Overview

The Ambarella S2L IP Camera Processor is a system-on-chip solution that integrates an advanced image sensor pipeline (ISP), an H.264 encoder capable of up to 5Mp30 video, and a powerful ARM® Cortex™-A9 CPU for user applications. Targeting professional IP Camera designs, the S2L supports HDR and motion-compensated 3D NR to handle challenging lighting conditions, while the multi-streaming H.264 encoder with Smart-AVC delivers superb video quality at low bitrates.

The S2L family is supported by a flexible Linux-based IP Camera SDK to allow development of differentiated products in areas such as sensor and lens tuning, analytics and network connectivity.

Key Features

Flexible Low-Power Platform
- ARM Cortex-A9 CPU
- Linux SDK for standards-based development
- 28 nm low power CMOS process

Advanced Image Processing
- Up to 14 Mpixel resolution
- Multi-exposure line-interleaved HDR
- Hardware dewarping engine
- Improved MCTF with advanced sharpening

High-Efficiency Video Encoding
- Up to 5M@30fps H.264 High Profile encoding
- Smart-AVC streaming as low as 600Kbps for 1080p30
- Flexible multi-streaming

Block Diagram

The diagram below illustrates an IP Camera design based on the Ambarella S2L device.
**General Specifications**

**Processor Cores**
- ARM® Cortex™-A9
- 32KB/32KB I/D and 128 KB L2 Cache
- NEON™ and FPU acceleration
- AES/3DES/SHA-1/MD5 Cryptography Engine
- Ambarella Image and Video DSPs

**Sensor and Video I/O**
- Dual-port RGB Bayer interface to popular sensors
  - Primary port: 8 lanes of SLVS/MIPI/HiSPI
  - Secondary port: 2-lane SLVS/MIPI/HiSPI
  - 12-lane SLVS in single port mode
  - 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**
- 14 MPixels maximum resolution
- 480 MHz maximum pixel rate
- Lens shading, fixed pattern noise correction
- Multi-exposure HDR (line-interleaved sensors)
- WDR local exposure

**Image Processing**
- 3D motion compensated noise reduction (MCTF)
- Adjustable AE/AWB/AF
- 180° 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**
- Advanced 3rd party analytics options
- Face detection and tracking
- Intelligent motion detection
- Tampering/intrusion detection and people counting
- License plate recognition
- Object recognition and more

**Video Encoding**
- H.264 codec BP/MP/HP Level 5.1 and MJPEG
- 14 MPixels maximum resolution
- 5M@30 fps encoding performance
- Up to 4 simultaneous stream encodes
- Smart-AVC low bitrate streaming
- Flexible GOP configuration with I, P and B frames
- Temporal Scalable Video Codec with 4 Layers (SVCT)
- Dynamic region of interest
- Multiple CBR and VBR rate control modes

**Memory Interfaces**
- DDR3/DDR3L up to 800MHz, 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**
- 10/100 Ethernet with RMII/MII
- Two USB2.0 ports with Device and Device/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**
- 28nm Low Power CMOS
- <500mW for 1080p30 including DDR
- Operating temperature -20°C to +85°C
- TFBGA package with 404 balls, 15x15 mm, 0.65 mm pitch

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**S2L IP Camera Development Platform**

The S2L 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)**
- S2L main board with connectors for sensor/lens board and peripherals
- 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.x 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

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