RZ/G Series microprocessors (MPUs) enable rapid development of game-changing Linux, Android, and QNX-based embedded systems. Designed for use in industrial, home appliance, office, and medical equipment, the RZ/G Series extends the capabilities of the successful Renesas RZ/A Series MPUs to deliver high-end performance in applications such as graphics, multistream video, and embedded vision.

The RZ/G Series features up to 1.5 GHz CPUs, 3D graphics acceleration, 1080p@60fps H.264 video processing, and DDR3 memory interfaces, providing ample performance margin for highly differentiated Human-Machine Interface (HMI)-type applications. Other features include USB, PCIe, SATA, Fast Ethernet, and Gigabit Ethernet interfaces.

### Key Features

- World-class Imagination Technologies 3D graphics engine for image rendering, plus 1080p 60fps video codec
- Arm® Cortex®-A7 and A15 CPU cores for power or performance optimization
- Shared IP and memory map over entire RZ/G Series MPU lineup
- Rich ecosystem of design and system integration partners
- RZ/G Linux Platform with super-long-term supported Civil Infrastructure Platform (CIP) Linux

### Key Benefits

- Enhance GUI expressiveness and add value to your end application with 3D graphics and real-time video
- Tune your design to minimize power dissipation or maximize performance to suit your specific requirements
- Build scalable software with common device drivers
- Compress your development cycle by tapping into a growing network of RZ/G MPU design experts
- Dramatically reduce risk and cost of implementing and maintaining industrial-grade Linux systems

### Power Savings

- No Heat Sink with RZ/G1E
- R8A77450, R8A77470
- R8A77440
- R8A77430
- R8A77420

### Performance Optimization

- R8A77420
  - RZ/G1H
  - 1.4 GHz Quad Arm Cortex-A15 & 780 MHz Quad ARM Cortex-A7 (25,528 DMIPS)
- R8A77430
  - RZ/G1M
  - 1.5 GHz Dual Arm Cortex-A15 with 84b memory bus and enhanced graphics (10,500 DMIPS)
- R8A77440
  - RZ/G1N
  - 1 GHz Dual Arm Cortex-A7 (3,800 DMIPS)
  - Over 25,000 DMIPS with RZ/G1H
The Renesas RZ/G Linux Platform makes it easy to implement and maintain Industrial-Grade Linux in electronic equipment thanks to a unique software-design framework with Renesas’ Verified Linux Package, advanced code verification and analysis tools, and cloud-build from within Renesas’ e² studio development environment. The Verified Linux Package is built with Civil Infrastructure Platform (CIP) Linux with super long-term (10+ year) support for a given Linux kernel, which eliminates the need for costly upgrades.

The RZ/G Linux Platform enables users of all types to excel with Linux – from those upgrading from microcontrollers to MPUs who don’t want to deal with setting up a Linux server of their own, to experts who are already accustomed to a manual Yocto build process.  

