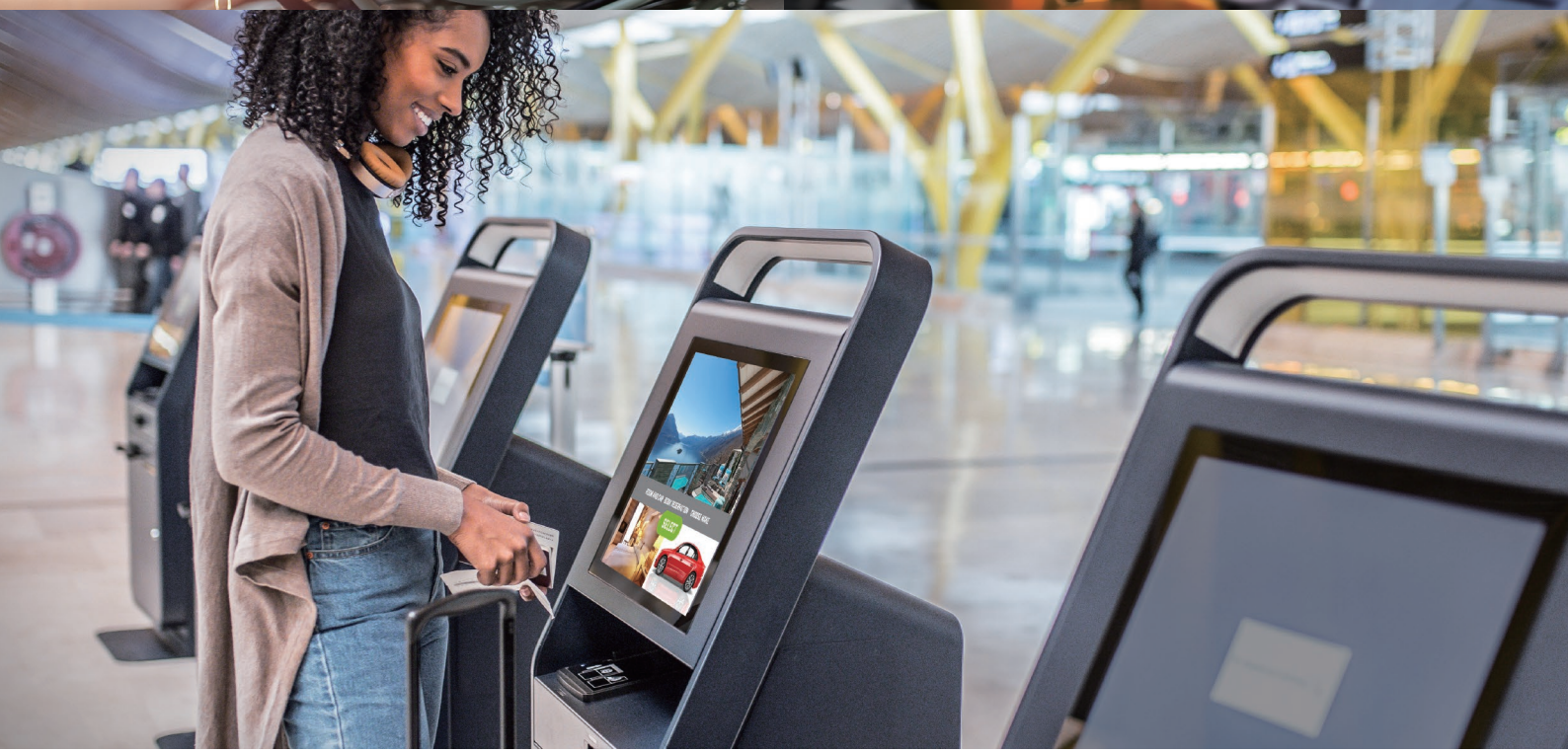
RENESAS
BIG IDEAS FOR EVERY SPACE

RZ FAMILY

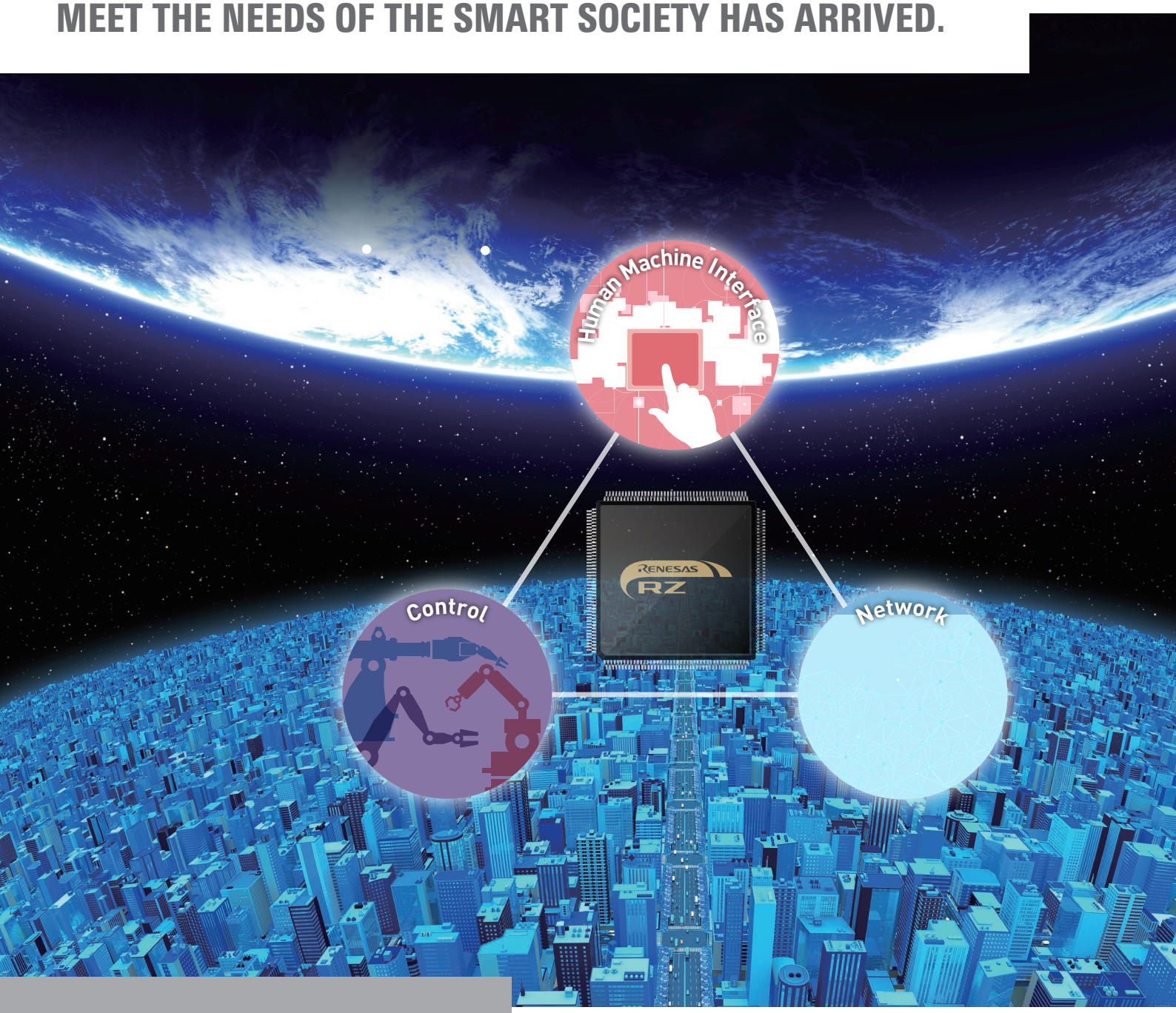
Renesas Microprocessor



2018.10

RENESAS RZ

THE NEXT-GENERATION PROCESSOR TO MEET THE NEEDS OF THE SMART SOCIETY HAS ARRIVED.



