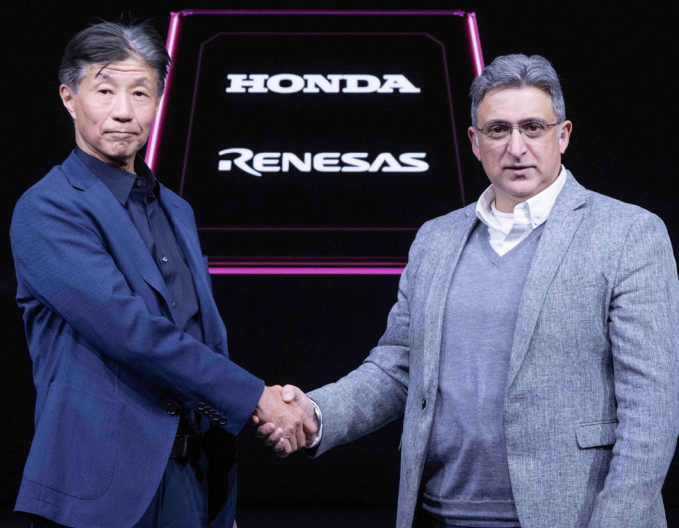


System-on-chip for software-defined vehicles



From left to right: Katsushi Inoue, Honda, and Vivek Bhan, Renesas (Source: Honda/Renesas)

Renesas and Honda agreed to develop an SoC (system-on-chip) for SDVs (software-defined vehicles). It includes an AI (artificial intelligence) processor and a general-purpose microcontroller with multiple CAN FD ports.

Software-defined vehicles demand networked ECUs (electronic control units) with sufficient computing power. In order to reduce the footprint of ECUs, particular tailored SoCs need to be developed in a close cooperation with the carmaker or the Tier-1 supplier. At the CES 2025, Renesas and Honda signed an agreement in this regard. The SoC to be developed is intended for future models of the Honda 0 (Zero) electric vehicle (EV) series. It will be launched in the late 2020s.

The Honda 0 series will adopt a centralized E/E architecture that combines multiple legacy ECUs responsible for controlling vehicle functions into a single ECU. The core ECU, which serves as the heart of the SDV, manages essential vehicle functions such as advanced driver assistance systems (ADAS) and automated driving (AD), powertrain control, and comfort features, in a single ECU. Using TSMC's 3-nm automotive process technology, this SoC can achieve a significant reduction in power consumption. The chiplet is based on the fifth-generation (Gen 5) R-Car X5 SoC series with an accelerator optimized for AI software developed independently by Honda. The two Japanese companies have collaborated closely for many years. The R-Car X5 series can incorporate up to 32 Cortex-A720AE cores and six Cortex-R52 dual lockstep cores with ASIL D (automotive safety integrity level) capabilities without external microcontrollers.

The chiplet offers the UCle (Universal Chiplet Interconnect Express) die-to-die interconnect and APIs (application programming interfaces), facilitating interoperability with other components in a multi-die system, even if they are non-Renesas chips. This design approach allows automakers such as Honda and Tier-1s to mix and match different functions and customize their systems including future upgrades across vehicle platforms.

Asif Anwar, Executive Director of Automotive Market Analysis, Techinsights, stated: "The path to the SDV will be underpinned by the digitalization of the cockpit, vehicle connectivity, and ADAS capabilities. The vehicle electric/electronic (E/E) architecture will be the core enabler as features and functions are integrated into zonal and centralized controllers that will provide the necessary compute capabilities. Techinsights forecasts the zonal controller and high-performance compute SoC processor market will grow at a CAGR (compound annual growth rate) of 17 % between 2028 and 2031."

Anwar continued, "Renesas is a top-three supplier of automotive processors and is leveraging decades of experience with its fifth generation R-Car X5H SoC that will scale with the requirements of an SDV. By leveraging the 3-nm process, the R-Car X5H SoC allows the automotive industry to implement a multi-use solution set that can be used across the vehicle platform with optimized power budgets. Combining this with the RoX SDV platform, Renesas can offer a software-first, cross-domain approach that will shorten the time-to-market for the automotive industry."

Until the fourth generation, the R-Car SoCs were designed for specific use cases. The new SoC generation is scalable. On the top end, they are used in so-called zonal ECUs. They need to provide a lot of communication interfaces. The R-Car Gen 5 system-on-chips feature multiple CAN FD ports and several Ethernet interfaces.

Renesas' latest R-Car X5H and all future Gen 5 products are designed to accelerate SDV development by combining hardware and software into a comprehensive development platform. The recently launched R-Car Open Access (RoX) SDV platform integrates all essential hardware, operating systems (OS), software, and tools needed for automotive developers to rapidly develop next-generation vehicles with secure and continuous software updates.

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