**News Release**

No.: REN2413(A)

**Renesas Introduces Industry’s First General-Purpose 32-bit RISC-V MCUs with Internally Developed CPU Core**

*RISC-V MCUs Offer Developers a New Low-Power, High-Performance Option along with Full Toolchain Support*

**Düsseldorf, March 26, 2024 ―** Renesas Electronics Corporation (TSE:6723), a premier supplier of advanced semiconductor solutions, today announced the industry’s first general-purpose 32-bit RISC-V-based microcontrollers (MCUs) built with an internally developed CPU core. While many MCU providers have recently joined investment alliances to advance the development of RISC-V products, Renesas has already designed and tested [a new RISC-V core](https://www.renesas.com/us/en/about/press-room/renesas-unveils-first-generation-own-32-bit-risc-v-cpu-core-ahead-competition) independently, which is now implemented in a commercial product and available globally. The new, R9A02G021 group of MCUs provides embedded systems designers a clear path to developing a wide range of power-conscious, cost-sensitive applications based on the open-source instruction set architecture (ISA).

While most of today’s RISC-V solutions target specific applications, the R9A02G021 group MCUs are designed to serve multiple end markets, such as IoT sensors, consumer electronics, medical devices, small appliances and industrial systems. Similar to existing general-purpose MCUs, designers will have access to a full-scale development environment for the R9A02G021, provided by Renesas and its extensive network of toolchain partners. This will allow them to significantly reduce costs, engineering resources and development time.

“From our RISC-V purpose built ASSPs to this new general-purpose MCU, our goal is to deliver commercially viable products that customers can take to mass production quickly, while demonstrating the benefits for the RISC-V architecture,” said **Daryl Khoo, Vice President of Embedded Processing 1st  Business Division at Renesas.** “In addition, customers often face with complex design challenges and tradeoffs such as performance, power consumption, memory, or a choice of CPU architecture. The new RISC-V MCU provides an additional degree of choice to customers who want to use products with the open architecture.”

As an early adopter of RISC-V, Renesas has a rich offering of RISC-V application-specific products, including its 32-bit [voice-control and motor-control ASSP devices](https://www.renesas.com/us/en/about/press-room/renesas-expands-risc-v-embedded-processing-portfolio-new-voice-control-assp-solution?utm_campaign=l-up-mcu_riscv_core-epsg-iotbd-ipm1-null&utm_source=null&utm_medium=pr&utm_content=news&other=assp) and [RZ/Five 64-bit general purpose microprocessors](https://www.renesas.com/us/en/about/press-room/renesas-pioneers-risc-v-technology-rzfive-general-purpose-mpus-based-64-bit-risc-v-cpu-core?utm_campaign=l-up-mcu_riscv_core-epsg-iotbd-ipm1-null&utm_source=null&utm_medium=pr&utm_content=news&other=rzfive) (MPUs), which were built on CPU cores developed by Andes Technology Corp. The R9A02G021 group represents the first generation of general- purpose MCUs based on the internally developed RISC-V core by Renesas that will roll out over the next several years.

“Until now, the MCU, a key potential market for RISC-V has been lacking strong commercial designs from leading suppliers which make up around 85% of the MCU market,” said **Tom Hackenberg, Principal Analyst, Computing & Software, More Moore Business Line at Yole Group.** “With Renesas introducing full commercial availability of a RISC-V multimarket MCU to its diverse MCU portfolio, as well as much needed support from well recognized industry standard tools suppliers, the RISC-V market is poised to finally start accelerating growth. As other leading vendors follow Renesas’ example, RISC-V should approach 10% of the overall MCU market by the end of 2029 with significant growth potential beyond (1).”

**Balancing Performance and Power**

The R9A02G021 RISC-V group offers ample performance with clock speeds up to 48MHz, while consuming extremely low power in standby at 0.3µA. It provides 128KB of fast flash memory, 16KB of SRAM memory and 4KB of flash memory for data storage. Designed to withstand harsh conditions, the MCUs can operate reliably at ambient temperatures ranging from -40 °C to 125 °C. The MCUs come with standard serial communications interfaces, as well as digital-to-analog converter (DAC) and analog-to-digital converter (ADC) functions to facilitate high-speed and secure connections with sensors, displays and other external modules. The wide 1.6V to 5.5V input voltage range enables low-voltage, low-current operation and allows noise immunity, making the R9A02G021 ideal for battery-powered devices.

**Key Features of the R9A02G021 MCU Group**

* **CPU:** RISC-V core at 48MHz, 3.27 Coremark/MHz
* **Memory:** 128KB code flash, 16KB SRAM (12KB and ECC SRAM 4KB) and 4KB data flash
* **Power Consumption:** 162µA/MHz (Active power), 0.3µA (SW Standby), 4µs (Standby wakeup)
* **Serial communications interfaces:** UART, SPI, I2C, SAU
* **Analog peripherals:** 12-bit ADC and 8-bit DAC
* **Temperature range:**  -40°C to 125°C (Ta)
* **Operating voltage range:** 1.6 to 5.5V
* **Packages:** 16 WLCSP, 24/32/48 QFN package (QFP option)

The R9A02G021 RISC-V MCUs are fully supported by Renesas’ e² studio Integrated Development Environment (IDE), offered to customers at no cost. The comprehensive toolchain includes a code configurator, the LLVM compiler and a fast prototyping board (FPB). Complete development environments are also available from Renesas’ partners: IAR with its Embedded Workbench IDE and I-jet debug probe, and SEGGER with the Embedded Studio IDE, J-Link debug probes and Flasher production programmers. Supporting documentation includes the FPB user manual, a Getting Started guide, schematics, Bill of Materials (BOM), and Gerber files.

