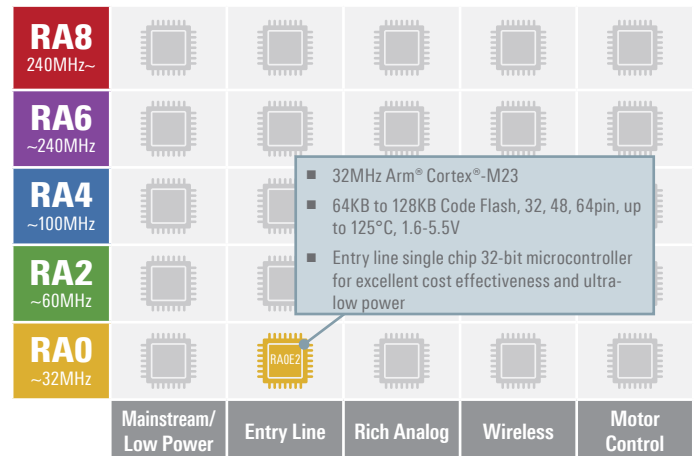# RENESAS

RA

32-BIT MCU FAMILY
RENESAS RA0E2 GROUP

32 MHz Arm® Cortex®-M23 Entry Level Ultra-Low Power General-Purpose Microcontroller

The RA0E2 group is a basic, simple MCU in the entry line of the RA0 series, offering excellent cost effectiveness and ultra-low power consumption. It delivers up to 32MHz of CPU performance using Arm Cortec-M23 core with up to 128KB of embedded flash memory, 16KB SRAM and a wide operation temperature range from -40 to 125°C.

The RA0 series is ideal for cost-sensitive applications such as low power and lower cost for consumer electronics, system control for small appliances, industrial system control and building automation.

RA8 240MHz~					
RA6 ~240MHz					
RA4 ~100MHz					
RA2 ~60MHz					
RA0 ~32MHz		RA0E2			
	Mainstream/ Low Power	Entry Line	Rich Analog	Wireless	Motor Control

- 32MHz Arm® Cortex®-M23
- 64KB to 128KB Code Flash, 32, 48, 64pin, up to 125°C, 1.6-5.5V
- Entry line single chip 32-bit microcontroller for excellent cost effectiveness and ultra-low power
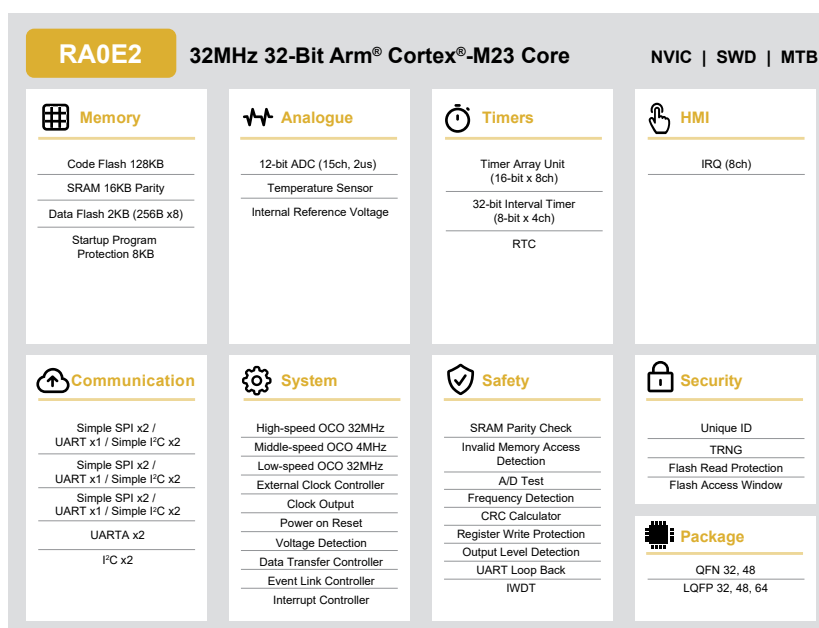
Key Features

- 32 MHz Arm Cortex-M23 core
- Up to 128KB Flash and 16KB SRAM
- 2KB data flash memory (100,000 program / erase (P/E) cycles)
- 32-pin, 48-pin and 64-pin package options
- Wide operation temp range from -40 to 125°C
- Wide voltage range of 1.6V to 5.5V
- ±1% High Accurate High speed on-chip oscillator
- TAU (16-bit general PWM timer) , TML32 (32-bit interval timers), RTC
- 12-bit A/D converter, Temperature sensor
- SAU (UART, Simple SPI, Simple I2C) , UART, I2C
- Random number generator
- Safety functions

Target Applications

- General purpose systems
- IoT devices
- Industrial automation and sensors
- Consumer applications
- Home appliances
- Building automation
- Medical & Healthcare devices
- Wearable devices

Block Diagram

RA0E2 — 32MHz 32-Bit Arm® Cortex®-M23 Core — NVIC | SWD | MTB

Memory
- Code Flash 128KB
- SRAM 16KB Parity
- Data Flash 2KB (256B x8)
- Startup Program Protection 8KB

Analogue
- 12-bit ADC (15ch, 2us)
- Temperature Sensor
- Internal Reference Voltage

