H32
Video SoC for Consumer Cameras

Key Features

Flexible Low-Power Platform
- Quad-core Arm® Cortex®-A53 CPU up to 1 GHz
- Multiple OS Support: ThreadX, Linux, ThreadX + Linux
- 10 nm low-power CMOS process

Advanced Image Processing
- Multi-sensor support
- Multi-exposure line-interleaved HDR sensors with a dynamic range greater than 120 dB
- Hardware de-warping engine
- Electronic image stabilization (EIS)
- Superior low-light processing
- 3D motion-compensated temporal filtering (MCTF)
- RGGB / RCCB / RCCC / RGB-IR / monochrome sensor support

High-Efficiency Video Encoding
- H.265 and H.264 video compression
- Flexible multi-streaming capability
- 8MP30 video performance
- Multiple CBR and VBR control modes
- Smart H.264 and H.265 encoder algorithms

Target Applications
- Multi-channel drive recorders
- Aftermarket ADAS
- Wearable cameras
- Action / sports cameras
- Driver monitoring systems (driver distraction / drowsiness detection)

Overview

Ambarella’s H32 SoC combines image / video processing, 8MP30 video encoding / decoding, 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 a 10 nm 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. H32 also 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 that are optimized for storage and streaming (WiFi / BLE).

H32 provides ample host CPU performance to implement application code and other lightweight computer vision algorithms such as localization and map building (SLAM) or neural networks.
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
- Ambarella image signal processor
- AVC / HEVC 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
- HDMI® 2.0 including PHY with CEC support
- PAL / NTSC composite SD video out
- 16-bit parallel LVCMOS (BT.601)

CMOS Sensor Processing / Image Processing
- 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 lenses
- 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
- Defective pixel correction
- Chromatic aberration correction

Computer Vision Applications
- User authentication (face detection / recognition)
- Driver monitoring system (driver distraction / drowsiness detection)
- License plate detection / recognition
- Lane departure warning / lane keeping
- Forward collision warning

Video Encoding / Decoding
- H.265 MP L5.0, H.264 MP / HP L5.1 and MJPEG
- 8MP30 maximum encoding / decoding performance
- Simultaneous encoding and streaming
- Multi-stream and multi-channel encoding
- Still capture (picture in video or PIV)
- Flexible GOP configuration with I, P, and B frames
- Multiple CBR and VBR rate control modules

Security Features
- Secure boot with TrustZone® and secure memory, TRNG, OTP, DRAM scrambling and virtualization

Memory Interfaces
- LPDDR4 / LPDDR4x / DDR4 up to 1.6 GHz, 16-bit data bus, and up to 1 GB capacity
- Three SD controllers
- Boot from SPI SLC NAND with BCH / SPI NOR / USB / 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 SPIO ports, PWM, IR, and ADC
- Watchdog timer, multiple general purpose timers, and JTAG

Physical
- 10 nm low-power CMOS
- Operating temperature -20°C to +85°C
- FC VFBGA package (288 balls, 11x12 mm, 0.65 mm pitch)

H32 Consumer Applications Development Platform

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

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

Software Development Kit
- ThreadX / Linux / ThreadX + Linux with patches, drivers, tools, and application source code
- Royalty-free libraries for ISP, 3A, d earm, and codecs
- Image tuning and manufacturing calibration tools
- Detailed documentation, including a programmer’s guide and more

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