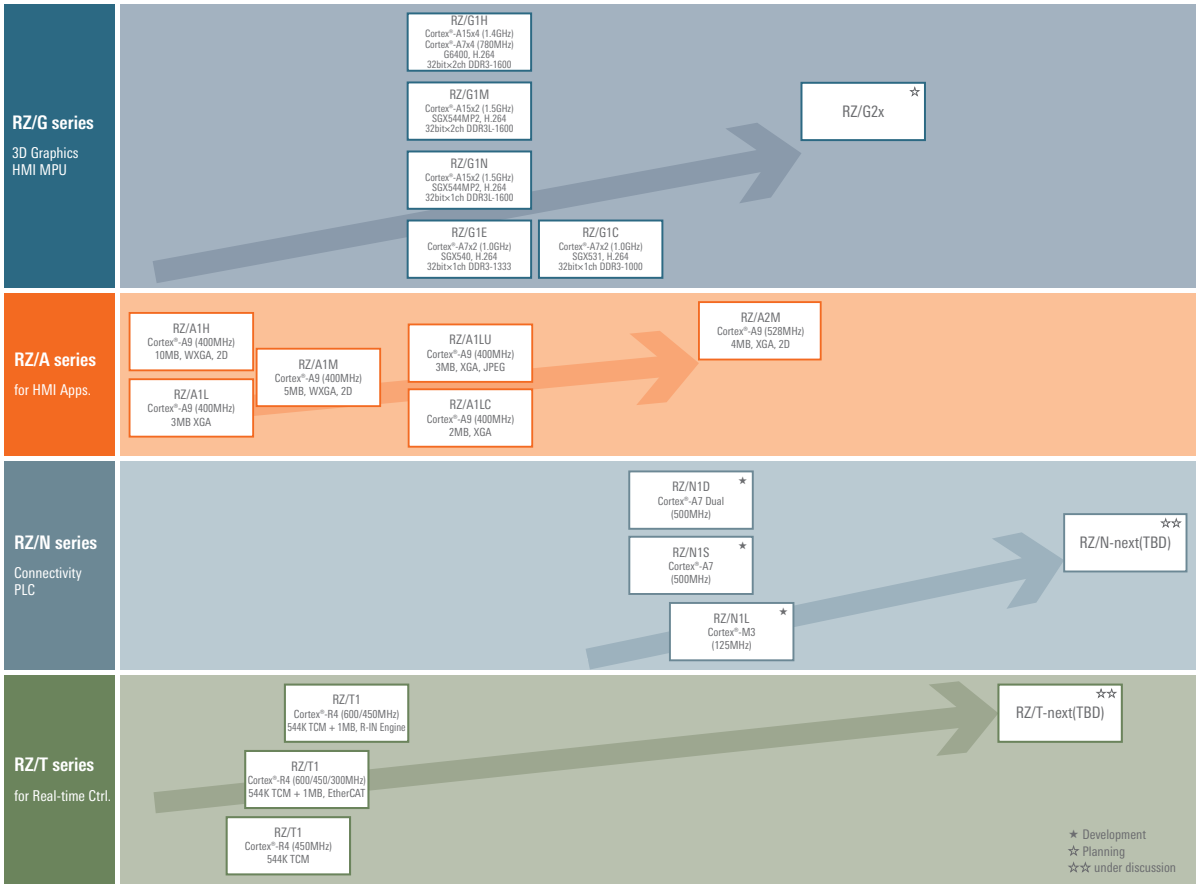
CONTENTS

The utilization of intelligent technology is advancing in all aspects of our lives, including electric household appliances, industrial equipment, building management, power grids, and transportation. The cloud-connected “smart society” is coming ever closer to realization. Microcontrollers are now expected to provide powerful capabilities not available previously, such as high-performance and energy-efficient control combined with interoperation with IT networks, support for human-machine interfaces, and more. To meet the demands of this new age, Renesas has drawn on its unmatched expertise in microcontrollers to create the RZ family of embedded processors. The lineup of these “next-generation processors that are as easy to use as conventional microcontrollers” to meet different customer requirements.

