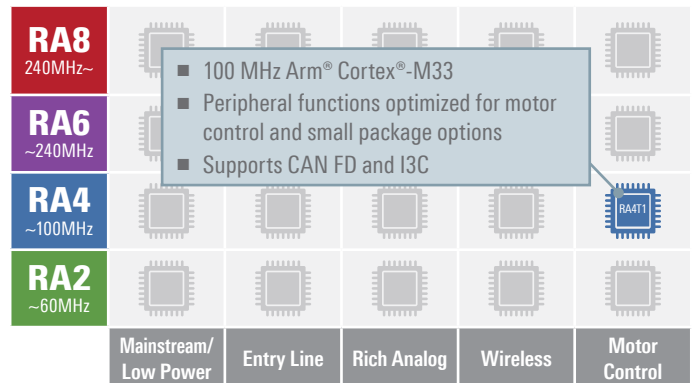# RENESAS

RA

32-BIT MCU FAMILY
RENESAS RA4T1 GROUP

RA4 Series 100MHz Arm® Cortex®-M33 Motor Control Microcontroller

The RA4T1 is based on the 100 MHz Arm® Cortex®-M33 core with TrustZone®.

The RA4T1 group offers optimized peripheral functions for motor control and inverter control with small 32-pin QFN and LQFP package options. These satisfy the needs of high-performance, cost-sensitive and space-constrained applications.

The RA4T1 integrates a wide range of communication interfaces including CAN FD, I3C, SCI and SPI covering all the connectivity needs of a wide range of motor control and consumer applications.
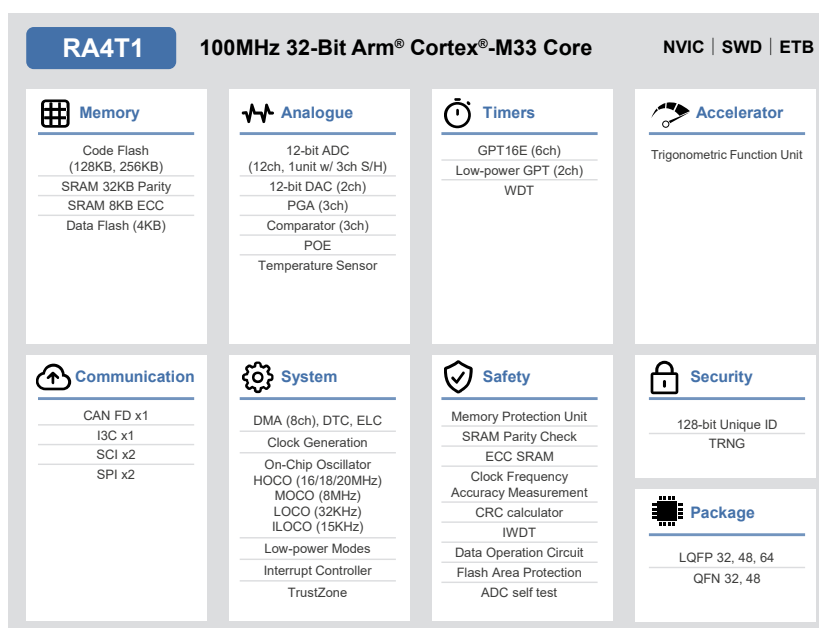
RA8 240MHz~				■ 100 MHz Arm® Cortex®-M33
RA6 ~240MHz				■ Peripheral functions optimized for motor control and small package options
RA4 ~100MHz				■ Supports CAN FD and I3C RA4T1
RA2 ~60MHz				
Mainstream/ Low Power	Entry Line	Rich Analog	Wireless	Motor Control

Target Applications

- Vacuum cleaner
- Washing machine
- Refrigerator
- IH cooker
- Fan
- Pump
- Thermal printer
- Power tools