Timers
- Timer Array Unit (16-bit x 8ch)
- 32-bit Interval Timer (8-bit x 4ch)
- RTC

HMI
- IRQ (8ch)

Communication
- Simple SPI x2 / UART x1 / Simple I²C x2
- Simple SPI x2 / UART x1 / Simple I²C x2
- Simple SPI x2 / UART x1 / Simple I²C x2
- UARTA x2
- I²C x2

System
- High-speed OCO 32MHz
- Middle-speed OCO 4MHz
- Low-speed OCO 32MHz
- External Clock Controller
- Clock Output
- Power on Reset
- Voltage Detection
- Data Transfer Controller
- Event Link Controller
- Interrupt Controller

Safety
- SRAM Parity Check
- Invalid Memory Access Detection
- A/D Test
- Frequency Detection
- CRC Calculator
- Register Write Protection
- Output Level Detection
- UART Loop Back
- IWDT

Security
- Unique ID
- TRNG
- Flash Read Protection
- Flash Access Window

Package
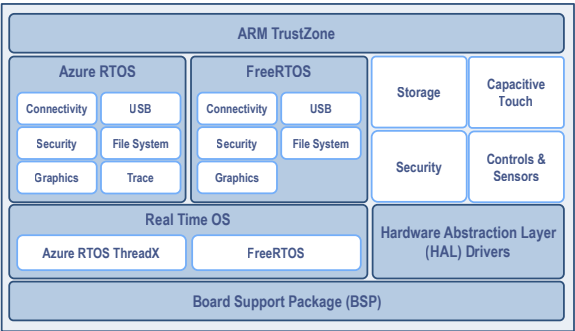- QFN 32, 48
- LQFP 32, 48, 64

RENESAS RA0E2 GROUP

Software Package

The Renesas Flexible Software Package (FSP) is designed to provide easy-to-use, scalable, high-quality software for embedded system designs using the Renesas RA family. FSP includes best-in-class HAL drivers with high performance and low memory footprint.

Based on an open software ecosystem, FSP provides customers with flexibility in product development, including the use of existing software assets and partner ecosystem solutions.
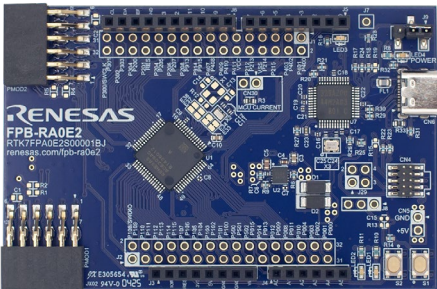
ARM TrustZone			
Azure RTOS	**FreeRTOS**	Storage	Capacitive Touch
Connectivity / USB	Connectivity / USB		
Security / File System	Security / File System	Security	Controls & Sensors
Graphics / Trace	Graphics		
Real Time OS		**Hardware Abstraction Layer (HAL) Drivers**	
Azure RTOS ThreadX	FreeRTOS		
Board Support Package (BSP)			

Tools and Support

The e^2 studio IDE provides support with intuitive configurators and intelligent code generation to make programming and debugging easier and faster.

IDE	Renesas e²studio	Keil MDK	IAR EWARM
Compiler	• GCC • LLVM • Arm Compiler* • IAR Arm Compiler*	• Arm Compiler*	• IAR Arm Compiler*
Debug Probe	• Renesas E2/E2 Lite • SEGGER J-Link	• SEGGER J-Link • Keil ULINK / CMSIS-DAP (limited support)	• IAR I-jet • SEGGER J-Link • Renesas E2/E2 Lite • CMSIS-DAP (limited support)
Production Programmer	• Renesas PG-FP6 • SEGGER J-Flash • Partner solutions		

* Compiler must be purchased and licensed directly from third party

Evaluation Kit

- RA0E2 Fast Prototyping Board is an evaluation board specialized for prototype development for a variety of applications
- Onboard debugging using SEGGER-J-Link®
- Order the kit and download documentation, design package, development tools and software at: renesas.com/fpb-ra0e2
- Orderable part number: **RTK7FPA0E2S00001BJ**

Ordering References

Flash/RAM	Ta					
128KB/16KB	-40 to 125 °C	R7FA0E2094CNH	R7FA0E2094CFJ	R7FA0E2094CNE	R7FA0E2094CFL	R7FA0E2094CFM
128KB/16KB	-40 to 105 °C	R7FA0E2093CNH	R7FA0E2093CFJ	R7FA0E2093CNE	R7FA0E2093CFL	R7FA0E2093CFM
64KB/16KB	-40 to 125 °C	R7FA0E2074CNH	R7FA0E2074CFJ	R7FA0E2074CNE	R7FA0E2074CFL	R7FA0E2074CFM
64KB/16KB	-40 to 105 °C	R7FA0E2073CNH	R7FA0E2073CFJ	R7FA0E2073CNE	R7FA0E2073CFL	R7FA0E2073CFM
Pin Count		32-pin	32-pin	48-pin	48-pin	64-pin
Package		HWQFN	LQFP	HWQFN	LQFP	LQFP
Package size (body)		5 x 5 mm	7 x 7 mm	7 x 7 mm	7 x 7 mm	10 x 10 mm
Pitch		0.5 mm	0.8 mm	0.5 mm	0.5 mm	0.5 mm

For more details, please visit: **renesas.com/ra0e2**