The Zenith of the Renesas micro

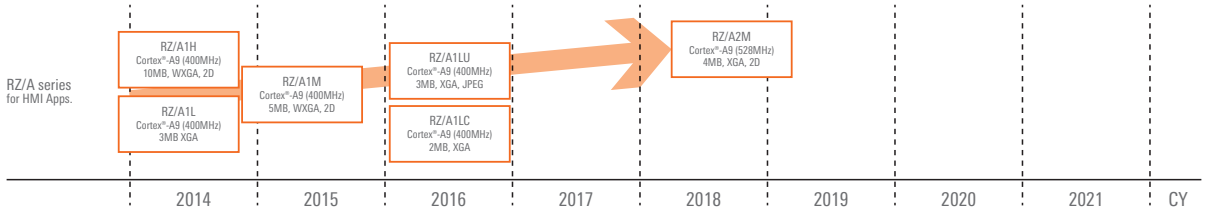
As embedded processors to help build the next generation of advanced products, the RZ family offers features not available elsewhere and brings new value to customer applications.

RZ Family Roadmap



RZ/A Series

RZ/A Series: Roadmap



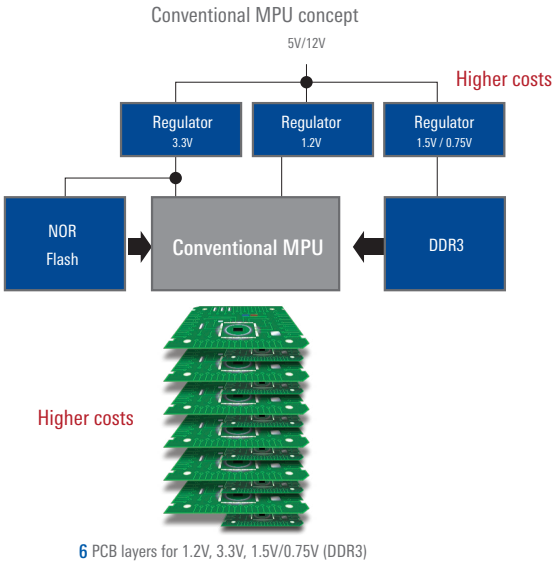
RZ/A Series: Application Fields

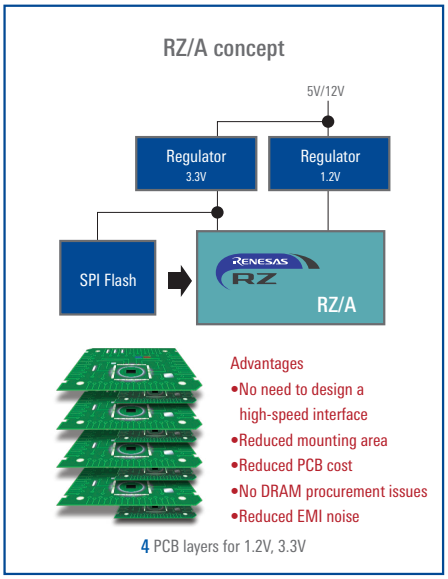
RZ/A Series Features

- Large-capacity on-chip RAM: 10MB
- Graphics display and camera input capabilities on a single chip
- Rich peripheral functions and software

