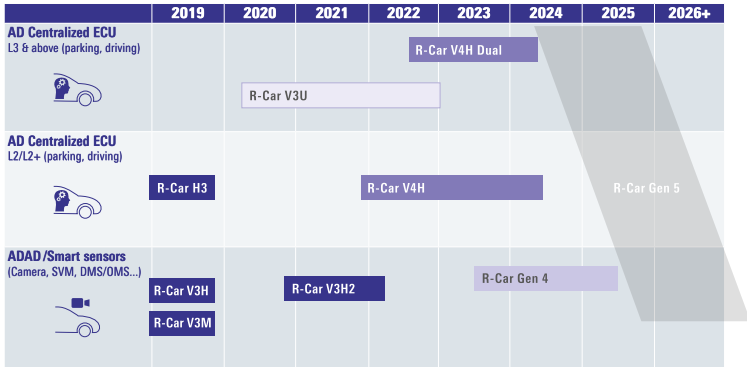# RENESAS
BIG IDEAS FOR EVERY SPACE

R-Car

64-bit – SOC Family
Renesas R-Car V4H

Best-in-Class SOC for Automated Driving Level 2+ / Level 3

The R-Car V4H enables market-leading performance per watt through a careful combination of best-in-class IP and expert HW optimization. It targets the highest volume zones of automated driving: Level 2+ and Level 3.

Thanks to a high level of integration, the R-Car V4H allows customers to develop cost-competitive, single-chip, ADAS electric control units (ECUs). These control units may support driving systems appropriate for automated driving Levels 2+ and Level 3, including full NCAP 2025 features. The R-Car V4H also supports surround view and automatic parking functions with impressive 3D visualization effects such as realistic rendering.

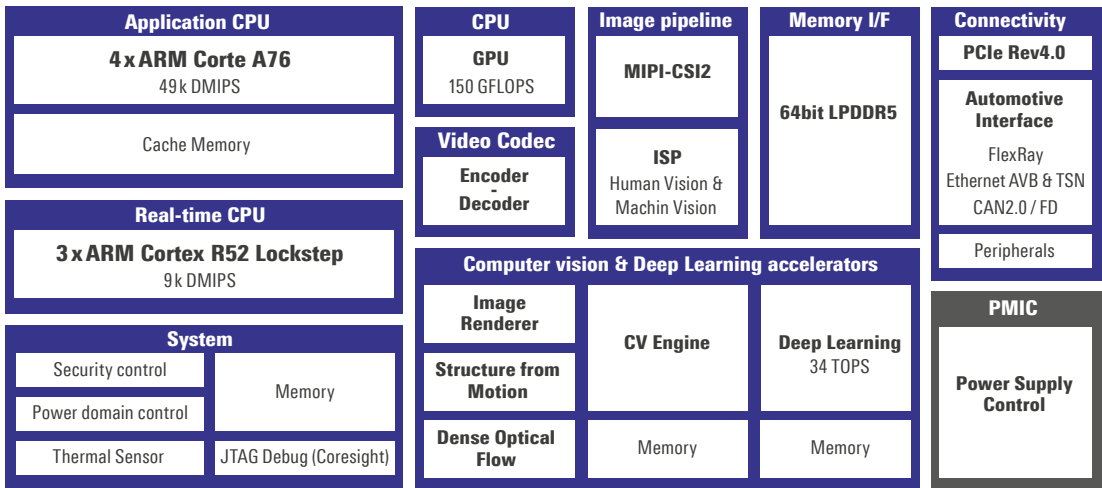|	2019	2020	2021	2022	2023	2024	2025	2026+
AD Centralized ECU L3 & above (parking, driving)						R-Car V4H Dual		
		R-Car V3U						
AD Centralized ECU L2/L2+ (parking, driving)	R-Car H3			R-Car V4H			R-Car Gen 5	
ADAD /Smart sensors (Camera, SVM, DMS/OMS...)	R-Car V3H	R-Car V3H2			R-Car Gen 4			
	R-Car V3M							

Target Applications

- Automated Driving L2+ & L3
- Auto Parking & Surround View
- Including Full NCAP 2025 5 Stars
- Commercial and Off-Road vehicles
- Industrial application (Survey camera, …)

Key Features

- Four Arm® Cortex®-A76 cores at 1.8 Ghz for a total of 49kDMIPS of general compute for ADAS / AD applications
- Three lockstep Arm® Cortex®-R52 cores at 1.4 Ghz, for a total of 9kDMIPS to support ASIL D real-time operation, and eliminate the need for external microcontrollers
- Dedicated Deep Learning & Computer Vision I/Ps with overall performance of 34 TOPS
- Image Signal Processor (ISP) with parallel processing for machine and human vision
- Image Renderer (IMR) for fisheye distortion correction or other mathematical operations
- Graphics Processing Unit (GPU) AXM-8-256 at 600 MHz for a total of more than 150 GFLOPS
- Dedicated automotive Interfaces: CAN, Ethernet AVB, TSN, and FlexRay
- Two fourth generation PCIe interface

