HAILO

Hailo-15 AI Vision Processor

**Unprecedented AI performance
in a camera power envelope**

Overview

Hailo-15 is a series of AI vision processors for smart cameras. The Hailo-15 System-on-a-Chip (SoC) combines Hailo's patented and field proven AI inferencing capabilities with advanced computer vision engines, generating premium image quality and advanced video analytics.
The unprecedented AI capacity can be used for both AI-powered image enhancement and processing of multiple complex deep learning AI applications at full scale and at superior efficiency.

Highlights & Key Features

Unparalleled AI Analytics

→ Up to 20 TOPS (Tera Operation Per Second) running on a powerful Neural Network (NN) Core enabling processing of multiple advanced DL models in parallel

→ High FPS deep learning model processing for faster and highly accurate detection of more objects per frame

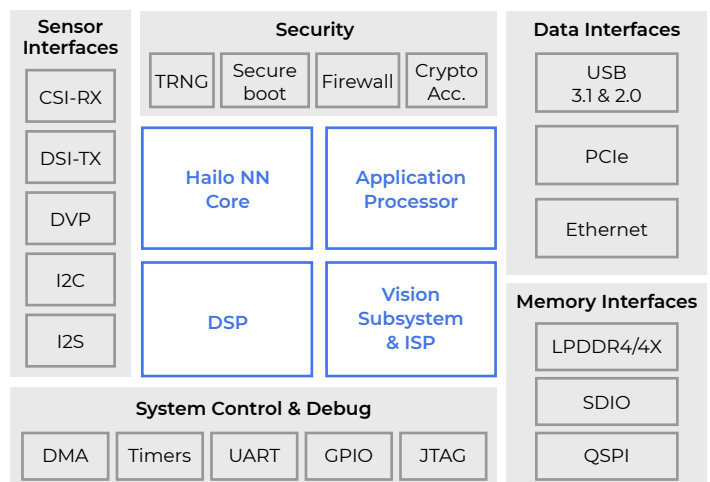→ Best AI performance at a standard camera power consumption & cost envelope

Superior Image Quality

→ AI-powered vision processing for video image enhancement: noise reduction in low-light conditions, digital zoom for a higher resolution, image stabilization for fine and clear video stream, dynamic range and distortion correction.

→ Premium 4k60 image quality with a cutting-edge ISP pipeline and an advanced Vision sub-system with High Dynamic Range (HDR) and Noise Reduction (NR) algorithms

→ Industry leading DSP vision processing and high-quality video encoding

Flexible & Secure System

→ Industry-standard frameworks with a complete Yocto-based Linux distribution

→ Industrial grade SoC with a variety of interfaces for image sensors, data, and memory

→ Secure boot and secure debug with hardware accelerated crypto library, TrustZone, TRNG, and Firewall

Block Diagram

Sensor Interfaces	Security				Data Interfaces
CSI-RX	TRNG	Secure boot	Firewall	Crypto Acc.	USB 3.1 & 2.0
DSI-TX	Hailo NN Core		Application Processor		PCIe
DVP					Ethernet
I2C	DSP		Vision Subsystem & ISP		**Memory Interfaces**
I2S					LPDDR4/4X

System Control & Debug					SDIO
DMA	Timers	UART	GPIO	JTAG	QSPI

General Specifications

High-performance NN core sub-system

Hailo-15H	Hailo-15M	Hailo-15L
20 TOPS	11 TOPS	7 TOPS

→ Hailo's patented structure defined dataflow architecture

→ Full software control for continuous capability upgrades

Vision sub-system

→ ISP: up to 12MP resolution, 600 Mpixel/s pixel rate

→ RGGB & RCCB CFAs support

→ Up to 3 exposures merging

→ WDR for low light image processing

→ Advanced noise reduction features: 2DNR, 3DNR, Chroma NR

→ Video Encoding (HEVC & AVC) H.265/H.264 , multiple stream

→ Image Stabilization, Lens Shading & Distortion Correction, Digital Zoom, Flip & Rotate

Sensor Interfaces

→ Video In: dual MIPI CSI, DVP 24 bit

→ Video Out: MIPI DSI

→ I2C (x4), I2S (x2 in, x2 out), SPI (x4)

Memory Interfaces[1]

→ LPDDR4/4X 32bit @4266 MT/s

→ QSPI

→ SDIO 3.0/eMMc5.1 (up to HS200)

DSP vision processing sub-system

→ Vector DSP, 256 MACs@ 700 MHz supports up to 350 GOPs

Physical[2]

→ Packaging: FCCSP 15x15 mm

→ Operating temperature -40°C to 85°C

Peripheral Interfaces[3]

→ PCIe Gen 3.0 x 4 lanes (Endpoint or RC)

→ 10 / 100 / 1000 Ethernet with RMII / RGMII

→ USB 3.1 Gen2 Host / Device. 2.0 Host

Security

→ Secure boot

→ Secure debug

→ Hardware accelerated crypto library

→ TrustZone, TRNG, Firewall

Application Processor sub-system[4]

→ Quad-core ARM™ A53 up to 1.3 GHz 12 kDMIPs

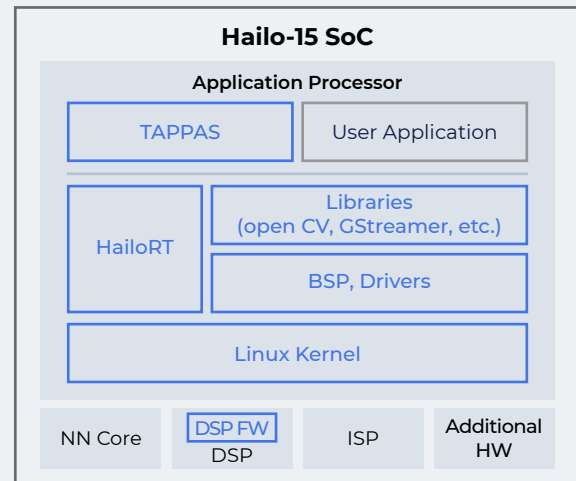*Hailo-15L:*
[1] *LPDDR4 32bit @3200 MT/s*
[2] *13x13 mm*
[3] *PCIe Gen 3.0 x 2 lanes*
[4] *Quad-core ARM™ A53 up to 1.1 GHz 10.1 kDMIPs*

Comprehensive Software Package

The vision processor software package includes a set of drivers, libraries and tools designed to develop smart cameras based on AI computer vision. It includes all the support for camera hardware interfaces and protocols, as well as specialized image- and video-processing algorithms and vision subsystem that are optimized for the requirements of camera-based applications.

Hailo-15 SoC

Application Processor

TAPPAS	User Application

HailoRT	Libraries (open CV, GStreamer, etc.)
	BSP, Drivers

Linux Kernel

NN Core	DSP FW / DSP	ISP	Additional HW

System Usage

The Hailo-15 series of AI Vision Processors offers a versatile solution for a variety of smart cameras, accommodating diverse requirements and able to be integrated into numerous AI-powered smart IP cameras.

Click here for more information & product inquiry

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