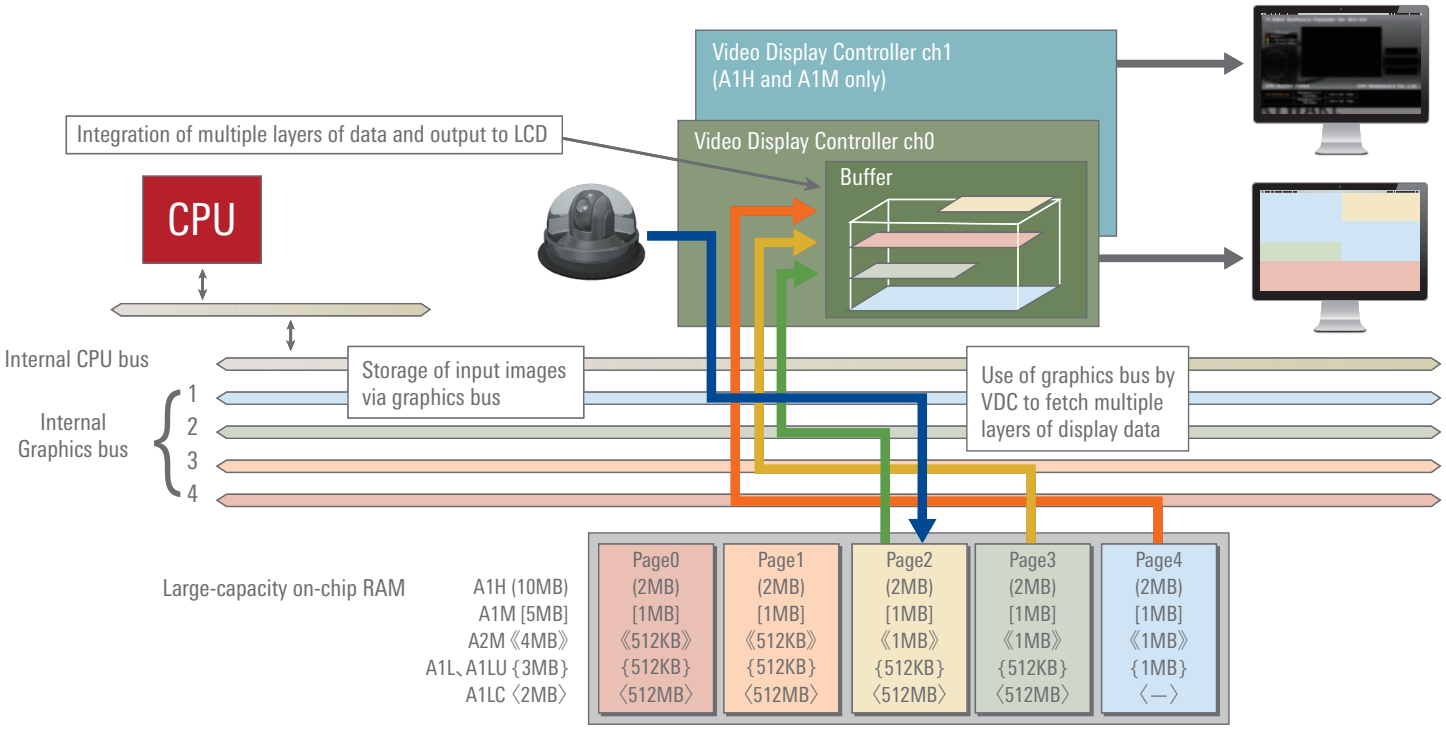
Large-capacity on-chip RAM: 10MB

DRAM-less solution



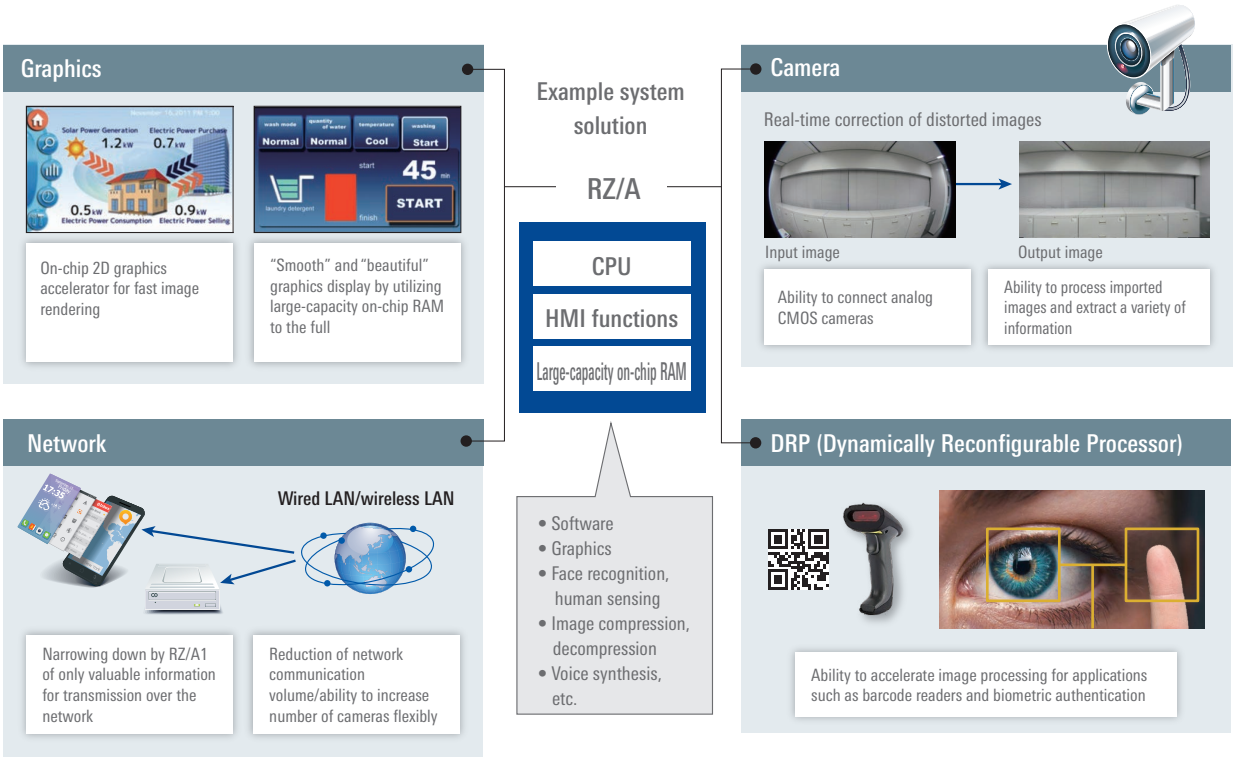


Graphics display and camera input capabilities on a single chip



