



S2 IP CAMERA PROCESSOR

Overview

The Ambarella S2 IP Camera Processor integrates a professional 4K Ultra HD H.264 encoder, an advanced image sensor pipeline, a Dual Core ARM® Cortex™-A9 CPU, and fully featured I/O peripherals to simplify system design. Designed with low-power 32nm technology, the S2 chip supports features such as improved MCTF with advanced sharpening, high dynamic range processing, dewarping, image stabilization, and video analytics.

The open dual-core processor platform combined with a robust Linux-based IP Camera SDK provides the flexibility to allow developers to differentiate in areas such as custom image tuning and video content analysis.



The S2 chip enables professional 4k Ultra HD encoding.

Key Features

Flexible Low-Power Platform

- Dual Core ARM® Cortex™-A9 CPU @ 1 GHz
- Linux SDK for standards-based development
- 32nm low power CMOS process

Advanced Imaging

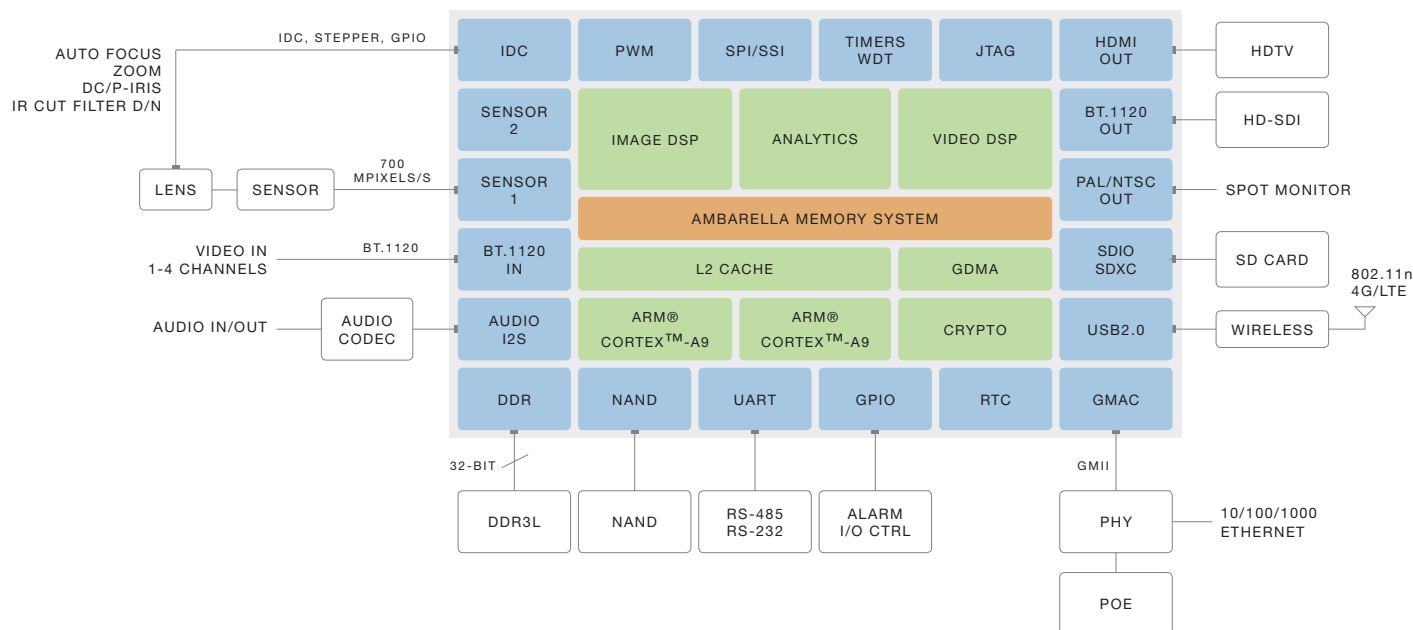
- 700Mpixels/s oversampling performance
- Intelligent video analytics hardware acceleration
- Panoramic 180°/360° dewarping with multiple windows
- Multi-exposure HDR and WDR tone mapping
- Electronic image stabilization (EIS)
- Improved MCTF with advanced sharpening

4K Ultra HD H.264 Encoder

- High Profile with B-frames for high efficiency
- Multi-streaming, low-latency encoding

Block Diagram

The diagram below illustrates an IP Camera design based on the Ambarella S2 device.



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

Image Processing

- 3D motion compensated noise reduction (MCTF)
- Electronic Image stabilization (EIS)
- Adjustable AE/AWB/AF
- 180/360° fish-eye dewarping with multi-window modes
- High quality polyphase scalers
- Digital PTZ and Virtual Cameras
- OSD engine; overlays, privacy mask
- Crop, mirror, flip, 90° rotation

Intelligent Video Analytics

- ARM + analytics hardware acceleration
- Face detection and tracking
- Intelligent motion detection
- Tampering detection

Video Encoding

- H.264 codec BP/MP/HP Level 5.1 and MJPEG
- 32 MPixels maximum resolution
- 4K Ultra HD encode performance
- Up to 8 simultaneous stream encodes
- Low bitrate/high quality encoding
- On-the-fly change of multiple encoding parameters
- Flexible GOP configuration
- Dynamic region of interest
- Multiple CBR and VBR rate control modes

Memory Interfaces

- DDR3/DDR3L
- 32-bit data bus
- Dual SMIO with SDXC SD™ Card
- 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
- Multiple PWM, Stepper, and ADC channels
- Many GPIO ports, PWM, Steppers, IR, ADC
- Watchdog Timer, multiple general purpose timers, JTAG

Physical

- 32nm Low Power CMOS
- <1W for 1080p60 encode
- <2W for 4K Ultra HD encode
- Operating temperature -20°C to +85°C
- TFBGA package with 404 balls, 15x15 mm, 0.65 mm pitch

S2 IP Camera Development Platform

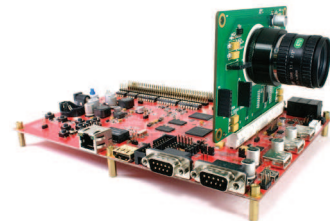
The S2 IP Camera Development Platform contains the necessary tools, software, hardware and documentation to develop an IP Camera while supporting development of customized features.

Evaluation Kit (EVK)

- S2 main board with connectors for sensor/lens board, BT.1120, iris, AF/zoom, SPI, IDC, JTAG, SD Card, USB, UART, audio, HDMI
- Sensor board: Aptina, Omnivision, Panasonic, Sony, and others
- Datasheet, BOM, schematics, and layout
- IP Camera reference application with C source code

Software Development Kit (SDK)

- Linux 2.6.38 kernel 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

Website : www.ambarella.com

General Inquiries : inquiries@ambarella.com

Telephone : 408 734 8888

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