



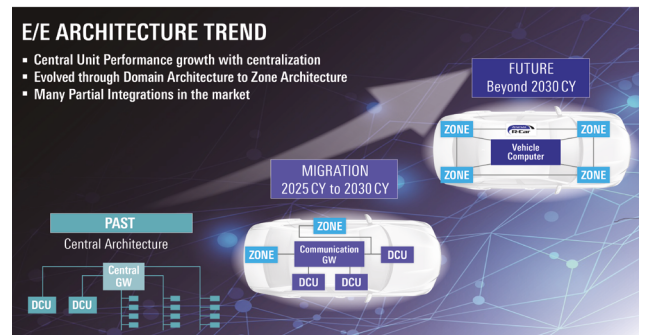
# Renesas 32-bit Zone/Domain and Vehicle Motion Microcontroller **RH850/U2B**



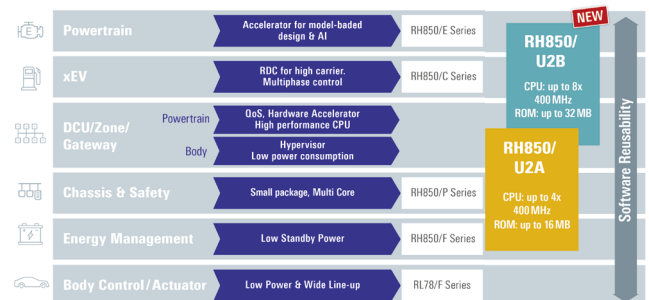
**RH850/U2B: next-generation 28nm cross-domain MCU realizes up to 8 cores x 40 MHz**

The RH850/U2B MCUs is designed to address the growing need to integrate multiple applications into a single chip and realize a unified electronic control unit (ECU) for the evolving electrical-electronic (E/E) architecture. Delivering a combination of high-performance, flexibility, freedom from interference, and security, the cross-domain RH850/U2B MCUs are built for the rigorous workloads required by vehicle motion in terms of hybrid ICE and xEV traction inverter, high-end zone control, connected gateway, and domain control applications.

With this, Renesas expands its cross-domain MCU portfolio with devices that range from RH850/U2A MCUs for body and chassis control systems up to high-performance RH850/U2B MCUs. Customers can also combine these MCUs with Renesas' R-Car S4 system-on-chip devices for automotive central gateway systems to build a scalable solution for E/E architectures.



## RENESAS AUTOMOTIVE MCU LINE UP



## Target applications and key features

### Target Applications

- Zone control ECU
- Domain control ECU
- Communication gateway
- Vehicle motion applications
  - xEV, ICE, TCU

### Key Features

- 400 MHz speed for up to 8+4 (LockStep) RH850 G4MH CPUs
- Top-level ratio of performance vs. power consumption
- Up to 32 MB Flash
- Up to 5.1 MB RAM

- RISC-V based MIMD high-performance embedded vector processor
- Embedded EMU3S (Embedded motor control unit), RDC3X (Position sensor interface) and TSG3 (motor timer) for field-oriented traction motor (inverter) control
- Up to 5x ADC (12-bit), with a maximum of 128 channels, including 4+4+2+2 Track and Hold inputs
- Up to 14 x DS-ADCs with a Digital Filter Engine
- GTM v4.1 vehicle motion timer
- High temperature support: up to Tj = 160°C

- State of the Art Interfaces
  - Up to 2x Gigabit Ethernet TSN including a switch function (RSwitch)
  - CAN-FD, SPI, RHSB (MSC), RHSIF, SENT, LIN, UART, I<sup>2</sup>C, PSi5
  - SFMA (Serial flash memory interface)
  - eMMC
- Support for FuSa and Security High
  - Security module with EVITA Full support
  - ISO26262 ASIL-D
- Extensive Eco-System supporting the latest standards concerning Tool, HW and SW areas

## RH850/U2B block diagram

<b>32-bit CPU</b> <b>Up to 8 RH850 G4MH Core + 4 Lock Step Core</b> @ 400 MHz Tj = -40 – up to +160 °C* Hypervisor, QoS MPU, FPU, FXU		<b>System</b> DMA + DTS Clock Monitor Temperature Sensor CVM Error Control Module MBIST/LBIST Boundary scan Power: Deep Stop Full OTA KCRC ICU-MH Security EVITA-Full NEXUS, RHSIF*		<b>Generic Timers</b> GTM v4.1 TAUD TAUJ* TAPA TSG3 ENCA TPBA HRPWM OSTM ICU-MH Security EVITA-Full TPTM		<b>Generic Timers</b> ATU-VI LTSC  <b>Analog</b> SAR-ADC, T/H DS-ADC Cyclic-ADC* Fast Comparator DFE		<b>Interfaces</b> Up to Gbit Ethernet* (TSN/SGMII) w/Switch RSCAN-FD FlexRay MSPI RLIN3 RHSIF RIIC* RHSB RSENT PSI5* PSI5-S*	
<b>Memory</b> Up to 32 MB Code Flash Up to 512 KB Data Flash Up to 5.1 MB RAM eMMC* SFMA		<b>Motor Control IP</b> RDC* EMU3S*		<b>Accelerator</b> DFP (DR1000C)*					