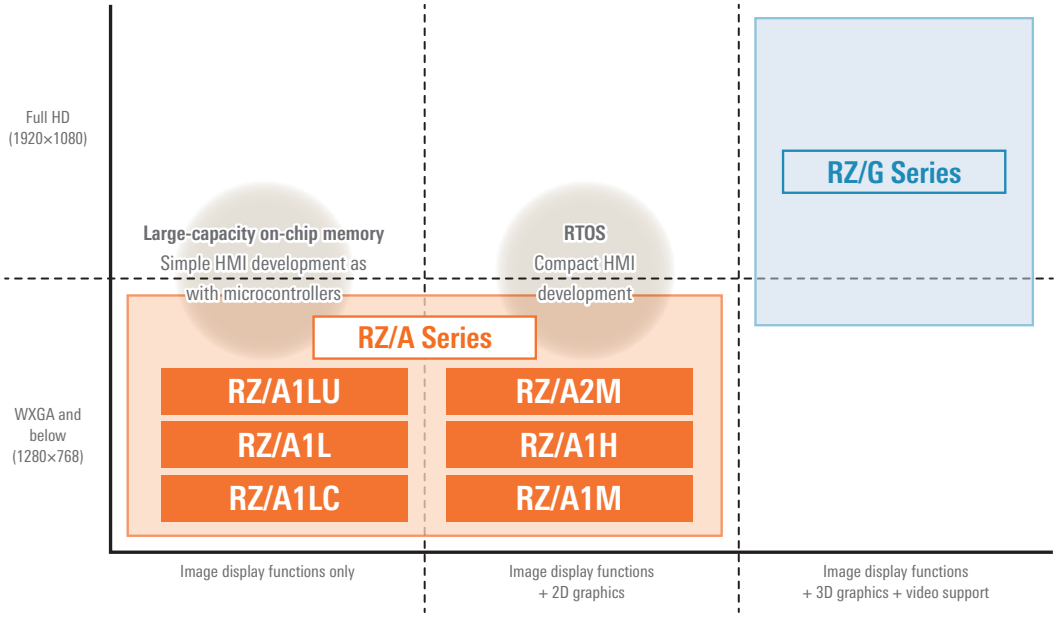
The bus configuration with independent buses for images and hardware-based superimposition processing make it easy to create graphical applications.

