

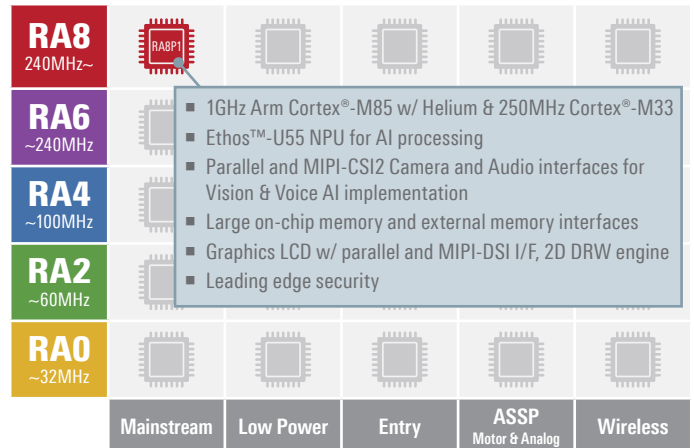
32-BIT MCU FAMILY

RENESAS RA8P1 GROUP

1GHz Arm® Cortex®-M85 and Ethos™-U55 NPU Based AI Microcontroller (MCU)

Renesas first AI-accelerated MCUs deliver 256 GOPS of AI performance, breakthrough CPU performance of over 7000 CoreMarks and advanced AI capabilities enabling voice, vision and real-time analytics AI applications. Built on 22nm advanced process, the single core RA8P1 MCUs are embedded with Arm® Cortex®-M85 core and Ethos™-U55 NPU, while the dual-core MCUs include an additional Cortex®-M33 core. RA8P1 offers advanced security that truly secures Edge AI and IoT applications. Jumpstart AI development with our Flexible Software Package, comprehensive development tools and RUHMI* Framework.

*Robust Unified Heterogenous Model Integration



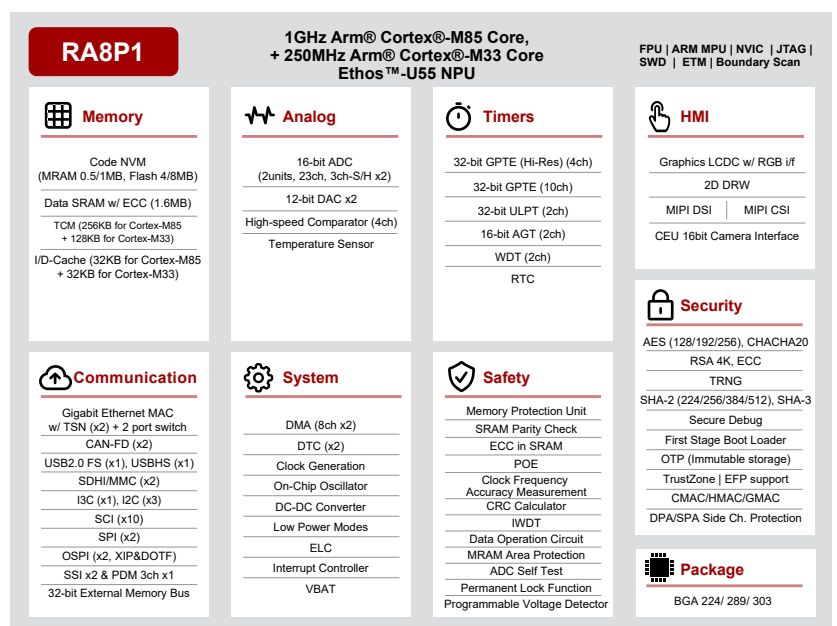
Key Features

- 1GHz Arm® Cortex®-M85 Core
- 250MHz Cortex-M33 Core
- Ethos™-U55 NPU, 256GOPS @500MHz
- Large memory: 0.5/1MB MRAM and 4/8MB Flash
- 2MB SRAM including TCM and 64KB Caches
- Parallel and MIPI-CSI2 Camera I/f for Vision AI
- I²S and PDM I/F for Voice AI
- GLCDC w/ RGB & MIPI-DSI I/Fs
- 2D Drawing Engine
- 224 & 289pin BGA packages
- 32-bit high resolution and ultra-low power timers
- Renesas Security IP, TrustZone, Tamper protection
- Secure Boot with Immutable storage for First Stage Bootloader
- 16-bit ADC, 12-bit DAC, HS comparators
- Gigabit Ethernet, TSN Switch, USB2.0 HS/FS, CAN-FD I/Fs
- SDHI, SPI, I²C/I²C Serial interfaces
- 32bit External memory I/F (CS/SDRAM)
- xSPI compliant Octal SPI with XIP & DOTF

Target Applications

- Machine Vision, Robotics
- Video Doorbells, Security Cameras
- Thermostats, Security Panels
- AI enabled fingerprint scanners
- Smart Appliances
- Traffic/Pedestrian/Driver Monitoring
- People Detection, Image Classification

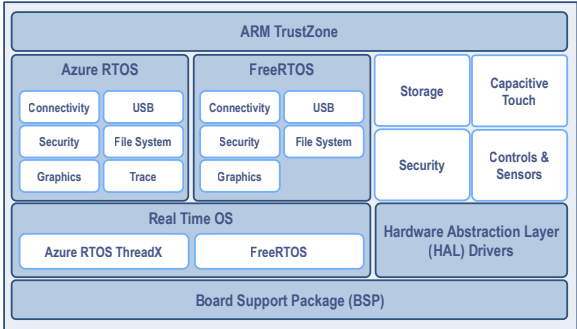
Block Diagram



RENESAS RA8P1 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 RA MCUs.



