)
- Automotive multi-channel Smart Auto Exposure and Auto White Balance

**Advanced Features**
- Multiple hardware and software fail-safe mechanisms to prevent "frozen image" errors
- WiFi and 4G/LTE connectivity support

**General Specifications**

**Image Sensor Interface**
- Four Ambarella B6 SERDES inputs with up to 3 Gbps/lane
- Four direct sensor VIN ports
- Support for SLVS, MIPI CSI-2, LVCMOS, 16-bit parallel
- CCIR.601 video input with external sync signals and BT.1120/CCIR.656 style with embedded sync codes

**Powerful CPU for Advanced Driver Assistance**
- 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

**Peripheral Interfaces**
- One USB 2.0 port configurable as Device or Host
- Two CAN / CAN-FD ports
- Two Ethernet MACs with IEEE 802.3-compliant GMII/MII Gigabit (10/100/1000-Mbps) interfaces
- Multiple I2S, SSI/SP1, I2C, and UART
- Multiple PWM, Stepper, and ADC channels
- Numerous GPIO ports, PWM, steppers, IR, ADC
- Watchdog Timer, multiple general-purpose timers, JTAG

**Memory Interfaces**
- Two SD controllers with SDXC SD™ card support; one port
- 16-bit/32-bit data bus, up to 2 Gbyte capacity
- LPDDR2, LPDDR3, LPDDR4, DDR3 and DDR3L up to 600 MHz
- NAND flash, SLC with ECC
- Boot from SPI-NOR, SPI-EEPROM, NAND flash, USB or eMMC

**Physical**
- 28-nm low-power CMOS
- AEC-Q100 grade 2 (-40 °C to +105 °C operating temperature range)
- TFBGA package with 577 balls, 14x14 mm, 0.5 mm pitch and 17x17 mm, 0.65 mm pitch options

**A9AQ Advanced HD Automotive Camera Development Platform**

The A9AQ Automotive Camera Development Platform contains the necessary tools, software, hardware and documentation to develop a fully featured automotive camera system.

**Evaluation Kit (EVK)**
- A9AQ main board with connectors for sensor/lens board, peripherals
- Camera modules or Sensor boards: 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

**Contact**

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