https://www.cip-project.org/

### High-Performance Processing with Support for 3D Graphics and Full HD Video

<table>
<thead>
<tr>
<th></th>
<th>RZ/G1C R8A77470</th>
<th>RZ/G1E R8A77450</th>
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<th>RZ/G1M R8A77430</th>
<th>RZ/G1H R8A77420</th>
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<tr>
<td><strong>Core</strong></td>
<td>Dual Cortex-A7</td>
<td>Dual Cortex-A7</td>
<td>Dual Cortex-A15</td>
<td>Dual Cortex-A15</td>
<td>Quad Cortex-A15</td>
</tr>
<tr>
<td><strong>Operating</strong></td>
<td>1.0 GHz</td>
<td>1.0 GHz</td>
<td>1.5 GHz</td>
<td>1.5 GHz</td>
<td>1.4 GHz 780 MHz</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Processing</strong></td>
<td>3,800 DMIPS</td>
<td>3,800 DMIPS</td>
<td>10,500 DMIPS</td>
<td>10,500 DMIPS</td>
<td>25,528 DMIPS</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Cache Size</strong></td>
<td>L1 cache I/32 KB D/32 KB</td>
<td>L1 cache I/32 KB D/32 KB</td>
<td>L1 cache I/32 KB D/32 KB</td>
<td>L1 cache I/32 KB D/32 KB</td>
<td>L1 cache I/32 KB D/32 KB</td>
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<tr>
<td></td>
<td>L2 cache 512 KB</td>
<td>L2 cache 512 KB</td>
<td>L2 cache 1 MB</td>
<td>L2 cache 1 MB</td>
<td>L2 cache 1 MB</td>
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<tr>
<td><strong>MMU</strong></td>
<td>Yes</td>
<td></td>
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<tr>
<td><strong>NEON/VFP</strong></td>
<td>SIMDv2/VFPv4</td>
<td></td>
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</tr>
<tr>
<td><strong>3D Graphics</strong></td>
<td>SGX531, 260 Mpx/s</td>
<td>SGX540, 520 Mpx/s</td>
<td>SGX544MP2, 1240 Mpx/s</td>
<td>SGX544MP2, 2080 Mpx/s</td>
<td>SG6400, 4160 Mpx/s</td>
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<tr>
<td><strong>Video Functions</strong></td>
<td>2 ch digital video inputs</td>
<td>2 ch digital video inputs</td>
<td>3 ch digital video inputs</td>
<td>4 ch digital video inputs</td>
<td>2 ch digital video inputs</td>
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<td></td>
<td>2 ch RGB video display interfaces</td>
<td>2 ch RGB video display interfaces</td>
<td>1 ch RGB video display interface</td>
<td>1 ch LVDS video output</td>
<td>2 ch LVDS video interfaces</td>
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<tr>
<td></td>
<td>1 ch analog input</td>
<td>1 ch LVDS video output</td>
<td>2 ch LVDS video interfaces</td>
<td>2 ch LVDS video interfaces</td>
<td>2 ch LVDS video interfaces</td>
</tr>
<tr>
<td><strong>Video Functions</strong></td>
<td>H.264 – 1920x1080 @ 60 x 1 ch</td>
<td>H.264 – 1920x1080 @ 60 x 2 ch</td>
<td>H.264 – 1920x1080 @ 60 x 2 ch</td>
<td>H.264 – 1920x1080 @ 60 x 2 ch</td>
<td>H.264 – 1920x1080 @ 60 x 2 ch</td>
</tr>
</tbody>
</table>

**Video image processing functions, including color conversion and scaling**
RZ/G SERIES MULTI-CORE MPUs
BIG IDEAS FOR EVERY SPACE WITH RZ/G MPUs

Human Machine Interface (HMI)
Create winning human machine interface solutions for building and office automation, healthcare, and industrial markets with RZ/G MPUs. Take advantage of the multitude of graphics and multimedia examples to get your prototypes up and running quickly and to get to market early.

EtherCAT Master with HMI for Industrial Automation
RZ/G1E with EtherCAT Master stack from partner, Acontis GmbH, is ideal for industrial PCs, HMI master devices, and motion controllers, especially when combined with Renesas RZ/T EtherCat slave devices.

Prototyping Kits and Production-Ready SoMs Available Through Renesas Partners

<table>
<thead>
<tr>
<th>iWave Systems</th>
<th>emtrion GmbH</th>
<th>Mistral Solutions</th>
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<tbody>
<tr>
<td>RZ/G1C SBC</td>
<td>RZ/G1E SoDIMM</td>
<td>RZ/G1E SMARC module</td>
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<tr>
<td>RZ/G1N &amp; M Qseven® SoM</td>
<td>RZ/G1H Qseven SoM</td>
<td>RZ/G1M emCON module with carrier board and LCD screen</td>
</tr>
<tr>
<td>RZ/G emCON module</td>
<td></td>
<td>RZ/G1E SMARC module with carrier board</td>
</tr>
</tbody>
</table>
Embedded Vision

Embedded vision and AI are areas of growing interest today as they hold huge promise to revolutionize human-to-machine and machine-to-machine interaction. Renesas is ideally positioned to enable this capability in products with a range of examples, created in conjunction with our software partners, for face recognition, object identification, optical flow, and more.

