S3L

IP Camera SoC

Key Features

Flexible Low-Power Platform
• Arm® Cortex®-A9 CPU
• Flexible Linux software development kit (SDK) for standards-based development

Advanced Image Processing
• Up to 8 MPixel resolution
• Multi-exposure line-interleaved HDR
• Hardware dewarp for 180° panorama
• Improved motion-compensated noise reduction (MCTF) with advanced sharpening
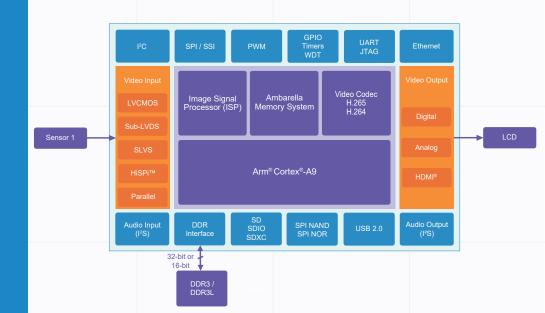
High-Efficiency Video Encoding
• H.265 and H.264 video compression
• Up to 8M@30fps video
• Flexible multi-streaming

Overview

The Ambarella S3L internet protocol (IP) camera system on chip (SoC) integrates an advanced image signal processor (ISP), H.265 and H.264 encoders capable of up to 8MP30 video, and a 1-GHz Arm® Cortex®-A9 CPU for implementing custom applications. The low-power S3L is suitable for a wide range of IP camera designs, offering advanced imaging features, such as high dynamic range (HDR) processing, motion-compensated 3D noise reduction, and lens distortion correction (LDC).

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

Ambarella
S3L#-A#-RH
S3L

I²C	SPI / SSI	PWM	GPIO Timers WDT	UART JTAG	Ethernet

Video Input — LVCMOS, Sub-LVDS, SLVS, HiSPi™, Parallel

Image Signal Processor (ISP) | Ambarella Memory System | Video Codec H.265 H.264

Arm® Cortex®-A9

Video Output — Digital, Analog, HDMI®

Sensor 1 → / → LCD

Audio Input (I²S)	DDR Interface	SD SDIO SDXC	SPI NAND SPI NOR	USB 2.0	Audio Output (I²S)

32-bit or 16-bit

DDR3 / DDR3L

S3L Block Diagram

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 digital signal processors (DSPs)

Sensor and Video I/O
- Seamless RBG 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 / BT.1120 video out
- 24-bit RGB out, HDMI® 1.4a with PHY out
- PAL / NTSC composite SD video out

Front End Sensor Processing
- 8 MPixel maximum resolution
- 480 MHz maximum pixel rate
- Lens shading and fixed pattern noise correction
- Multi-exposure HDR (line-interleaved sensors)
- Wide dynamic range (WDR) local exposure

Image Processing
- 3D motion-compensated noise reduction (MCTF)
- Adjustable auto exposure (AE) / auto white balance (AWB) / auto focus (AF)
- 180° fisheye LDC
- High-quality polyphase scalers
- Digital pan / tilt / zoom (DPTZ) and virtual cameras
- On-screen display (OSD) engine, overlays, and privacy mask
- Crop, mirror, and 90° / 270° rotation
- DC-iris and P-iris
- Defect pixel correction
- Geometric and chroma LDC
- Gamma compensation and color enhancement
- Backlight compensation

Intelligent Video Analytics
- Advanced third-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 MP / HP L5.1 and MJPEG
- 8 MPixel maximum resolution
- 8M@30fps maximum encoding performance
- Up to four simultaneous stream encodes
- SmartAVC low bit-rate streaming
- Flexible group of pictures (GOP) configuration with I, P, and B frames
- Temporal scalable video codec (SVC-T) with four layers
- Dynamic region of interest (ROI) with 32 free-form regions
- Multiple CBR and VBR control modes

Memory Interfaces
- DDR3 / DDR3L up to 840 MHz, 32-bit or 16-bit data bus
- Two SD controllers with SDXC SD™ card
- NAND flash and 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 with PHY
- Multiple I²S, SSI / SPI, I²C, and UART
- Many GPIO ports, PWM, steppers, IR, and ADC
- Watchdog timer, multiple general purpose timers, and JTAG

Physical
- 28 nm low-power complimentary metal-oxide semiconductor (CMOS)
- Operating temperature -20°C to +85°C
- LFBGA package with 353 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, onsemi, Panasonic, Sony, and others
- Datasheet, BOM, schematics, and layout
- IP camera reference application with C source code available with additional licensing

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 and more