A12A Advanced HD Automotive Camera SoC

Overview

The A12A SoC family enables single-channel Quad HD (4MP, 1440p) at 30fps, Full 1080p HD at up to 60 fps, and dual-channel Quad HD, 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, 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 allows a wider field of view to be captured, while still maintaining a high level of detail throughout the image.

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 SDK leverages Ambarella's multi-stream encoding capability for Full HD video recording while simultaneously sending a second stream to the smartphone.

Key Features

Unparalleled Performance
◦ Full HD @ 60fps or Quad HD 4MP @ 30fps
◦ Two-channel Quad HD @ 30fps
◦ Electronic Image Stabilization (EIS)

Superior Image Quality
◦ Advanced Night Vision for Low Light Conditions
◦ Full-Resolution Oversampling
◦ Wide Dynamic Range (WDR)
◦ High Dynamic Range (HDR)
◦ Automotive Smart Auto Exposure

Advanced Features
◦ Advanced Driver Assistance System (ADAS)
◦ WiFi and 4G/LTE Connectivity Support

Block Diagram

The diagram below illustrates an automotive camera design based on the Ambarella A12A SoC.
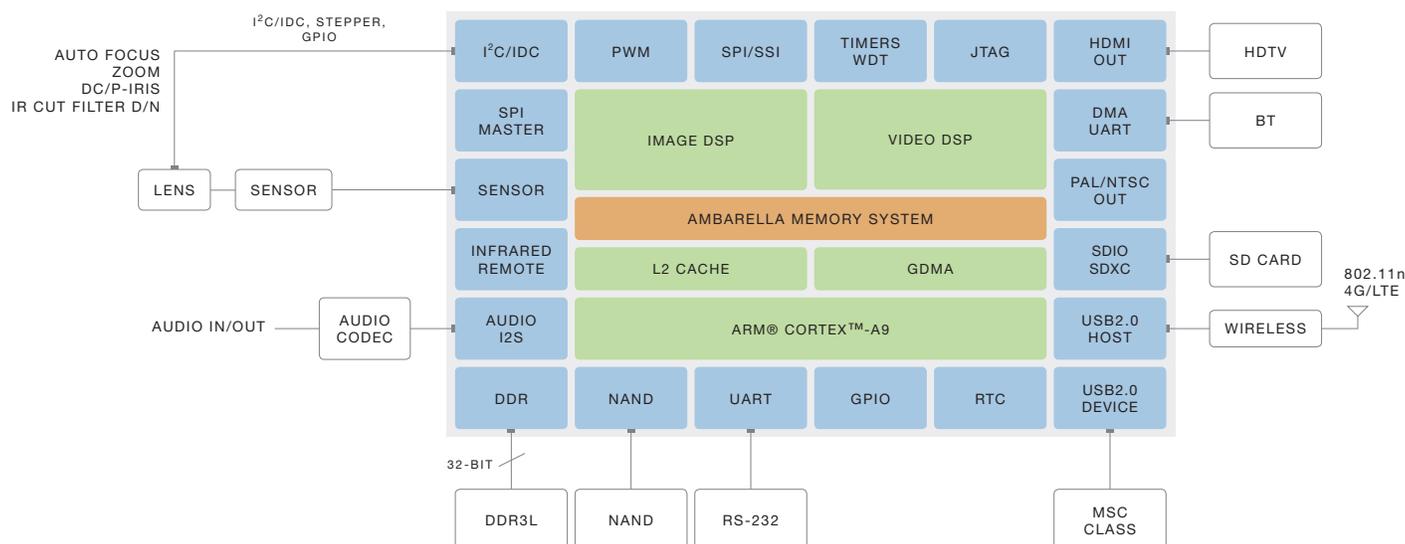
General Specifications

Image Sensor Interface
- 500 MPixels/s sensor data input
- LVDS, sub-LVDS, SLVS/MLVS
- LVCMOS, Parallel, MIPI, HiSPi™

High Performance Automotive Video Engine
- Quad HD 4MP @ 30fps, Full 1080p HD @ 60fps
- Simultaneous encode of two high-resolution Quad HD 4MP @ 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 (de-warp) 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
- Includes 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, flip, scale functions and LCD rotation
- Alpha-blending OSD; text, overlays
- Multiple video output ports

Memory Interfaces
- DDR3/DDR3L up to 600 MHz
- 16-bit/32-bit data bus
- Three SD controllers with SDXC SD™ Card
- NAND flash, 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 w/PHY
- Multiple SSI/SPI, I^{2}C/IDC, and UART
- Multiple PWM, Stepper, and ADC channels
- Numerous GPIO ports, PWM, Steppers, IR, ADC
- Watchdog Timer, multiple general-purpose timers, JTAG, I2S

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℃ to +85℃ or -40℃ to +105℃

A12A Advanced HD Automotive 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)
- A12 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

Contact www.ambarella.com/about/contact/inquiries.html