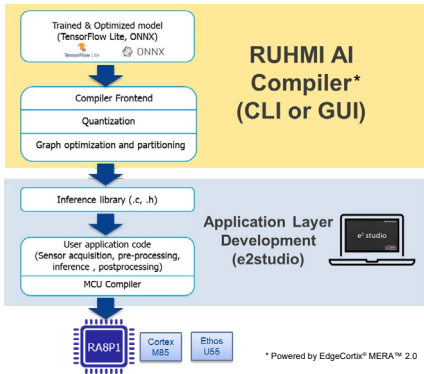
The FSP is based on an open software ecosystem of production-ready drivers, supporting Azure® RTOS, FreeRTOS™ or bare-metal programming. It also includes a selection of other middleware stacks, providing great flexibility for migrating code from older systems or developing new applications from scratch.

RUHMI Framework

Accelerate your AI Development with RUHMI* – Renesas’ first Comprehensive AI tool designed to deploy latest neural network models in a framework-agnostic way. It enables model quantization, graph partitioning and conversion, generating efficient, MCU-friendly source code.

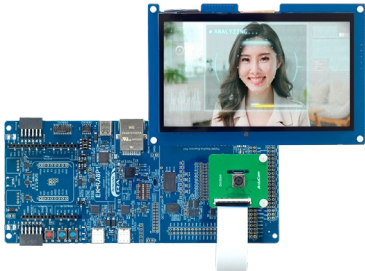
With native support for commonly used ML frameworks – TensorFlow Lite & ONNX – ready-to-use application examples and models optimized for RA8P1, RUHMI supports both novice users and expert AI developers. Enjoy flexible deployment options with GUI for Windows, integrated into e²Studio or CLI for Windows and Linux.

*Robust Unified Heterogenous Model Integration



Ordering References

Ext. Flash/ MDRAM/RAM	MIPI DSI/CSI2	Tj	Max frequency*	* Indicating max frequency as Cortex-M85/Cortex-M33				Coming Soon
8MB/1MB/2MB	Yes	0 to 95 °C	1GHz/250MHz					R7JA8P1KSLSAJ
		-40 to 105 °C	800MHz/200MHz					R7JA8P1KSDSAJ
	No	0 to 95 °C	1GHz/250MHz					R7JA8P1JSLSAJ
		-40 to 105 °C	800MHz/200MHz					R7JA8P1JSDSAJ
4MB/1MB/2MB	Yes	0 to 95 °C	1GHz/250MHz					R7JA8P1KRLSAJ
		-40 to 105 °C	800MHz/200MHz					R7JA8P1KRDSAJ
	No	0 to 95 °C	1GHz/250MHz					R7JA8P1JRLSAJ
		-40 to 105 °C	800MHz/200MHz					R7JA8P1JRDSAJ
1MB/2MB	Yes	0 to 95 °C	1GHz/250MHz	R7KA8P1BFLCAB	R7KA8P1BFLCAC	R7KA8P1KFLCAB	R7KA8P1KFLCAC	
		-40 to 105 °C	800MHz/200MHz	R7KA8P1BFDCAJ	R7KA8P1BFDCAJ	R7KA8P1KFDCAJ	R7KA8P1KFDCAJ	
	No	0 to 95 °C	1GHz/250MHz	R7KA8P1AFLCAB	R7KA8P1AFLCAC	R7KA8P1JFLCAB	R7KA8P1JFLCAC	
		-40 to 105 °C	800MHz/200MHz	R7KA8P1AFDCAJ	R7KA8P1AFDCAJ	R7KA8P1JFDCAJ	R7KA8P1JFDCAJ	
512KB/2MB	Yes	0 to 95 °C	1GHz/-	R7KA8P1BDLCAB	R7KA8P1BDLCAC			
		-40 to 105 °C	800MHz/-	R7KA8P1BDCAJ	R7KA8P1BDCAJ			
	No	0 to 95 °C	1GHz/-	R7KA8P1ADLCAB	R7KA8P1ADLCAC			
		-40 to 105 °C	800MHz/-	R7KA8P1ADCAJ	R7KA8P1ADCAJ			
Pin Count			224-pin	289-pin	224-pin	289-pin	303-pin	
Package type			BGA	BGA	BGA	BGA	BGA	
Package size (body)			11 x 11 mm	12 x 12 mm	11 x 11 mm	12 x 12 mm	15 x 15 mm	
Pin pitch			0.65 mm	0.65 mm	0.65 mm	0.65 mm	0.8 mm	
Core			Single (Cortex-M85)		Dual (Cortex-M85/Cortex-M33)			



Tools and Support

The e²studio 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	<ul style="list-style-type: none">■ GCC■ LLVM■ Arm Compiler*■ IAR Arm Compiler*	<ul style="list-style-type: none">■ Arm Compiler*	<ul style="list-style-type: none">■ IAR Arm Compiler*
Debug Probe	<ul style="list-style-type: none">■ Renesas E2/E2 Lite■ SEGGER J-Link	<ul style="list-style-type: none">■ SEGGER J-Link■ Keil ULINK / CMSIS-DAP**	<ul style="list-style-type: none">■ IAR I-jet■ SEGGER J-Link■ Renesas E2/E2 Lite■ CMSIS-DAP**
Production Programmer	<ul style="list-style-type: none">■ Renesas PG-FP6■ SEGGER J-Flash■ Partner solutions		

* Compiler must be purchased and licensed directly from third party
** Limited support

For more details, please visit: [renesas.com/ra8p1](https://www.renesas.com/ra8p1)

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