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, and dewarping.

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.

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
- 600Mpixels/s oversampling performance
- Panoramic 180°/360° dewarping with multiple windows
- Multi-exposure HDR and WDR tone mapping
- Improved MCTF with advanced sharpening

4K Ultra HD H.264 Encoder
- High Profile with B-frames for high efficiency
- Multi-streaming, low-latency encoding
- 3840x2160p30 or 8M@30 fps encoding performance

The S2 chip enables professional 4K Ultra HD 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
- High-speed RGB Bayer interface to popular sensors
  - 12-lane SLVDS/HiSPI™/subLVDS, 4-lane MIPI™, or
  - 16-bit parallel
- 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
- 600 MHz maximum pixel rate
- Lens shading, fixed pattern noise correction
- Multi-exposure HDR
- WDR local exposure

Image Processing
- 3D motion compensated noise reduction (MCTF)
- 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°/270° rotation
- DC-iris and P-iris
- Defect pixel correction
- Geometric and chroma lens distortion correction
- Gamma compensation and color enhancement
- Backlight compensation

Intelligent Video Analytics
- Face detection and tracking
- Intelligent motion detection
- Tampering detection
- Intrusion detection and people counting
- Advanced 3rd party analytics options
- License plate recognition
- Object recognition and more

Video Encoding
- H.264 codec BP/MP/HP Level 5.1 and MJPEG
- 32 MPixels maximum resolution
- 4K UltraHD (3840x2160p30) encoding 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 up to 528MHz
- 32-bit data bus
- Dual SMIO with SDXC SD™ Card
- NAND flash, SLC with ECC
- Boot from NAND, 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
- <1.5W for 1080p60 including DDR
- <2.5W for 4K including DDR
- 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 3.8.8 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  www.ambarella.com/about/contact/inquiries.html

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