Key Features

- 100MHz Arm® Cortex®-M33 with TrustZone®
- 128KB - 256KB Flash memory and 40KB SRAM
- 4KB Data Flash to store data as in EEPROM
- Scalable from 32-pin to 64-pin packages
- PWM timer
- 12-bit ADC
- Programmable gain amp
- High speed comparator
- 12-bit DAC
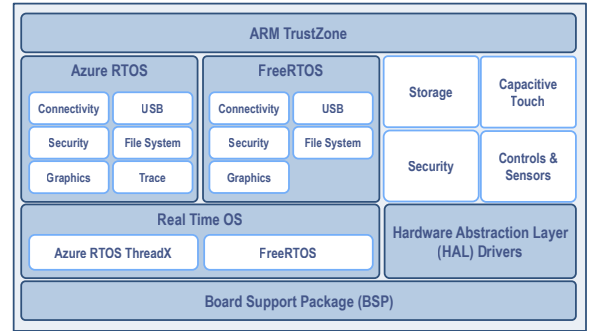- Trigonometric Function Unit
- CAN FD
- I3C, SCI, SPI

Block Diagram

RA4T1 — 100MHz 32-Bit Arm® Cortex®-M33 Core — NVIC | SWD | ETB

Memory
- Code Flash (128KB, 256KB)
- SRAM 32KB Parity
- SRAM 8KB ECC
- Data Flash (4KB)

Analogue
- 12-bit ADC (12ch, 1unit w/ 3ch S/H)
- 12-bit DAC (2ch)
- PGA (3ch)
- Comparator (3ch)
- POE
- Temperature Sensor

Timers
- GPT16E (6ch)
- Low-power GPT (2ch)
- WDT

Accelerator
- Trigonometric Function Unit

Communication
- CAN FD x1
- I3C x1
- SCI x2
- SPI x2

System
- DMA (8ch), DTC, ELC
- Clock Generation
- On-Chip Oscillator HOCO (16/18/20MHz) MOCO (8MHz) LOCO (32KHz) ILOCO (15KHz)
- Low-power Modes
- Interrupt Controller
- TrustZone

Safety
- Memory Protection Unit
- SRAM Parity Check
- ECC SRAM
- Clock Frequency Accuracy Measurement
- CRC calculator
- IWDT
- Data Operation Circuit
- Flash Area Protection
- ADC self test

Security
- 128-bit Unique ID
- TRNG

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

RENESAS RA4T1 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. 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 e² studio IDE provides support with intuitive configurators and intelligent code generation to make programming and debugging easier and faster.
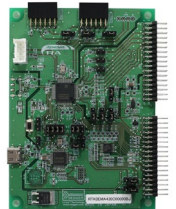
IDE	Renesas e²studio	Keil MDK	IAR EWARM
Compiler	• GCC • Arm Compiler • IAR Arm Compiler	• Arm Compiler	• IAR Arm Compiler
Debug Probe	• Renesas E2/E2 Lite • SEGGER J-Link	• SEGGER J-Link • Keil ULINK (limited support)	• IAR I-Jet (limited support) • SEGGER J-Link
Production Programmer	• Renesas PG-FP6 • SEGGER J-Flash • Partner solutions		

Evaluation Kit

- MCK-RA4T1 Renesas Flexible Motor Control Kit for RA4T1 MCU Group
- Includes CPU board, inverter board, PMSM motor, and accessories
- Documentation and more information: renesas.com/mck-ra4t1
- Orderable part number: **RTK0EMA430S00020BJ**

- MCB-RA4T1 CPU Board for RA4T1 MCU Group
- On-board debugging using SEGGER J-Link®
- Documentation and more information: renesas.com/mcb-ra4t1
- Orderable part number: **RTK0EMA430C00000BJ**

Ordering References

Flash RAM DataFlash	256KB 40KB 4KB	R7FA4T1BB3CNH	R7FA4T1BB3CFJ	R7FA4T1BB3CNE	R7FA4T1BB3CFL	R7FA4T1BB3CFM
	128KB 40KB 4KB	R7FA4T1B93CNH	R7FA4T1B93CFJ	R7FA4T1B93CNE	R7FA4T1B93CFL	R7FA4T1B93CFM
Pin Count		32pin	32pin	48pin	48pin	64pin
Package		QFN	LQFP	QFN	LQFP	LQFP
Size (body)		5x5mm	7x7mm	7x7mm	7x7mm	10x10mm
Pitch		0.5mm	0.8mm	0.5mm	0.5mm	0.5mm
Operating Temperature		-40 to +105°C	-40 to +105°C	-40 to +105°C	-40 to +105°C	-40 to +105°C

For more details, please visit: **renesas.com/ra4t1**