

H22AQ

Video SoC for Automotive

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 (EIS)
- 3D motion-compensated temporal filtering (MCTF)
- Superior low-light processing

High-Efficiency Video Codec

- 8MP30 H.264 / H.265 video compression
- Flexible multi-streaming capability
- JPEG encoding for stills
- CBR and VBR control modes

Target Applications

- Multi-channel drive recorders
- Single- / multi-channel electronic mirrors
- Driver monitoring systems (driver distraction / drowsiness detection)

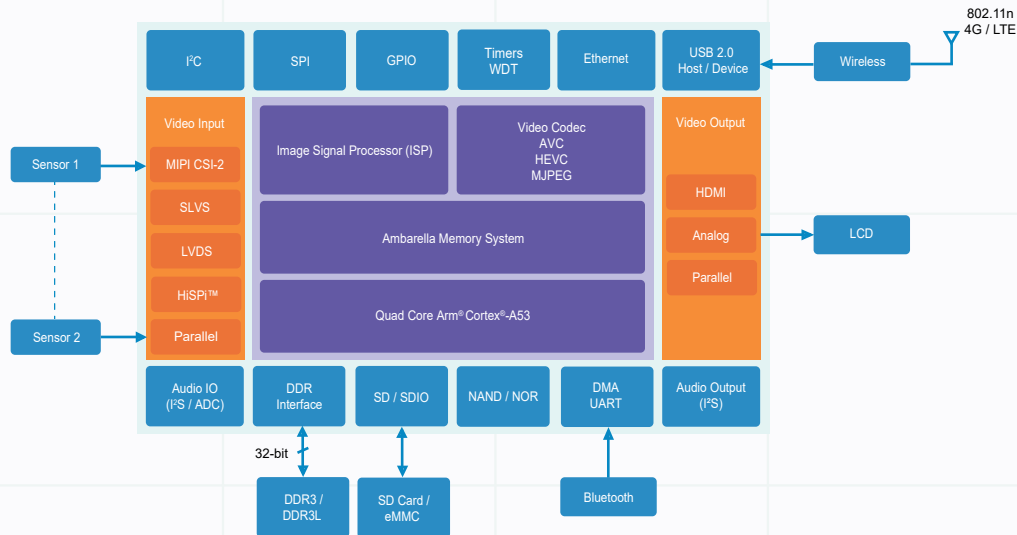


Overview

Ambarella's H22AQ SoC combines image / video processing, 8MP30 video encoding / decoding in a single, low-power design, making it a leading 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. H22AQ is an ideal platform for implementing multi-channel digital video recorders, single- or multi-channel electronic mirrors 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 an 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 simultaneously. The highly-efficient distortion correction block in hardware supports cameras with ultra wide-angle lenses.

H22AQ also supports multi-sensor input, enabling recording systems that require two or more independent sensor inputs. To help customers implement their applications, Ambarella's software development kit is available in RTOS (ThreadX) / Linux / and RTOS + Linux (dual OS).



H22AQ Block Diagram

General Specifications

Processor Cores

- Quad-core Arm® Cortex®-A53 up to 696 MHz
- 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 732 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

- RRGB 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
- 3-axis electronic image stabilization (EIS)
- Lens distortion correction (LDC) for wide-angle lenses
- Crop, mirror, flip, 90° / 270° rotation
- Defective pixel correction
- Geometric lens distortion correction
- Chromatic aberration compensation
- Gamma compensation and color enhancement
- Black level correction
- Lens shading correction

Video Encoding / Decoding

- H.265 MP L5.1, H.264 MP / HP L5.1, and MJPEG
- 8MP30 maximum encoding / decoding 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

- H22AQ 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, dewarp, and codecs
- Image tuning and manufacturing calibration tools
- Detailed documentation, including a programmer's guide and more

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