

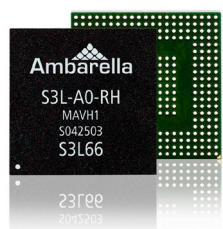


# S3L IP Camera SoC

## Overview

The Ambarella S3L IP Camera SoC integrates an advanced image sensor pipeline (ISP), H.265 and H.264 encoders capable of up to 5Mp30 video, and a 1-GHz ARM® Cortex™-A9 system CPU for implementing custom applications. The low-power S3L is suitable for a wide range of professional IP camera designs, offering advanced imaging features such as HDR processing, motion-compensated 3D noise reduction, and lens distortion correction.

The flexible S3L SDK provides a Linux-based framework and development environment that includes image-tuning tools and a rich set of APIs, enabling a range of product customization and differentiation options in areas such as sensor and lens tuning, analytics and network applications.



The S3L chip is suitable for professional IP Cameras with 1080p30, 1080p60 and 5Mp30 class performance

## 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

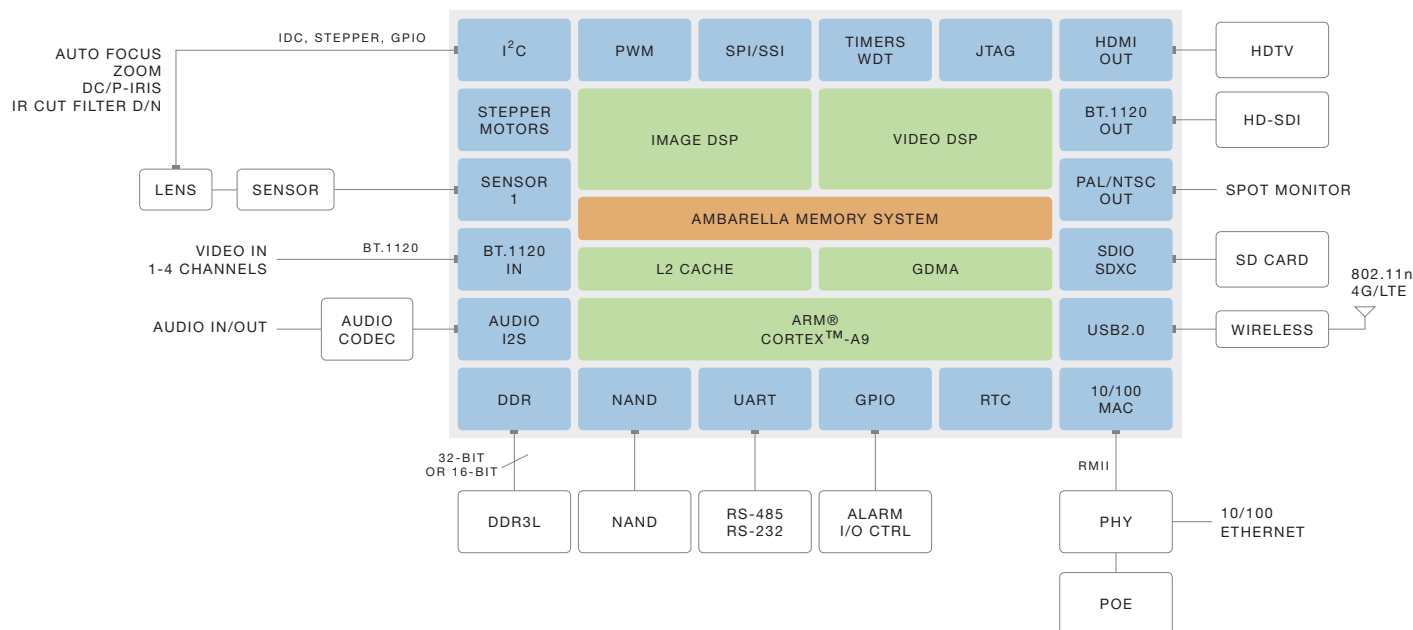
- Up to 6 Mpixel resolution
- Multi-exposure line-interleaved HDR
- Hardware dewarp for 180° panorama
- Improved MCTF with advanced sharpening

### High-Efficiency Video Encoding

- H.265 and H.264 video compression
- Up to 5M@30fps + VGA video
- Flexible multi-streaming

## Block Diagram

The diagram below illustrates an IP Camera design based on the Ambarella S3L device.



## General Specifications

### Processor Cores

- ARM® Cortex™-A9 up to 1.0 GHz
- 32 KB / 32 KB 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

- Seamless RGB Bayer interface to popular sensors
  - 8-lane SLVS/HiSPi™ or 4-lane MIPI
  - 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

- 6 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° fisheye lens distortion correction
- 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.265 (HEVC) MP L5.1, H.264 BP / MP / HP L5.1 and MJPEG
- 6 MPixels maximum resolution
- 5M@30fps + 480p30 maximum encoding performance
- Up to 4 simultaneous stream encodes
- SmartAVC low bitrate streaming
- Flexible GOP configuration with I, P and B frames
- Temporal Scalable Video Codec with 4 Layers (SVCT)
- Dynamic region of interest (ROI) with 32 free-form regions
- Multiple CBR and VBR rate control modes

### Memory Interfaces

- DDR3 / DDR3L up to 800 MHz, 32-bit or 16-bit data bus
- Two 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 USB 2.0 ports with Device and Device / Host w/PHY
- Multiple I2S, SSI / SPI, I<sup>2</sup>C, and UART
- Many GPIO ports, PWM, Steppers, IR, ADC
- Watchdog Timer, multiple general purpose timers, JTAG

### Physical

- 28-nm low-power CMOS
- Operating temperature -20°C to +85°C
- TFBGA package with 404 balls, 14x14 mm, 0.65 mm pitch

## S3L IP Camera Development Platform

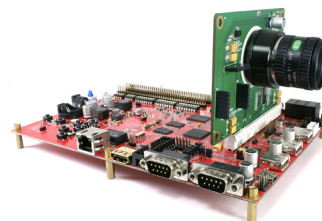
The S3L IP Camera Development Platform contains the necessary tools, software, hardware and documentation to develop an IP Camera while supporting development of customized features.

### Evaluation Kit (EVK)

- S3L 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 3.10.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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