Renesas Marketplace for Verified Software Add-Ons

The online Renesas Marketplace connects product developers to value-adding Renesas partners, enabling developers to immediately bring to life RZ/G silicon with leading software solutions, including embedded vision, EtherCAT, and fast-boot, among others.

Europe: https://mp.renesas.com/en-eu/rzg/
Singapore: https://mp.renesas.com/en-sg/rzg/
Japan: https://mp.renesas.com/ja-jp/rzg/
RZ/G SERIES BLOCK DIAGRAMS

RZ/G1E (R8A77450)

Bring huge value to your low-cost embedded design with over 3,800 Dhrystone (DMIPS) performance at a low power footprint via Arm’s lowest power processor, the Cortex-A7, while enjoying dual Ethernet, 3D graphics, and a 1080p60 H.264 video codec.

RZ/G1C (R8A77470)

(block diagram not shown)

Keep BOM costs down with a 4-layer PCB and no need for a PMIC. With a dual-core, 3,800 DMIPS Arm Cortex-A7 processor, you can build brilliant HMI systems with accelerated graphics from a PowerVR SGX531 3D GPU and a 1080p60 H.264 video codec. Available in a FX-BGA2121-501 package.

RZ/G1M (R8A77430)

Take your high-end MPU design to the next level with over 10,000 DMIPS performance from two Arm Cortex-A15 cores; USB 3.0, SATA and PCIe interfaces; 3D graphics; a 1080p60 H.264 video codec; and a 64-bit wide external DDR3 SDRAM bus to deliver immense memory bandwidth and an incredible end-user experience.

1 USB 3.0 and SATA0 share same PHY.
2 PCIe and SATA1 share same PHY.
3 Ethernet AVB and 10/100 Ethernet share the same pins.
Harness the ultimate in embedded MPU performance with this 8-core “Big-Little” quad Arm Cortex-A15 and quad Arm Cortex-A7 based MPU that delivers over 25,000 DMIPS; USB 3.0, SATA and PCIe interfaces; ultra high-end 3D graphics with two-channel 1080p60 H.264 video codec to propel your application beyond the reach of your competition.

### RZ/G1H (R8A77420)

Leverage a rich set of high-end embedded capabilities with 10,500 DMIPS from two Arm Cortex-A15 CPUs; a USB 3.0, SATA or PCIe interface; a 3D graphics engine; and a 1080p60 H.264 video codec to propel your application beyond the reach of your competition.

### RZ/G1N (R8A77440)

### USB 3.0, SATA and PCIe share same PHY.

### PCIe and SATA1 share same PHY.

### Ethernet AVB and 10/100 Ethernet share the same pins.
RZ/G EXTENDS RENESAS RZ MPU FAMILY WITH 3D GRAPHICS, H.264 VIDEO CODEC, AND HIGH-PERFORMANCE DDR3 MEMORY INTERFACES

Software Development Environment

Partners & Affiliations

Design Services

System-on-Module (SoM) and Design Services

Graphics

Embedded Vision

Linux

Android

Witekio

iWave

Crank Software Inc.

emtrion embedded systems

Qt

Uncanny Vision

Emtrion Vision Alliance

QNX

timesys

嵌入式系统

MISTRAL

... Partners in Real Time

Evaluation Kits

RZ/G1M Starter Kit
Part No.: YR8A77430S000BE

RZ/G1E Starter Kit
Part No.: YR8A77450S000BE

Various partner kits and SoMs also available through iWave Systems, emtrion embedded systems, Mistral Solutions and others

Software Library Free SW
www.renesas.com/softwarelibrary

Free Samples
www.renesasamples.com

Technical Support
www.renesas.com/tech_support

Consultant and tool vendor network
www.renesas.com/Alliance

Customized updates
www.renesas.com/MyRenesas

University program
www.renesas.com/University

Online training
www.RenesasInteractive.com

Renesas MCU Ecosystem

Renesas Electronics America Inc.
renesas.com

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