Rich peripheral functions and software



With ample peripheral functions and software, a single chip can cover a wide range of fields, including display, camera input, communication, and audio functions.

HMI Solutions



- HMI solutions optimized to match the image resolution, functions, and OS
- RZ/G series: Full HD, functions: 3D Gfx, vide, OS: Linux (RichOS)
- RZ/A series: WXGA and below, functions: 2D Gfx, camera input processing, OS: RTOS

RZ/A2M Group

CPU (Arm® Cortex®-A9)
- Operating frequency: 528MHz
- Single-precision/double-precision FPU
- Arm® NEON™

On-chip memory
- 4MB

Main graphics and camera input functions
- Video display controller (VDC6): 1 channel
  LCD output: Max. WXGA
  Screen superimposition: 3 layers
  Video input: Max. XGA
- CMOS camera input (CEU): 1 channel
- MIPI-CSI2 interface: 1 channel
- Distortion compensation unit (IMR): 1 channel
- 2D graphics engine: 1 channel
- Sprite engine: 1 channel
- JPEG coding engine: 1 channel

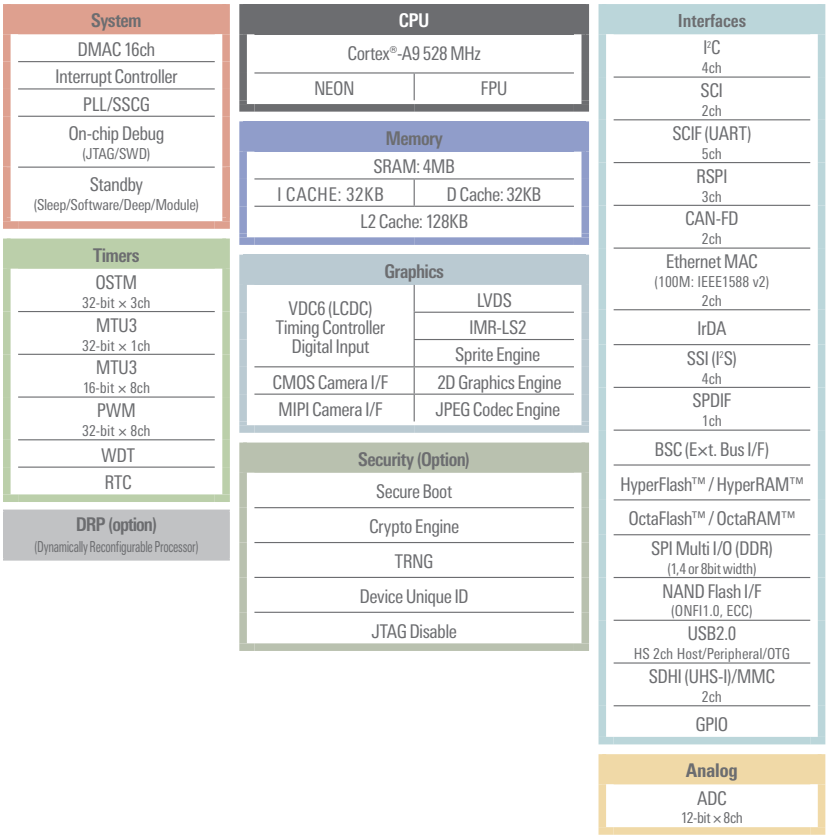
Main memory interface functions
- NOR flash, SDRAM, NAND flash
- Serial flash: 1-bit/4-bit/8-bit: 1 channel, 8-bit: 1 channel
  (ability to run stored programs directly)
- SD/MMC host interface: 2 channels

