The RA2E1 group is RA Family's entry line single-chip microcontroller based on the 48MHz Arm® Cortex®-M23 core and up to 128-KB code flash and 16-KB SRAM memory. The optimized processing and Renesas' low power process technology make it the industry's most energy-efficient, ultra-low power MCU. The RA2E1 group supports a wide operating voltage range of 1.6V to 5.5V and a large selection of packages such as LQFP, QFN, LGA, BGA and WLCSP. The RA2E1 provides pin and peripheral compatibility with RA2L1 group, and is ideal for battery-operated applications and other systems requiring high performance and low-energy consumption in space constrained applications.

**Key Features**
- 48MHz Arm® Cortex®-M23
- Up to 128kB Flash Memory and 16kB SRAM
- 4kB Data Flash to store data as in EEPROM
- A scalable selection of 25pin to 64pin packages (LQFP, QFN, LGA, BGA, WLCSP)
- Wide operating voltage range of 1.6V to 5.5V
- Enhanced Capacitive Touch Sensing Unit (CTSU)
- 12-bit ADC, LPACMP, Temperature Sensor
- 32-bit General PWM Timer, 16-bit General PWM Timer, Low power Asynchronous General Purpose Timer
- RTC
- SCI (UART, Simple SPI, Simple I2C)
- SPI/ I2C multi-master interface
- Safety
- Security and Encryption

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

**RA2E1 32-Bit Arm® Cortex®-M23 Core**

**NVIC | SWD | ETB**

**Communication**
- I2C x1
- SCI x4
- SPI x1

**System**
- Sys Tick
- DTC
- Multiple Clocks
- On-Chip Oscillator
- HOCO (24.32.48.64MHz), LOCO (16MHz), EOCO (15MHz)
- Low Power Modes
- ELC
- Port Function Select
- RTC

**Memory**
- Code Flash (128kB, 256kB, 512kB)
- SRAM (16kB) Parity
- Data Flash (4kB)

**Analogue**
- 12-bit ADC (13ch)
- Low Power Analog Comparator (2ch)
- Temperature Sensor

**Timers**
- GPT 32-bit (1ch)
- GPT 16-bit (5ch)
- APT 4-channel (2ch)
- I2C

**HMI**
- Capacitive Touch Sensing Unit (30ch)

**POE**
- Clock Frequency Accuracy Measurement
- CRC Calculator
- HOCO
- Data Operation Circuit
- Flash Area Protection
- ADC Self Test

**Package**
- LQFP 32, 48, 64
- BGA 64
- QFN 32, 48
- WLCSP 25

**Security**
- AES (128/256)
- TRNG
- 128 bit Unique ID

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

The RA2E1 group is RA Family’s entry line single-chip microcontroller based on the 48MHz Arm® Cortex®-M23 core and up to 128-KB code flash and 16-KB SRAM memory. The optimized processing and Renesas’ low power process technology make it the industry’s most energy-efficient, ultra-low power MCU. The RA2E1 group supports a wide operating voltage range of 1.6V to 5.5V and a large selection of packages such as LQFP, QFN, LGA, BGA and WLCSP. The RA2E1 provides pin and peripheral compatibility with RA2L1 group, and is ideal for battery-operated applications and other systems requiring high performance and low-energy consumption in space constrained applications.
**Benefits**

- Entry line single chip 32-bit microcontroller enables to build energy-efficient systems at lower cost
- Pin and peripheral compatibility with RA2L1 group
- 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
- Single chip solutions for system and robust touch functions
- IEC60730 safety standard for household appliances class B (Fail-safe)
- A large selection of packages such as LQFP, QFN, LGA, BGA and WLCSP
- Easy to be used for any customer doing transition from an original 8/16-bit MCU design

**Tools and Support**

<table>
<thead>
<tr>
<th>IDE</th>
<th>Renesas e-studio</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>IAR Arm Compiler</td>
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<td>Debugger</td>
<td>Renesas E2/E2 Lite</td>
<td>SEGGER J-Link</td>
<td>IAR I-Jet</td>
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<td>Programmer</td>
<td>Renesas PG-FP6</td>
<td>SEGGER J-Flash</td>
<td>Third party solutions</td>
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</tbody>
</table>

**Evaluation Kit**

- **EK-RA2E1 (Full MCU evaluation including on-chip debugger)**
  - Part name: RTK7EKA2E1S00001BE

- **Fast Prototyping Board including On-Chip debugger (FPB-RA2E1)**
  - Part name: RTK7FPA2E1S00001BE

**Ordering References**

<table>
<thead>
<tr>
<th>Part name</th>
<th>Flash</th>
<th>RAM</th>
<th>DataFlash</th>
<th>Package</th>
<th>Package dimensions</th>
<th>Pin pitch</th>
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<td>16Kb</td>
<td>4Kb</td>
<td>64 LQFP</td>
<td>10x10mm</td>
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<td>16KB</td>
<td>4KB</td>
<td>48 LQFP</td>
<td>7x7mm</td>
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</tbody>
</table>

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

For more details, please visit [www.renesas.com/ra2e1](http://www.renesas.com/ra2e1)