

# H2

## Video SoC for Consumer Applications

### Key Features

#### Flexible, Low-Power Platform

- Quad-core Arm® Cortex®-A53 CPU up to 1 GHz
- Dual operating system (OS) support: ThreadX, Linux

#### High Resolution and Frame Rate Image Processing

- 4KP90 video encoding (AVC)
- 4KP60 video encoding (HEVC)
- High ISO still capture and video processing
- High dynamic range (HDR) multi-exposure capture up to 4KP60
- Simultaneous second stream
- 3D electronic image stabilization (EIS) with 6-axis correction (translational, pitch, yaw, and roll) and shutter correction up to 4KP60
- Dual processing pipeline for drone optical flow, 360° cameras, and other multi-sensor applications

#### Wireless Connectivity and Video Streaming Options

- USB host for 4G module connectivity
- DMA UART for Bluetooth (BT) module connection
- Dual encode for on the fly mobile resolution streaming



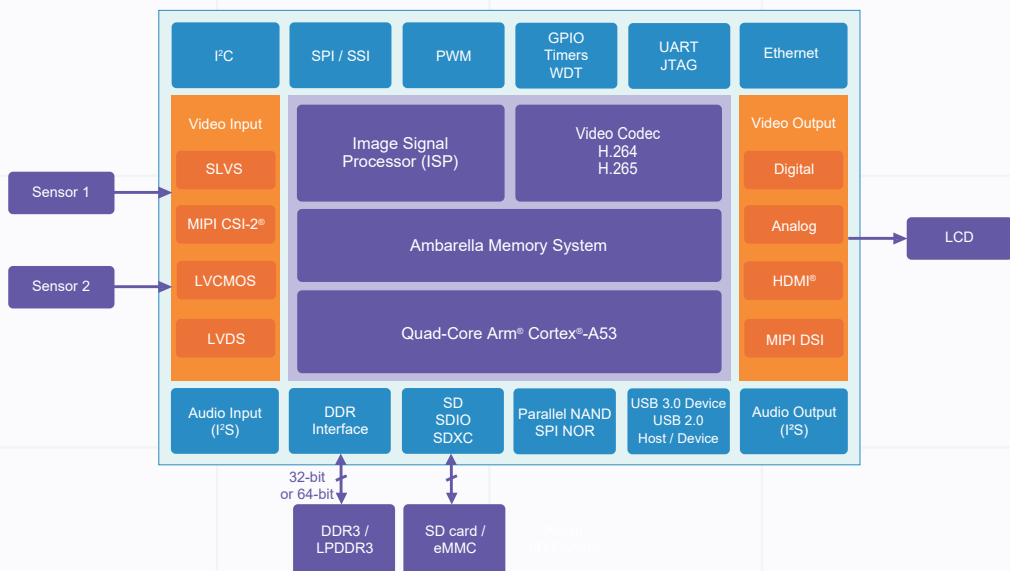
### Overview

The Ambarella H2 video system on chip (SoC) for consumer applications integrates an advanced image sensor processor (ISP), H.264 (AVC) and H.265 (HEVC) encoders, and a powerful quad-core Arm® Cortex®-A53 CPU for advanced analytics, flight control, WiFi streaming, and other user applications.

Targeting the next generation of connected drones, sports, and 360° virtual reality (VR) cameras, H2 delivers up to 4K video recording at 90 fps or equivalent performance while streaming a second, live, mobile-resolution video over a WiFi network for preview or sharing.

Equipped with dedicated hardware, H2 supports 3D electronic image stabilization (EIS) up to 4KP60 and multi-exposure high dynamic range (HDR) capture up to 4KP60.

A unique architecture and 14 nm process technology minimizes H2 power consumption while maximizing performance.



H2 Block Diagram

# General Specifications

## Processor Cores

- Quad-core Arm® Cortex®-A53 up to 1 GHz
- 32 KB / 32 KB I/D and 256 KB L2 cache
- AES / 3DES / SHA-1 / MD5 cryptography engine
- NEON™ SIMD and floating point unit (FPU) acceleration
- Ambarella image and video digital signal processors (DSPs)

## Sensor and Video I/O

- 4 MIPI CSI-2® sensor inputs, 4 lanes each
- 8-lane SLVC-EC
- 8-lane MIPI® mode
- 1-lane MIPI DSI® output
- 10-lane SLVS / HiSPI™ mode
- 24-bit RGB out, HDMI® 2.0 with PHY out
- PAL / NTSC composite SD video out
- RGB Bayer interface to popular sensors

## CMOS Sensor Processing

- High dynamic range (HDR) multi-exposure capture up to 4KP60
- Lens shading and fixed pattern noise correction
- Multi-exposure HDR
- Dynamic range (WDR and HDR) engine

## Image Processing

- 3D motion-compensated noise reduction (MCTF)
- Adjustable auto exposure (AE) / auto white balance (AWB) / auto focus (AF)
- Lens distortion correction (LDC) for wide angle lenses
- Defect pixel correction
- Geometric and chroma LDC
- Backlight compensation
- Electronic image stabilization (EIS) and tilt correction up to 4KP60
- Crop, mirror, flip, 90° / 270° rotation

## Video Encoding

- H.265 / HEVC Main and Main10 (8 / 10-bit) Profile Level 5.1 encoding up to 4KP60
- H.264 MP / HP level 5.2 encoding up to 4KP90
- Simultaneous streams
- Multiple constant bit rate (CBR) and variable bit rate (VBR) control modes

## Memory Interfaces

- LPDDR3 / DDR3 (for certain parts) up to 1 GHz, 64-bit or 32-bit data bus
- Three SD controllers, including SDXC™ / UHS-1 support
- Boot from SPI NOR, SPI EEPROM, NAND flash, USB, eMMC, or SLC with ECC

## USB Interfaces

- One device and one configurable host / device interface, each with built-in PHY
- Device interface with USB 3.0 support

## Peripheral Interfaces

- 10 / 100 / 1000 Ethernet with RMII / RGMII
- Multiple I²S, SSI / SPI, IDC, I²C, and UART
- Many GPIO ports, multiple PWM, steppers, IR, and ADC
- Watchdog timer, multiple general purpose timers, and JTAG

## Physical

- 14 nm low-power complimentary metal-oxide semiconductor (CMOS)
- Two FCBGA packages available:
  - 646-pin, 14x15.5 mm, 0.5 mm pitch
  - 881-pin, 21x21 mm, 0.65 mm pitch
- Operating temperature: -20°C to +85°C

## H2 Consumer Applications Development Platform

The H2 consumer applications development platform contains the necessary tools, software, hardware, and documentation to develop a small form-factor camera.

### Evaluation Kit (EVK)

- H2 main board with connectors for sensor / lens board and peripherals
- Sensor board: Sony, onsemi, OmniVision, and others
- Datasheet, BOM, schematics, and layout
- Reference application with C source code available with additional licensing

### Software Development Kit (SDK)

- 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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