Block Diagram

Application CPU
4 x ARM Corte A76 49k DMIPS
Cache Memory

Real-time CPU
3 x ARM Cortex R52 Lockstep 9k DMIPS

System	
Security control	Memory
Power domain control	
Thermal Sensor	JTAG Debug (Coresight)

CPU
GPU 150 GFLOPS

Video Codec
Encoder - Decoder

Computer vision & Deep Learning accelerators		
Image Renderer	**CV Engine**	**Deep Learning** 34 TOPS
Structure from Motion		
Dense Optical Flow	Memory	Memory

Image pipeline
MIPI-CSI2
ISP Human Vision & Machin Vision

Memory I/F
64bit LPDDR5

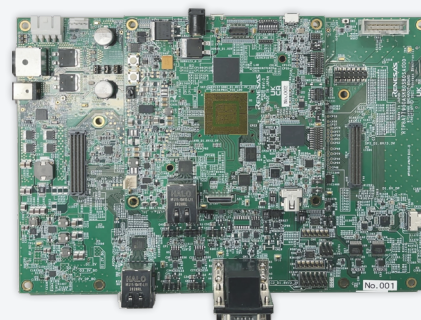| Connectivity |
|---|
| **PCIe Rev4.0** |
| **Automotive Interface** FlexRay Ethernet AVB & TSN CAN2.0 / FD |
| Peripherals |

PMIC
Power Supply Control

Benefits

- R-Car V4H is tailored for the Automated Driving Level 2+ / Level 3, balancing Innovation and automotive constraint.

- Deep Learning up to 34 TOPS, capable of handling any state-of-the-art neural networks for automated driving.

- Low power consumption allowing air cooling systems and thus drastically BOM.

- ASIL SOC reduces SW & HW development effort and remove the need additional redundant devices.

- Real time ASIL D CPU core avoiding the need of external MCU to handle Realtime task and Autosar.

- Multiple PCIe enabling easy scaling of R-Car V4H and smooth increase overall system performance.

- R-Car SDK SW development environment enables fast time-to-market for computer vision and deep learning.

- Renesas Provide PMIC specially developed for R-Car V4H allowing optimized power management in ASIL D environment.

White Hawk Development board

- Shorten time to market by using the reference board that enables immediate platform development

- Provides an easy-to-start system development environment using the R-Car V4H starter kit, R-Car compatible power management ICs (PMICs), LPDDR5-6400 memory, Flash memory, display output, and Ethernet 1000BASE-T in a compact, separate core syste

- Delivers 34 TOPS from R-Car V4H for deep learning, enabling high-speed object recognition through camera, radar and lidar sensor data fusion

- Provides 4 RGMII for Ethernet channels, 2 CSI2 channels, 2 DSI channels, 2 PCIe Gen4 channels, and 8 CAN channels

- Supports remote power control via CAN and Ethernet, enabling system evaluation in a remote environment

- Realizes functional safety compliant power management with R-Car PMICs, including RAA271005 and RAA271041

- Reduces BOM cost and mounting size by replacing multiple crystal oscillators with a programmable clock generator

SW Development environment

R-Car SDK for ADAS & AD

PC Development platform		Target embedded Platform		
Development tools	Simulation Platform	Libraries & Sample code	SoC Devices	Reference Board *1
e² Studio GUI ADAS Plugins for real Time debugging Deep learning toolchain Computer Vision compiler Cross compiler	HW accelerator models for accurate and fast simulations. SIL, HIL	Deep learning & computer Vision Libraries 3D Graphics Libraris*² Video codec Board Support Packages Sample Vision SW example & tutorial	R-Car V3M R-Car V3H R-Car V3U R-Car V4H	Starter Kit & evaluation board

Effortless installation of the development environment for ALL R-Car Vx Device

Optimized for use with Renesas' state-of-the-art R-Car V4H system on chips (SoCs), the new R-Car SDK is built for rule-based automotive computer vision and AI-based functions. The simulation platform offers both AI and conventional hardware accelerators for highly accurate simulations in real time, while providing a full suite of development PC-based tools for both Windows and Linux as well as multiple libraries, including support for deep learning, computer vision, video codecs, and 3D graphics (Linux only). Beside Linux, delivered as Open Source SW, it also supports multiple ASIL-D compliant operating systems (Linux, QNX, and Integrity) in a single package.

Hardware Ordering Reference

Part Name	Product
RTP8A779G0ASKB0FS0SA000	White Hawk board Global
Y-RCAR-V4H-WHITEHAWK-BRD-WS10	White Hawk Board Europe
R8A779G0LA01BA	R-Car V4H SOC

For more details, please visit www.renesas.com/r-car-V4H

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