480 MHz Arm® Cortex®-M85 Based High-Performance Microcontroller with Helium™ and TrustZone®

The new Renesas RA8M1 group features the industry’s first 32-bit MCUs based on the new Arm® Cortex®-M85 core and delivers breakthrough performance of over 3000 Coremark points at 480 MHz to meet the most demanding application needs. RA8M1 MCUs integrate the high performance Cortex-M85 core with large memory, multiple external interfaces and a rich peripheral set optimized to address diverse application requirements and are available in packages from 100 to 224 pins, to enable a broad range of high-performance applications. Secure Element-like functionality is built in with advanced cryptographic Security IP, immutable storage and tamper protection for truly secure IoT.

Key Features
- 480MHz Arm Cortex-M85 with Helium™ MVE
- 1MB - 2MB Flash and 1MB SRAM including TCM
- 32KB I/D Caches and 12KB Data Flash
- Renesas Security IP and Armv8-M TrustZone
- Immutable storage for First Stage Bootloader
- xSPI compliant Octal SPI with XIP & DOTF
- 32/16-bit timers, 32-bit ultra-low-power timer
- 12-bit ADC, 12-bit DAC, HS comparator
- Ethernet, USB2.0 HS/FS, CAN-FD, SCI, SPI/I2C/I3C
- Camera Interface, external memory interfaces (CS/SDRAM)

Target Applications
- Industrial applications
- Consumer products
- Smart Home and Building Automation
- Office Automation
- Medical and Healthcare
- Predictive Maintenance and Voice AI applications

480MHz Arm Cortex-M85 Core, Armv8.1-M Architecture w/ Helium

FPU | ARM MPU | NVIC | JTAG | SWD | ETM | Boundary Scan

RA8M1 Block Diagram

Memory
- Flash (2MB-16MB)
- Data Flash (32KB) & Flash Cache
- SRAM (1MB)
- With ECC (2MB)
- With parity (512KB)
- TCM w/ ECC (512KB)
- I/O Caches (32KB)
- Standby SRAM (16KB)

Communication
- Ethernet MAC + CMA (x1)
- CAN-ED (x4)
- USB2.0 HS (x1)
- USB2.0 FS (x1)
- SPI (x4)
- SCI (x2)
- SD (x1)
- Octal SPI (x1, XIP&DOTF)
- External Memory Bus

Analog
- 12-bit ADC (16384, 256, Unit w/ 32-Kb-S/H)
- 12-bit DAC (256)
- High-speed Comparator (20MHz)
- Temperature Sensor

System
- DMA (x8)
- OCM
- Clock Generation
- On-chip Oscillator
- DC-DC Converter
- Low Power Modes
- ELC
- Internet Controller
- USB

Timers
- 32-bit GPT (128)
- 32-bit GPT (64)
- 16-bit UCPT (64)
- 16-bit AQT (32)
- RTC

Safety
- Memory Protection Unit
- SRAM Parity Check
- ECC x SRAM
- vCore Frequency Accuracy Measurement
- CRC Calculator
- IWDT
- Data Operation Circuit
- Flash Area Protection
- ADC Self Test

Security
- AES (128/192/256)
- RSA 4K, ECC
- TRNG
- SHA-2 (256/384/512)
- Secure Debug
- First Stage Boot Loader
- ROM (Immutable storage)
- TrustZone
- CMA/CMA+MAC/UPC
- FSA/ISA Side Ch. Protection

Package
- CSP 100, 144, 176
- BGA 224

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Software Package

The Renesas Flexible Software Package (FSP) is designed to provide easy-to-use, scalable, high-quality software for embedded system designs using RA MCUs.

The FSP is based on an open software ecosystem of production-ready drivers, supporting Azure® RTOS, FreeRTOS™ or bare-metal programming. It also includes a selection of other middleware stacks, providing great flexibility for migrating code from older systems or developing new applications from scratch.

Tools and Support

The e’ studio IDE provides support with intuitive configurators and intelligent code generation to make programming and debugging easier and faster.

Evaluation Kit

- Easily evaluate key features of the RA8M1 MCU and develop sophisticated IoT and embedded systems applications
- On-board debugging using SEGGER-J-Link®
- Order the kit and download documentation, design package, development tools and software at: renesas.com/ek-ra8m1
- Orderable part number: RTK7EKA8M1S0001BE

Ordering References

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<th>Flash/RAM</th>
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<tbody>
<tr>
<td>2MB/1MB</td>
<td>-40 to 125 °C</td>
<td>R7FA8M1AHECFP, R7FA8M1AHECFB, R7FA8M1AHECFC, R7FA8M1AHECSD</td>
</tr>
<tr>
<td>1MB/1MB</td>
<td>-40 to 125 °C</td>
<td>R7FA8M1AFECFP, R7FA8M1AFECFB, R7FA8M1AFECFC, R7FA8M1AFECSD</td>
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For more details, please visit: renesas.com/ra8m1