Ambarella
AI envisioned

PRODUCT BRIEF

CV28M

Computer Vision SoC for IP Cameras

Key Features

Flexible Low-Power Platform

- CVflow® computer vision engine
- 64-bit dual-core Arm® Cortex®-A53 CPU up to 1 GHz
- Linux kernel version 4.14 or later (64-bit)
- Linux SDK for standards-based development
- Secure boot with TrustZone® and secure memory, TRNG, OTP, DRAM scrambling and virtualization
- Industry-leading image sensor support
- 10 nm low-power CMOS process

CVflow Computer Vision Engine

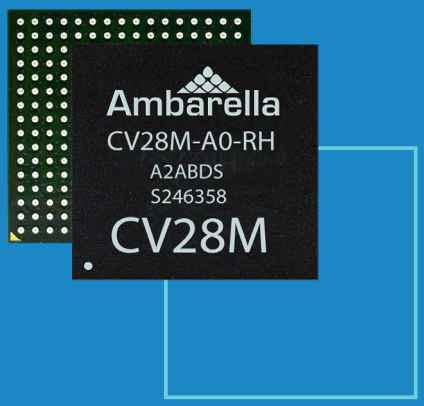
- CNN / DNN inference acceleration for detection, classification, and more
- CNN toolkit for easy porting with Caffe, TensorFlow, and ONNX
- Accelerators for conventional CV operations
- Tools for high- and low-level algorithm development

Advanced Image Processing

- Up to 320 MPixel/s input rate
- Multi-exposure line-interleaved HDR
- Superior low-light processing
- 3D motion-compensated temporal filtering (MCTF)
- Hardware dewarping engine
- Electronic image stablilization (EIS)
- Up to three independent sensor inputs

High-Efficiency Video Encoding

- H.265 and H.264 video compression
- Flexible multi-streaming capability
- Up to 4KP30 video performance
- Multiple constant bit rate (CBR) and variable bit rate (VBR) control modes
- Smart H.264 and H.265 encoder algorithms



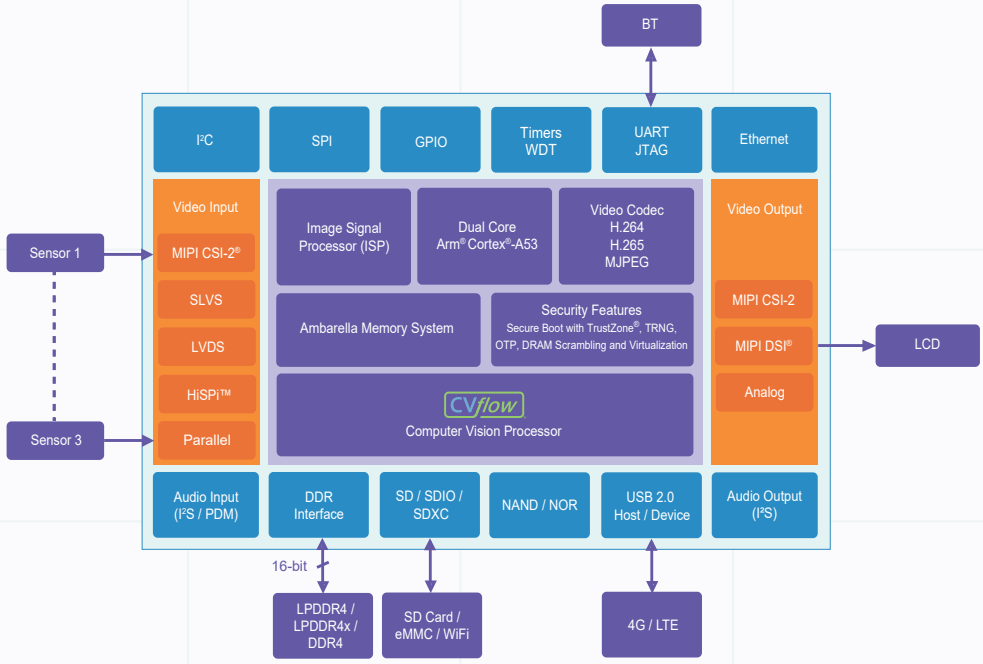
Overview

Ambarella's CV28M system on chip (SoC) combines state-of-the-art computer vision technology with image processing in a single, low-power design. Fabricated using advanced 10 nm process technology, CV28M achieves an industry-leading combination of low power and high performance in both human and computer vision (CV) applications.

