Key Features

Flexible Low-Power Platform
- CVflow® computer vision engine
- 64-bit quad-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
- Tools for high- and low-level algorithm development

Advanced Image Processing
- Up to 504 MPixel/s input rate
- Multi-exposure line-interleaved HDR
- Superior low-light processing
- 3D motion-compensated temporal filtering (MCTF)
- Hardware dewarping engine
- Electronic image stabilization (EIS)
- Up to three independent sensor inputs

High-Efficiency Video Encoding
- H.265 and H.264 video compression
- Flexible multi-streaming capability
- 4KP30+ video performance
- Multiple CBR and VBR bit rate control modes
- Smart H.264 and H.265 encoder algorithms

Overview

Ambarella’s CV25S 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, CV25S achieves an industry-leading combination of low power and high performance in both human and computer vision applications.

Meeting the demands of the next generation of intelligent IP cameras, CV25S’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, CV25S minimizes cloud storage costs by streaming high-resolution video at low bit rates.

To further enhance its computer vision capabilities, CV25S 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.

CV25S includes a suite of advanced cybersecurity features such as secure boot with TrustZone® and secure memory, true random number generator (TRNG), one-time programmable memory (OTP), DRAM scrambling and virtualization, and a programmable secure level for each peripheral interface. To help customers easily port their own neural networks onto the CV25S SoC, Ambarella’s software development kit offers a complete set of tools.
## General Specifications

### Processor Cores
- Quad-core Arm® Cortex®-A53 up to 1 GHz
- 32 KB / 32 KB I/D and 1 MB L2 cache
- 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 / HiSP™ input
- 16-bit parallel LVCMOS (BT.601 / 656)
- BT.601 / 656 16-bit video in and 16-bit BT.601 out
- HDMI® 2.0 including PHY with CEC support
- PAL / NTSC composite SD video
- 4-lane MIPI DSI / CSI-2 and FPD (VESATM / JEIDA) out

### Sensor Processing
- 504 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° and 360° fisheye lens distortion correction
- High quality polyphase scalers
- Digital PTZ and virtual cameras
- OSD engine, overlays, and privacy mask
- Crop, mirror, flip, 90° / 270° rotation
- DC-iris and P-iris
- Defective pixel correction
- Geometric lens distortion correction
- Chromatic aberration correction
- Gamma compensation and color enhancement
- Backlight 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 8 simultaneous stream encodes
- Flexible GOP configuration with I, P, and B frames
- Temporal scalable video codec (SVC-T) with 4 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, 32-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 CMOS
- Operating temperature -25°C to +85°C
- FC TFBGA package (361 balls, 13x13 mm, 0.65 mm pitch)

---

### CV25S Camera Development Platform

The CV25S 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
- CV25S main board with connectors for sensor / lens board and peripherals
- Sensor board: Sony, ON Semi, Omnivision, and others
- Datasheet, BOM, schematics, and layout
- SDK and reference application with C source code

#### 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/

Copyright Ambarella International LP. All rights reserved. Ambarella and the Ambarella logo are trademarks of Ambarella International LP. All other brands, product names, and company names are trademarks of their respective owners. The information in this document is believed to be reliable, but may project preliminary functionality not yet available. Ambarella makes no guarantee or warranty concerning the accuracy and availability of said information and shall not be responsible for any loss or damage whatever nature resulting from the use of, or reliance upon it. Ambarella does not guarantee that the use of any information contained herein will not infringe upon patent, trademark, copyright, or other rights of third parties. Ambarella reserves the right to make changes in the product and / or its specifications presented in this publication at any time without notice.

10/2021