H22AQ
Video SoC for Automotive

Overview

Ambarella's H22AQ SoC combines image / video processing, 8MP30 video encoding / decoding in a single, low-power design, making it an ideal choice to power the next generation of automotive cameras / video recorders. Fabricated in a 14 nm process technology, it achieves an industry-leading combination of low-power and high-performance. It is an ideal platform for implementing multi-channel digital video recorders, single or multi-channel electronic mirror with recording, driver / in-cabin monitoring cameras, and more.

H22AQ implements a highly efficient 8MP30 AVC (H.264) / HEVC (H.265) encoder / decoder in hardware along with industry-leading image signal processor (ISP). The H22AQ's ISP provides outstanding imaging in low-light conditions while high dynamic range (HDR) processing extracts maximum image detail in high contrast scenes. The flexible architecture allows encoding of multiple streams that are optimized for storage and video streaming over WiFi / BLE at the same time. The highly-efficient distortion correction block in hardware supports cameras with ultra wide-angle lenses.

H22AQ also supports multi-sensor input, thus enabling recording systems that require two or more independent sensor inputs. The software development kit is available in RTOS (ThreadX) / Linux / RTOS + Linux (dual OS) for customers to implement their applications.

The 14 nm H22AQ SoC Device

Key Features

Flexible Low-Power Platform
- Quad-core Arm® Cortex®-A53 CPU up to 696 MHz
- Multiple OS Support: ThreadX, Linux, ThreadX + Linux
- 14 nm low-power CMOS process

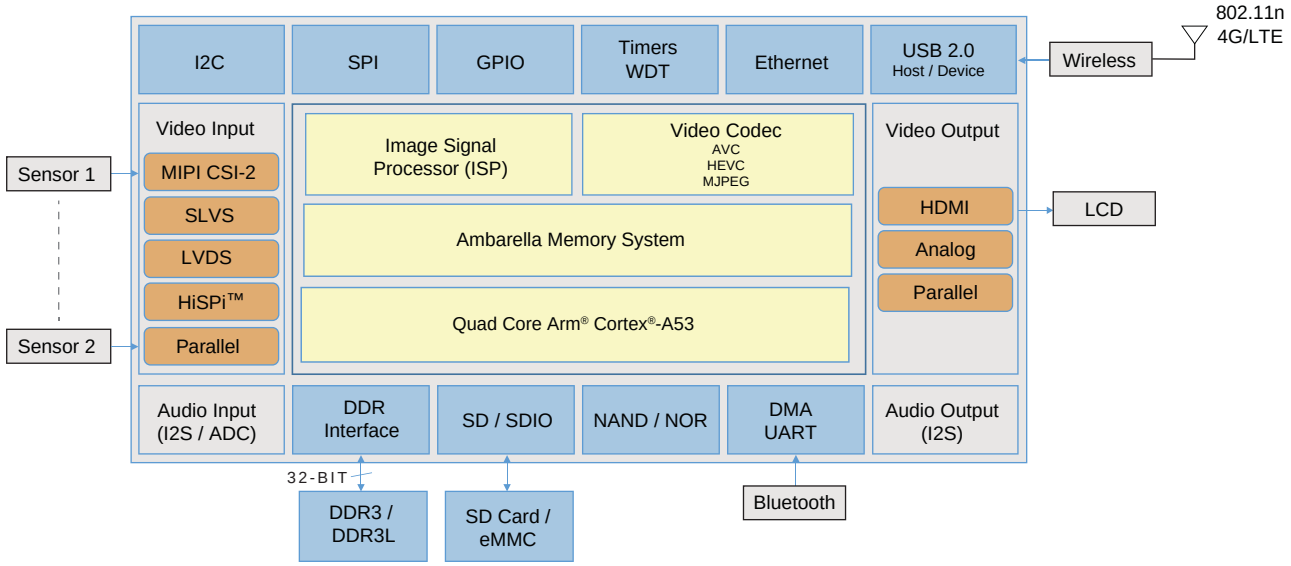
Advanced Image Processing
- Multi-sensor support
- Multi-exposure line-interleaved HDR
- Hardware dewarping engine
- Electronic image stabilization
- 3D motion-compensated noise reduction (MCTF)
- Superior low-light processing

High-Efficiency Video Codec
- 8MP30 H.264 / H.265 video compression
- Flexible multi-stream capability
- JPEG encoding for stills
- CBR and VBR control modes

Target Applications
- Multi-channel drive recorder
- Single- / multi-channel electronic mirror
- Driver monitoring system (driver distraction / drowsiness detection

Block Diagram

The diagram below illustrates a design based on the Ambarella H22AQ device.



General Specifications

Processor Cores
- Quad-core Arm® Cortex®-A53 up to 696 GHz
- 32 KB / 32 KB I/D and 256 KB L2 cache
- NEON™ SIMD acceleration
- Ambarella image signal processor
- AVC / HEVC video codec

Video Input
- Single or dual sensor inputs with independent ISP configuration
- MIPI CSI-2 / LVDS / SLVS / HiSPi™
- 14-bit parallel LVCMOS (BT. 601 / 656)

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

Memory Interfaces
- DDR3 / DDR3L up to 696 MHz clock rate, 32-bit data bus, up to 2 GB capacity
- Two SD controllers
- Boot from SPI NOR / NAND flash / USB / eMMC

Peripheral Interfaces
- One USB 2.0 port device / host w/ PHY 2
- 10 / 100 / 1000 Ethernet with RMII / RGMII
- Audio interface including I²S and DMIC
- Multiple SSI / SPI, I2C / IDC, and UART
- Multiple GPIO ports, PWM, IR, and ADC
- Watchdog timer, multiple general purpose timers, and JTAG

CMOS Sensor Processing / Image Processing
- RGGB and monochrome sensor support
- Multi-exposure HDR (line-interleaved sensors)
- Dynamic range (WDR and HDR) engine
- 3D motion-compensated temporal filtering (MCTF)
- Adjustable AE / AWB / AF
- 3-axis electronic image stablization (EIS)
- Lens distortion correction (LDC) for wide-angle lens
- Crop, mirror, flip, 90° / 270° rotation
- Defect pixel correction
- Geometric lens distortion correction
- Chromatic aberration compensation
- Gamma compensation and color enhancement
- Black level correction
- Lens shading correction

Video Encoding
- H.265 MP L5.1, H.264 MP / HP L5.1, and MJPEG
- 8MP30 maximum encoding performance
- Simultaneous recording and streaming
- Multi-stream and multi-channel encoding
- JPEG encoding for stills
- Multiple CBR and VBR control modes

Physical
- 14 nm low-power CMOS
- FC LFBGA package (369 balls, 14x14 mm, 0.65 mm pitch)
- Operating temperature -40°C to +105°C
- Automotive qualified (AEC-Q100 Grade-2)

H22AQ Camera Development Platform

The H22AQ camera development platform contains the necessary tools, software, hardware, and documentation to develop a small form factor camera.

Evaluation Kit (EVK)
- H22AQ main board with connectors for sensor / lens board, peripherals
- Sensor board: OmniVision, Sony, and others
- Datasheet, BOM, schematics, and layout
- Reference application with C source code

Software Development Kit (SDK)
- ThreadX / Linux / 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, including a programmer's guide and more

Contact www.ambarella.com/about/contact/inquiries.html