**Winning Combinations**

Renesas has developed **“**[All-in-One Smart Pressure Cooking Pot](https://www.renesas.com/us/en/application/consumer-electronics/appliances/all-one-smart-pressure-cooking-pot)**,”** which combines the R9A02G021 with numerous compatible products from its portfolio, like RAA211412 DC/DC converter, ZSSC3224/3240 signal conditioners, RV1S9231A IGBT driver, RJH60T04DPQ IGBT and DA16200 Wi-Fi SoC. Combined, they enable a cost-efficient, compact, modular solution for modern connected appliances. These Winning Combinations are technically vetted system architectures from mutually compatible devices that work together seamlessly to bring an optimized, low-risk design for faster time to market. Renesas offers more than 400 Winning Combinations with a wide range of products from the Renesas portfolio to enable customers to speed up the design process and bring their products to market more quickly. They can be found at [renesas.com/win](https://www.renesas.com/us/en/applications).

**Availability**

The [R9A02G021 RISC-V MCU](https://www.renesas.com/products/microcontrollers-microprocessors/risc-v/r9a02g021-ultra-low-power-48mhz-mcu-renesas-risc-v-cpu-core?utm_campaign=s-up-mcu_riscv_gp-epsg-iotbd-ipm1-null&utm_source=null&utm_medium=pr&utm_content=pp) is available today through global distributors, along with the FPB, software and development tools. More information is available at: [renesas.com/R9A02G021](https://www.renesas.com/products/microcontrollers-microprocessors/risc-v/r9a02g021-ultra-low-power-48mhz-mcu-renesas-risc-v-cpu-core?utm_campaign=s-up-mcu_riscv_gp-epsg-iotbd-ipm1-null&utm_source=null&utm_medium=pr&utm_content=pp). A blog article about the new RISC-V device is available [here](https://www.renesas.com/blogs/risc-v-unleashes-your-imagination?utm_campaign=s-up-mcu_riscv_gp-epsg-iotbd-ipm1-null&utm_source=null&utm_medium=pr&utm_content=blog).

## Renesas MCU Leadership The world leader in MCUs, Renesas ships more than 3.5 billion units per year, with approximately 50% of shipments serving the automotive industry, and the remainder supporting industrial and Internet of Things applications as well as data center and communications infrastructure. Renesas has the broadest portfolio of 8-, 16- and 32-bit devices, delivering unmatched quality and efficiency with exceptional performance. As a trusted supplier, Renesas has decades of experience designing smart, secure MCUs, backed by a dual-source production model, the industry’s most advanced MCU process technology and a vast network of more than 250 ecosystem partners. For more information about Renesas MCUs, visit [renesas.com/MCUs](https://www.renesas.com/us/en/products/microcontrollers-microprocessors?utm_campaign=f-up-mcu_ra8m1-epsg-iotbd-ipm1-null&utm_source=null&utm_medium=pr&utm_content=pcp&other=mcu_lp).

**About Renesas Electronics Corporation**

Renesas Electronics Corporation ([TSE: 6723](http://www.jpx.co.jp/english/)) empowers a safer, smarter and more sustainable future where technology helps make our lives easier. The leading global provider of microcontrollers, Renesas combines our expertise in embedded processing, analog, power and connectivity to deliver complete semiconductor solutions. These Winning Combinations accelerate time to market for automotive, industrial, infrastructure and IoT applications, enabling billions of connected, intelligent devices that enhance the way people work and live. Learn more at [renesas.com](http://www.renesas.com/). Follow us on [LinkedIn](https://www.linkedin.com/company/renesas/), [Facebook](https://www.facebook.com/RenesasElectronics/), [X](https://twitter.com/renesasglobal), [YouTube](https://www.youtube.com/user/RenesasPresents), and [Instagram](https://www.instagram.com/renesas_global/).

###

(Note 1) Source: The Microcontroller Market Monitor, 2024 Q1 Edition, Yole Intelligence

**Media contact for further information, text and graphics or to discuss feature article opportunities:**

Alexandra Janetzko / Martin Stummer

HBI Communication Helga Bailey GmbH(PR agency), Hermann-Weinhauser-Str. 73, 81673 Munich, Germany

Tel.: +49 89 99 38 87-32 / -34

Email: [alexandra\_janetzko@hbi.de](mailto:alexandra_janetzko@hbi.de) / [martin\_stummer@hbi.de](mailto:martin_stummer@hbi.de)

Web: [www.hbi.de](http://www.hbi.de/)