Meeting the demands of the next generation of intelligent Internet protocol (IP) cameras, CV28M's CVflow® architecture provides deep neural network (DNN) computer vision processing and 4KP30 video encoding, enabling a multitude of computer vision applications on the edge. Efficiently encoding in both AVC and HEVC video formats, CV28M minimizes cloud storage costs by streaming high-resolution video at low bit rates.

To further enhance its computer vision capabilities, CV28M 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.

CV28M includes a suite of advanced security features to implement on-device physical security, including secure boot with TrustZone®, true random number generator (TRNG), one-time programmable (OTP), DRAM scrambling, and virtualization. To help customers easily port their own neural networks onto the CV28M SoC, Ambarella's software development kit (SDK) offers a complete set of tools.



CV28M Block Diagram

General Specifications

Processor Cores
- Dual-core Arm® Cortex®-A53 up to 1 GHz
- NEON™ SIMD and FPU acceleration
- AES / SHA1 / SHA2-256 crypto acceleration
- Ambarella image signal processor and video codec

Sensor and Video I/O
- Single, dual, or triple sensor input with independent ISP configuration
- Sub-LVDS / MIPI CSI-2® / SLVS / HiSPi™ input
- 16-bit parallel LVCMOS video in
- BT.601 / 656 video in
- PAL / NTSC composite SD video out
- 4-lane MIPI DSI® / CSI-2 and FPD (VESA / JEIDA) out

Sensor Processing
- 320 MPixel/s maximum pixel rate
- Lens shading correction
- Multi-exposure HDR (line-interleaved sensors)
- WDR with local tone mapping

Image Processing
- 3D motion-compensated temporal filtering (MCTF)
- 3-axis electronic image stabilization (EIS)
- Adjustable AE / AWB / AF
- 180° fisheye lens distortion correction
- High-quality polyphase scalers
- Digital pan / tilt / zoom (DPTZ) and virtual cameras
- On-screen display (OSD) engine and overlays
- Crop, mirror, flip, 90° / 270° rotation
- DC-iris and P-iris
- Defective pixel correction
- Geometric lens distortion correction (LDC)
- Chromatic aberration correction
- Gamma compensation and color enhancement
- Backlight compensation
- Vignetting compensation

Intelligent Video Analytics
- CVflow vision processor for CNN / DNN edge 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 L5.1, H.264 MP / HP L5.1, and MJPEG
- 4KP30 maximum encoding performance
- Up to eight simultaneous stream encodes
- Flexible group of pictures (GOP) configuration with I, P, and B frames
- Temporal scalable video codec (SVC-T) with four layers
- Dynamic region of interest (ROI)
- 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
- Three SD controllers: SD / SDIO / SDXC
- Boot from SPI or parallel SLC NAND with BCH / SPI NOR / USB / eMMC

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

Physical
- 10 nm low-power complimentary metal-oxide semiconductor (CMOS)
- Operating temperature -25°C to +85°C
- FC VFBGA package (288 balls, 11x12 mm, 0.65 mm pitch)

CV28M Camera Development Platform

The CV28M camera development platform contains the necessary tools, software, hardware, and documentation to develop a camera utilizing the powerful CVflow processor while supporting the development of customized features.

Evaluation Kit
- CV28M main board with connectors for sensor / lens board and peripherals
- Sensor board: Sony, onsemi, Omnivision, and others
- Datasheet, BOM, schematics, and layout
- SDK and reference application with C source code available with additional licensing

Software Development Kit
- Royalty-free libraries for ISP, dewarp, and video recording
- Image tuning and manufacturing calibration tools
- Detailed documentation, including a programmer's guide and more
- CNN / DNN model preparation, porting, and profiling tools

www.ambarella.com/contact-us/

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