Entry Line 32-bit Arm® Cortex®-M23 General Purpose Microcontroller

The RA2E2 group is RA Family’s entry line single-chip microcontroller based on the 48-MHz Arm® Cortex®-M23 core with Renesas innovative on-chip peripheral functions. RA2E2 group offers the ultra-low power operation and high speed serial communication with smallest package options of 20pin, 24pin QFN and 16pin wafer-level CSP package, satisfying the needs of cost-sensitive and space-constrained applications. These RA2E2 group enable extremely cost-effective designs for IoT sensor nodes, portable devices, industrial control, and any battery-operated application that requires developers to cut power consumption, cost and space.

Key Features
- 48MHz Arm® Cortex®-M23
- Up to 64kB Flash Memory and 8kB SRAM
- 2kB Data Flash to store data as in EEPROM
- Scalable from 16pin to 24pin packages
- Wide operating voltage range of 1.6V to 5.5V
- Best-in class Active/Standby power consumption
- 12-bit ADC, Temperature Sensor
- 16-bit General PWM Timer, 32-bit Low power Asynchronous General Purpose Timer
- I3C bus interface
- SCI (UART, Simple SPI, Simple I2C)
- SPI interface
- Safety
- Security and Encryption
- 125°C operating temperature support
- Smallest package options (16pin WLCSP, 20, 24pin HWQFN)

RA2E2 Block Diagram

- Memory
  - Code Flash (64kB)
  - SRAW (8kB) Parity
  - Data Flash (2kB)
- Analogue
  - 12-bit ADC (8bit)
  - Temperature Sensor
- Timers
  - GPT 16-bit (8bit)
  - ADC/24-bit (24)
- HMI
  - High current IO (-20mA)
- Communication
  - I2C x1
  - SCI x1 (SCI/SSC/SP)
  - SPI x1
- System
  - Sys Tick
  - DTC
  - Multiple Clocks
  - On-Chip Oscillator
  - HOCO (24,32,48,64MHz), LOCO (32kHz), ILOCO (15kHz)
  - Low Power Modes
  - ELC
  - Port Function Select
- Safety
  - Memory Protection Unit
  - SRAM Parity Check
  - POE
  - Clock Frequency
  - Accuracy Measurement
  - CRC Calculator
  - EOC
  - Data Operation Circuit
  - Flash Area Protection
  - ADC Self Test
- Security
  - AES (128/256)
  - TRNG
  - 128 bit Unique ID
- Package
  - GFN 20, 24
  - WLCSP 16

Target Applications
- General Purpose
- Consumer Applications
- Home Appliances
- Industrial Automation
- Building Automation
- Medical & Healthcare

RA2A1 RA2L1 RA2E1 RA2E2
<table>
<thead>
<tr>
<th>Performance Range</th>
<th>48MHz, Arm® Cortex®-M23</th>
<th>48MHz, Arm® Cortex®-M23</th>
<th>48MHz, Arm® Cortex®-M23</th>
<th>48MHz, Arm® Cortex®-M23</th>
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<tbody>
<tr>
<td>Memory Range</td>
<td>256kB Flash, 32kB RAM</td>
<td>128-256kB Flash, 32kB RAM</td>
<td>Up to 128kB Flash, 16kB RAM</td>
<td>Up to 64kB Flash, 8kB RAM</td>
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<tr>
<td>Package</td>
<td>32-44pin</td>
<td>48-100pin</td>
<td>25-64pin</td>
<td>16-24pin</td>
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<tr>
<td>USB, CAN</td>
<td>-</td>
<td>CAN</td>
<td>-</td>
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<tr>
<td>Security</td>
<td>-</td>
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<tr>
<td>HMI</td>
<td>-</td>
<td>32ch Cap Touch</td>
<td>32ch Cap Touch</td>
<td>-</td>
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<tr>
<td>Other Features</td>
<td>24bit Sigma Delta ADC, 16bit ADC</td>
<td>-</td>
<td>13C Interface</td>
<td>-</td>
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</table>
RENASAS RA2E2 GROUP

Benefits

■ Entry line Single chip 32-bit Microcontroller enables to build energy-efficient systems at lower cost
■ The smallest package options with 20, 24pin QFN and 16pin Wafer-Level CSP package
■ Pin and peripheral compatibility with RA2L1 group and RA2E1group
■ Wide operating voltage range of 1.6V to 5.5V
■ Best-in class Active/Standby power consumption in Arm Cortex®-M23 Microcontroller
■ Reduce system BOM by eliminating external components
■ IEC60730 Safety Standard for Household Appliances class B(Fail-safe)
■ I3C Bus interface to realize higher communication speed, while significantly reducing power consumption
■ Easy to be used for any customer doing transition from an original 8/16-bit MCU design

Tools and Support

<table>
<thead>
<tr>
<th>Tool Type</th>
<th>IDE</th>
<th>Renesas e’sudio</th>
<th>Keil MDK</th>
<th>IAR EWARM</th>
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<tbody>
<tr>
<td>Compiler</td>
<td>■ GCC</td>
<td>■ Arm Compiler</td>
<td>■ Arm Compiler</td>
<td>■ IAR Arm Compiler</td>
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<tr>
<td>Debugger</td>
<td>■ Renesas E2/E2 Lite</td>
<td>■ SEGGER J-Link</td>
<td>■ IAR I-Jet</td>
<td>■ SEGGER J-Link</td>
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<tr>
<td>Programmer</td>
<td>■ Renesas PG-FP6</td>
<td>■ SEGGER J-Flash</td>
<td>■ Third party solutions</td>
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</tbody>
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Evaluation Kits

■ EK-RA2E2 (Full MCU evaluation including on-chip debugger)  
  – Part name: RTK7EKA2E2S00001BE

■ Fast Prototyping Board including on-chip debugger (FPB-RA2E2)  
  – Part name: RTK7FPA2E2S00001BE

Ordering References

<table>
<thead>
<tr>
<th>Part name</th>
<th>Flash</th>
<th>RAM</th>
<th>DataFlash</th>
<th>Package</th>
<th>Package dimensions (mm)</th>
<th>Pin pitch (mm)</th>
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<tbody>
<tr>
<td></td>
<td>64kb</td>
<td>8kB</td>
<td>2kB</td>
<td>16 WLCSP</td>
<td>1.87 x 1.84</td>
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<td></td>
<td>32kb</td>
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<td>20 HWQFN</td>
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<td></td>
<td>16kb</td>
<td>8kB</td>
<td>2kB</td>
<td>24 HWQFN</td>
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<tr>
<td>RAM</td>
<td>8kB</td>
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<tr>
<td>DataFlash</td>
<td>2kB</td>
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</table>

■ xx = 4C for -40 to 125°C
■ xx = 3C for -40 to 105°C
■ xx = 2D for -40 to 85°C

For more details, please visit www.renesas.com/ra2e2

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