**ABBREVIATIONS:**







ADC: Analog to Digital Converter  
 ATU-VI: Advanced Timer Unit for Powertrain  
 DFP: Data Flow Processor  
 DFE: Digital Filter Engine  
 EMU3: Enhanced Motor Control Unit 3  
 FPU: Floating Point Unit  
 FXU: Floating-point operation coprocessor  
 GTM: Generic Timer Module  
 MPU: Memory Protection Unit  
 QoS: Quality of Service  
 RDC: Resolver Digital Converter  
 TSG3: Motor Control Timer

\*dep. on the line-ups and packages

## Benefits

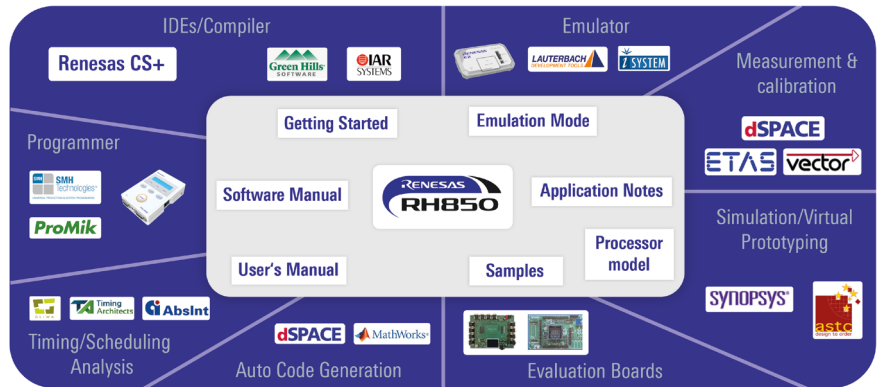
- To enhance the performance level for real-time control the RH850/U2B will be partly equipped with the ASIL-D capable DR1000C, a RISC-V based parallel coprocessor IP with vector extension.
- Integrated hypervisor hardware-based virtualization assist function allows multiple software systems with up to ISO26262 ASIL D functional safety levels to operate independently, without interference, during high performance, and reduces the virtualization overhead to maintain real-time execution.
- Quality-of-Service (QoS) provides a latency monitor and regulation function for all bus masters to ensure minimum bandwidth is always available.
- Support safe and rapid full no-wait OTA software updates with dual-bank embedded flash that allows the ECU to update and save images while the MCUs are in active mode and enables the ECU to operate from the original code if a failure occurs.
- Integrated motor control accelerator IP (EMU3S) works in conjunction with multiple dedicated motor control timer structures like GTM v4.1 and TSG3 to dramatically reduce CPU processing loads while achieving high-speed rotation.

## Evaluation Boards

SUPPORTED DEVICES	RH850/U2Bx Series		
	BGA 292-pin	BGA 373-pin	BGA 468-pin
<b>BOARD TYPE</b> RH850/U2B Piggyback board with device socket (supports stand-alone operation)	 Y-RH850-U2B-292PIN-PB-T1-V1	 Y-RH850-U2B-373PIN-PB-T1-V1	 Y-RH850-U2B-468PIN-PB-T1-V1
<b>Main board</b> (adds additional functionality, e.g. physical I/F for Ethernet, FlexRay, CAN and LIN)	 Y-RH850-X1X-MB-T1-V1	 Y-RH850-X1X-MB-T2-V1	 Y-RH850-X2X-MB-T1-V1

## Software development tools

- Compilers
  - Green Hills Multi® C/C++ Compiler
  - IAR Embedded Workbench for RH850 (under preparation)
  - Renesas CS+ compiler
- Emulators
  - Renesas E2 On-Chip Debugging Emulator
  - Lauterbach TRACE32 Emulator support
- Flash Programming Tools
  - PG-FP6 Programmer
  - Renesas Flash Programming Software (RFP)



## Hardware Ordering Reference

RH850/U2B Part Name	RH850/U2B Piggyback board
<b>R7F7025x</b> (part name depends on the package and configuration)	<b>Y-RH850-U2B-292PIN-PB-T1-V1</b> <b>Y-RH850-U2B-373PIN-PB-T1-V1</b> <b>Y-RH850-U2B-468PIN-PB-T1-V1</b>

## Availability

Samples of the RH850/U2B, Piggyback boards are available for selected customers now.  
 For more information, please contact regional sales.

For more details, please visit [RH850/U2B - Zone/Domain and Vehicle Motion Microcontroller | Renesas](#)