RTOS-Based MPU
Introduction to Renesas RZ/A Series

The RZ/A series is an RTOS-based microprocessor (MPU) combining excellent real-time performance and fast boot time based on Renesas’ proprietary technology and Arm® ecosystem, and is as user-friendly as Renesas MCUs.

The high-speed performance of RZ/A MPU can quickly process graphics and high-load applications in the third generation RZ/A3UL group MPU. RZ/A2M is embedded with Dynamically Reconfigurable Processor (DRP) technology enabling real-time video image pre-processing at the endpoint, for embedded AI applications. RZ/A1 group offers up to 10 MB of on-chip SRAM, which can buffer up-to WXGA resolution graphics without the need for external SDRAM.

**RZ/A Series Product Positioning**

<table>
<thead>
<tr>
<th>Performance</th>
<th>External DDR3L/4 RAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ/A1</td>
<td>• 1.6Gbps DDR3L/4 x 16bit (Up to 4GB)</td>
</tr>
<tr>
<td>RZ/A1LU</td>
<td>• 1.6Gbps DDR3L/4 x 16bit (Up to 4GB)</td>
</tr>
<tr>
<td>RZ/A1H</td>
<td>• Support HD (1280 x 720)</td>
</tr>
<tr>
<td>RZ/A1LC</td>
<td>• Support WVGA (800 x 640)</td>
</tr>
<tr>
<td>RZ/A1M</td>
<td>• Support HD (1280 x 720)</td>
</tr>
<tr>
<td>RZ/A2M</td>
<td>• Support WVGA (800 x 640)</td>
</tr>
</tbody>
</table>

**1st Generation**
- On-chip RAM 2-10MB
- Arm® Cortex®-A9 400MHz

**2nd Generation**
- On-chip RAM 4MB
- Arm® Cortex®-A9 528MHz
- DRP for AI
- MIPI Camera I/F
- 132Mbps Octa x 2

**3rd Generation**
- 1.6Gbps DDR3L/4 x 16bit (Up to 4GB)
- Arm® Cortex® -A55 1GHz
- 200Mbps Octa IF

**Benefits of RZ/A Series - Develop like MCUs**

RZ/A series MPUs retain the ease-of-use of Renesas MCUs due to rich integrated development environments, and deliver higher performance than MCUs.

Free of charge RZ/A software package (Downloadable from Renesas Web)

GUI Development Tools: TES Guiliani-Lite

Adopts FreeRTOS V10 (High market share in WW)

Supports Azure RTOS with rich middleware

**ex) RZ/A2M Software Package**

- Free RTOS
- Middleware eGML*¹
- Device Driver
- Sample Application
- TES Guiliani App

Development environment: e² studio

Compiler: GNU Arm Embedded Toolchain

*1 embedded Graphics Multiplatform Library
*2 Guiliani Streaming Editor

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Benefits of RZ/A3UL

- 64bit CPU@1GHz RTOS MPU
- Choice of two memory I/Fs for different applications
  - Octal-SPI Flash/Octal-SPI RAM: For simple and low cost PCB design
  - DDR3L/DDR4: For high resolution HMI and camera use cases
- Pin-compatible RZ/A3UL (RTOS) and RZ/G2UL (Linux) for easy migration
  - The 361-pin package is pin-compatible between RZ/A3UL and RZ/G2UL

Benefits of RZ/A1 Group, and RZ/A2M MPUs

- Reduced PCB cost
- No DRAM procurement issues
- Reduced EMI noise

Benefits of RZ/A1, A2M

- Dynamically Reconfigurable Processor (DRP) technology accelerates image processing
- Enables hybrid e-AI solutions with DRP for image processing + CPU for inference

Product Information

<table>
<thead>
<tr>
<th>RZ/A1H, RZ/A1M</th>
<th>RZ/A1L</th>
<th>RZ/A1LC</th>
<th>RZ/A2M</th>
<th>RZ/A3UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU/Frequency</td>
<td>Cortex-A9/400MHz</td>
<td>Cortex-A9/528MHz, Cortex-A55/1GHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-Chip RAM</td>
<td>5MB / 10MB</td>
<td>3MB</td>
<td>2MB</td>
<td>128KB (w/ ECC)</td>
</tr>
<tr>
<td>Supported Flash ROM</td>
<td>NOR, Serial (DDR*1), NAND</td>
<td>NOR, Serial (DDR)</td>
<td>NOR, Serial (SDR)</td>
<td>Serial (DDR), HyperFlash, OctaFlash</td>
</tr>
<tr>
<td>RAM Interface</td>
<td>SDRAM</td>
<td>SDRAM, HyperRAM, OctaRAM</td>
<td>DDR3L/DDR4, OctaRAM</td>
<td></td>
</tr>
<tr>
<td>Graphics Engine</td>
<td>2D (Open/VG)</td>
<td>Unavailable</td>
<td>2D, Sprocket Engine</td>
<td>Unavailable</td>
</tr>
<tr>
<td>LCD Controller</td>
<td>VDC5 (2ch)</td>
<td>VDC5 (1ch)</td>
<td>VDC6 (1ch)</td>
<td>LCDC (1ch)</td>
</tr>
<tr>
<td>Camera Interface</td>
<td>Digital (Parallel)/Analog</td>
<td>Digital (Parallel)</td>
<td>Digital (Parallel/Serial: MIPI)</td>
<td>Digital (Serial: MIPI)</td>
</tr>
<tr>
<td>JPEG Codec Unit</td>
<td>Available</td>
<td>Unavailable</td>
<td>Available</td>
<td>Unavailable</td>
</tr>
<tr>
<td>Connectivity</td>
<td>2 x USB2.0(IFS/HS)</td>
<td>2 x SDHI</td>
<td>2 x SDHI (UHS-II)</td>
<td>1 x USB2.0 Host</td>
</tr>
<tr>
<td>Package</td>
<td>256MB, 328MBGA, 256BGA*3</td>
<td>176MB, 208MBFP, 233BGA, 176BGA*3</td>
<td>176BGA*3</td>
<td>324BGA, 272BGA, 256BGA, 176BGA*3</td>
</tr>
<tr>
<td></td>
<td>[1MB]</td>
<td>[1MB]</td>
<td>[1MB]</td>
<td>361BGA*3</td>
</tr>
</tbody>
</table>

*1 Frequency limitations apply
*2 2ch can be used simultaneously
*3 For industrial/consumer use

For more information, visit www.renesas.com/rza