RENESAS

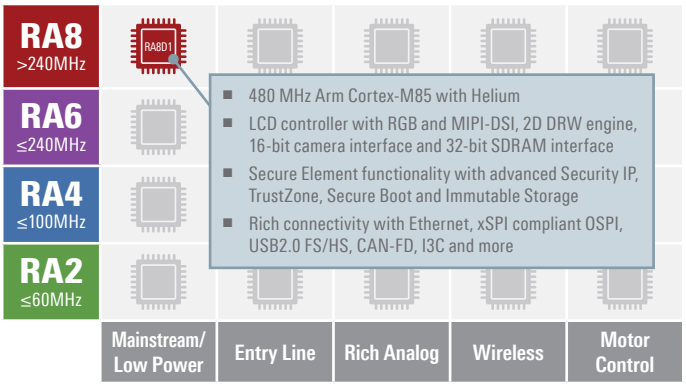
RENESAS RA

32-bit MCU Family

RENESAS RA8D1 GROUP

480 MHz Arm® Cortex®-M85 Based Graphics Microcontroller with Helium™ and TrustZone®

The Renesas RA8D1 group are the industry's first 32-bit graphics-enabled MCUs based on the Arm Cortex-M85 (CM85) core, delivering breakthrough performance of over 3000 Coremark points at 480 MHz and superior graphics capabilities that enable high-resolution displays and Vision AI applications. RA8D1 MCUs integrate the high-performance CM85 core with large memory, a high resolution TFT-LCD controller with parallel RGB and MIPI-DSI interfaces, 2D drawing engine, 16-bit camera interface, multiple external interfaces and a rich peripheral set optimized to address diverse application requirements. These MCUs are available in 176- and 224-pin packages to meet the requirements of a broad range of graphics and AI applications. Secure Element-like functionality is built-in with advanced cryptographic Security IP, immutable storage and tamper protection, for truly secure IoT.



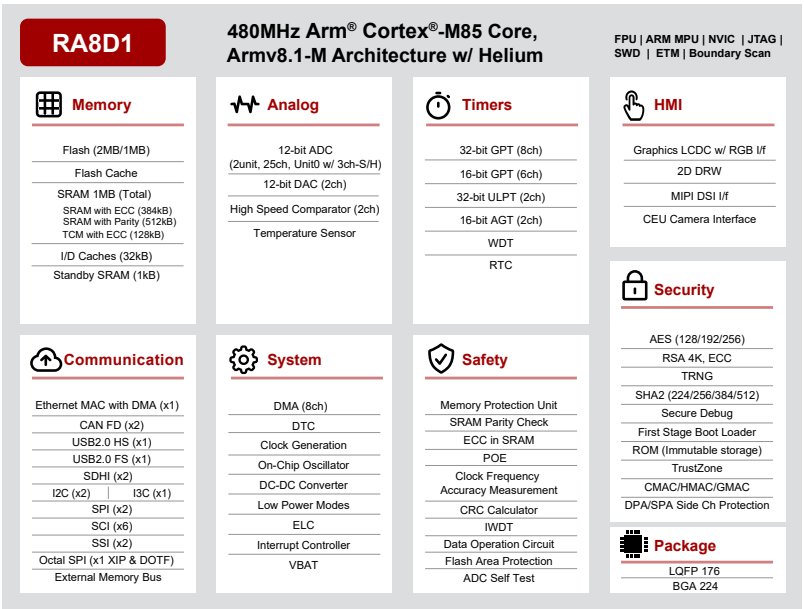
Key Features

- 480 MHz Arm Cortex-M85 with Helium MVE
- 1MB - 2MB Flash, 1MB SRAM including TCM
- 32KB I/D Caches and 12KB Data Flash
- Graphics LCD controller with RGB & MIPI-DSI I/Fs
- 2D drawing engine, 16-bit CEU camera interface
- xSPI-compliant Octal SPI with XIP and DOTF
- Renesas Security IP and Armv8-M TrustZone
- Immutable storage for First Stage Bootloader
- 32/16-bit timers, 32-bit ultra-low-power timer
- 12-bit ADC, 12-bit DAC, HS comparator
- Ethernet, USB2.0 HS/FS, CAN-FD interfaces
- 32-bit external memory I/F (CS/SDRAM)

Target Applications

- Industrial HMI, Machine vision
- Video doorbells, Security cameras
- Thermostats, Security panels
- Printer displays, QR code reader
- Patient health monitors
- People detection, Image classification

Block Diagram

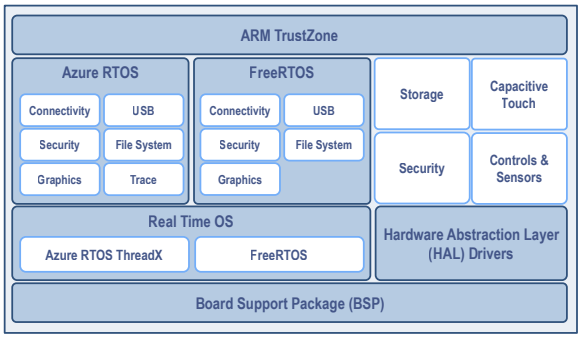


RENESAS RA8D1 GROUP

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.



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 • 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

- Evaluate key features of RA8D1 MCUs and develop edge and endpoint AI / ML, IoT, HMI, and other embedded systems applications
- Includes MIPI graphics expansion board (4.5 Inch backlit TFT display, 480x854 pixel resolution) and camera expansion board (Arducam OV3640)
- Features on-board debugging using SEGGER-J-Link®
- Order the kit and download documentation, design package, development tools, and software at: renesas.com/ek-ra8d1
- Orderable part number: **RTK7EKA8D1S01001BE**

Ordering References

Flash/RAM	Tj			
2MB/1MB	-40 to 125 °C	w/o MIPI-DSI	R7FA8D1AHECFC	R7FA8D1AHECBD
		w/ MIPI-DSI	R7FA8D1BHECFC	R7FA8D1BHECBD
1MB/1MB	-40 to 125 °C	w/o MIPI-DSI	R7FA8D1AFECFC	R7FA8D1AFECBD
		w/ MIPI-DSI	R7FA8D1BFECFC	R7FA8D1BFECBD
Pin Count			176-pin	224-pin
Package			LQFP	BGA
Package size (body)			24 x 24 mm	13 x13 mm
Pitch			0.5 mm	0.8 mm

For more details, please visit: **renesas.com/ra8d1**

© 2023 Renesas Electronics Corporation. All rights reserved.

Corporate Headquarters
TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks
Arm® and Cortex® are registered trademarks of Arm Limited. Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information
For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Document No.: R01PM0092EU0100