



H32

Video SoC for Consumer Cameras

Overview

Ambarella's H32 SoC combines image/video processing, 6MP30 video encoding, and a quad-core processor in a single, low-power design making it an ideal choice for aftermarket dash cameras, wearable products, and action cameras. Fabricated in an advanced 10nm process technology, H32 achieves an industry-leading combination of low-power and high-performance in image and video processing applications.

H32 uses a next generation image signal processor (ISP) to deliver outstanding imaging in low-light conditions, while its high dynamic range (HDR) processing extracts maximum image detail in high contrast scenes. The chip implements a highly-efficient distortion correction block which allows support of ultra-wide angle and fisheye lenses. Its flexible hardware architecture allows processing of videos from multiple sensors simultaneously enabling a lower overall system BOM cost. H32 supports applications that require multiple encoded streams simultaneously optimized for storage and streaming (Wifi/BLE) at the same time.

H32 provides ample host CPU performance to implement application code and other lightweight computer vision algorithms such as simultaneous localization and map building (SLAM) or neural networks.



The H32 chip targets IP camera designs

Key Features

Advanced Image Processing

- More than 6MP30 video processing rate
- Multi-exposure line-interleaved HDR sensors with a dynamic range greater than 120 dB
- Hardware dewarping engine
- Electronic image stabilization (EIS)
- Superior low-light processing
- 3D motion-compensated temporal filtering (MCTF)
- Support for RGGB, RCCB, RCCC, RGB-IR, and monochrome sensors

High-Efficiency Video Encoding

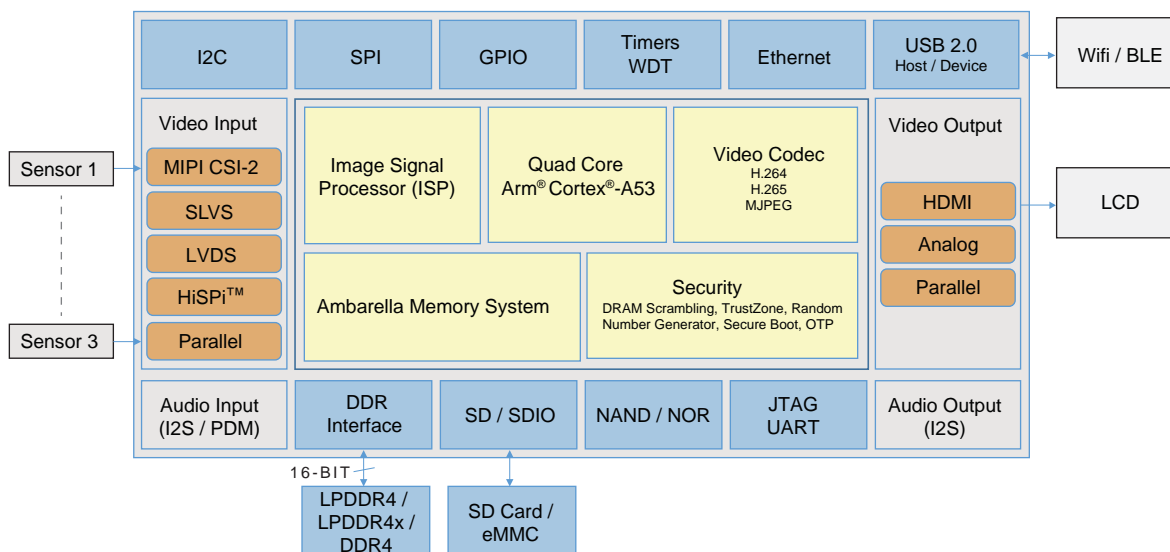
- H.265 and H.264 video compression
- Flexible multi-streaming capability
- 6Mp30 video performance
- Multiple CBR and VBR bit-rate control modes
- Smart H.264 and H.265 encoder algorithms

Target Applications

- Multi-channel drive recorder
- Wearable cameras
- Action / Sports cameras

Block Diagram

The diagram below illustrates a design based on the Ambarella H32 device.



General Specifications

Processor Cores

- Quad-core Arm® Cortex®-A53 up to 1 GHz
- 32KB / 32KB I/D and 1 MB L2 Cache
- NEON™ SIMD and FPU acceleration
- OTP, secure boot, TrustZone®, IO virtualization
- AES / 3DES / SHA-1 / MD5 crypto acceleration
- Ambarella image signal processor and video codec

Video Input

- Single, dual, or triple sensor inputs with independent ISP configuration
- Sub-LVDS / MIPI CSI-2 / SLVS / HiSPi™
- 16-bit parallel LVCMOS (BT.601 / 656)

Video Output

- 16-bit parallel LVCMOS (BT.601)
- HDMI® 2.0 including PHY with CEC support
- PAL / NTSC composite SD video out

CMOS Sensor Processing / Image Processing

- 6MP30 maximum input resolution
- Lens shading correction
- Multi-exposure HDR (line-interleaved sensors)
- 3D motion-compensated temporal filtering (MCTF)
- RGGB / RCCB / RCCC / RGB-IR / monochrome sensor support
- 3-axis electronic image stabilization (EIS)
- Adjustable AE / AWB
- Lens distortion correction (LDC) for wide angle lens
- LED flicker compensation for LED sources
- Gamma compensation and color enhancement
- Vignetting compensation
- Dynamic range (WDR and HDR) engine
- OSD engine, overlays, privacy mask
- Crop, mirror, flip, 90° / 270° rotation
- Defect pixel correction
- Chromatic aberration correction

Intelligent Video Analytics

- People counting and tracking
- Face detection and recognition
- Human / pet / vehicle classification
- Object classification, recognition, and more
- License plate recognition

Video Encoding

- H.265 MP L5.0, H.264 MP/HP L5.1 and MJPEG
- 6MP30 maximum encoding performance
- Up to 8 simultaneous stream encodes
- Flexible GOP configuration with I, P, and B frames
- Multiple CBR and VBR rate control modules

Memory Interfaces

- LPDDR4 / LPDDR4x / DDR4 up to 1.6 GHz, 16-bit data bus, and up to 1 Gbyte capacity
- Three SD controllers: SD / SDIO / SDXC
- Boot from SPI SLC NAND with BCH, SPI NOR, USB, or eMMC
- Single- / dual- / quad-SPI NOR and SPI NAND

Peripheral Interfaces

- 10 / 100 / 1000 ethernet with RMII / RGMII
- USB 2.0 port configurable for host / device
- Multiple I2S / PDM, SSI / SPI, I2C, and UART
- Multiple GPIO ports, PWM, IR, ADC
- Watchdog timer, multiple general purpose timers, JTAG

Physical

- 10 nm low-power CMOS
- Operating temperature -20°C to +85°C (additional temperature option available)
- FC-TFBGA package with 288 balls, 11x12 mm, 0.65 mm pitch

H32 Applications

The H32 consumer applications development platform contains necessary tools, software, hardware, and documentation to develop a small form factor camera.

Evaluation Kit (EVK)

- H32 main board with connectors for sensor / lens board and peripherals
- Sensor board: Omnivision, Sony, and others
- Datasheet, BOM, schematics, and layout
- Reference application with C source code

Software Development Kit (SDK)

- Dual OS ThreadX / Linux 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 programmers reference manual and application notes

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