Main communication functions
- USB 2.0 High Speed: 2 channels (Host/Function switchable)
- 10M/100M EtherMAC: 2 channels
- SCIF: 5 channels
- I²C: 4 channels
- SSI: 4 channels
- RSPI: 3 channels
- CAN-FD: 2 channels

Optional functions
- DRP (Dynamically Reconfigurable Processor)

Package
- 176-LFBGA (13mm×13mm, 0.8mm pitch)
- 256-LFBGA (11mm×11mm, 0.5mm pitch
- 272-FBGA (17mm×17mm, 0.8mm pitch
- 324-FBGA (19mm×19mm, 0.8mm pitch

RZ/A2M block diagram



RZ/A1H Group and RZ/A1M Group (Pin Compatible)

CPU (Arm® Cortex®-A9)
- Operating frequency: 400MHz
- Single-precision/double-precision FPU
- Arm® NEON™

On-chip memory
- RZ/A1H: 10MB
- RZ/A1M: 5MB

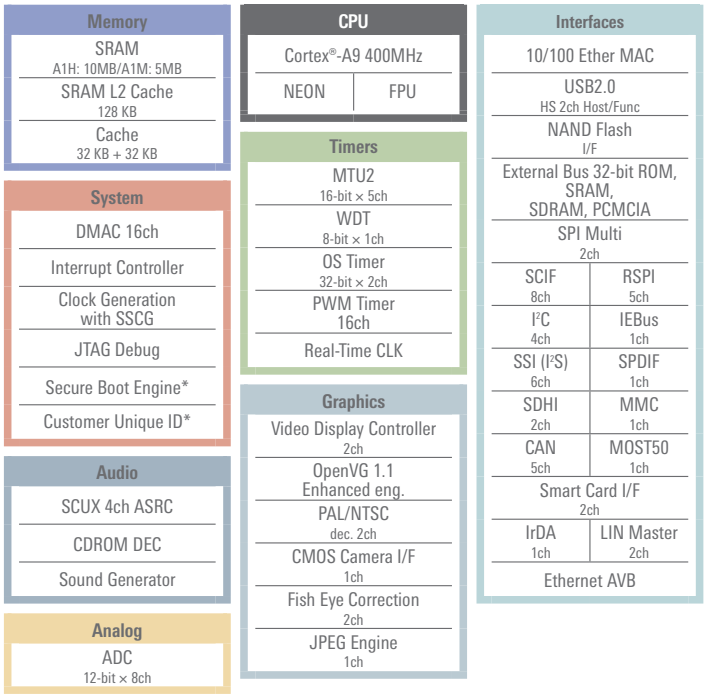
Main graphics and camera input functions
- Video display controller (VDC5): 2 channels
  LCD output: Max. WXGA
  Screen superimposition: 4 layers
  Video input: Max. XGA (CVBS analog input supported)
- CMOS camera input (CEU): 1 channel
- PAL/NTSC decoder (DVDEC): 2 channels
- Distortion compensation unit (IMR): 1 channel
- Open VG accelerator: 1 channel
- JPEG coding engine: 1 channel

Main memory interface functions
- NOR flash, SDRAM, NAND flash
- QSPI serial flash: 2 channels (ability to run stored programs directly)
- SD host interface: 2 channels
- MMC host interface: 1 channel

Main communication functions
- USB 2.0 High Speed: 2 channels (Host/Function switchable)
- 10M/100M EtherMAC: 1channel
- SCIF: 8 channels
- I²C: 4 channels
- SSI: 6 channels
- RSPI: 5 channels
- Ethernet AVB: 1 channel
- CAN: 5 channels

Package
- 256-LFBGA (11mm × 11mm,0.5mm pitch)
- 256-LFQFP (28mm × 28mm,0.4mm pitch)
- 324-FBGA (19mm × 19mm,0.8mm pitch)

RZ/A1H,and RZ/A1M block diagram



* =Option

RZ/A1LU Group

CPU (Arm® Cortex®-A9)
- Operating frequency: 400MHz
- Single-precision/double-precision FPU
- Arm® NEON™

On-chip memory
- RZ/A1LU: 3MB

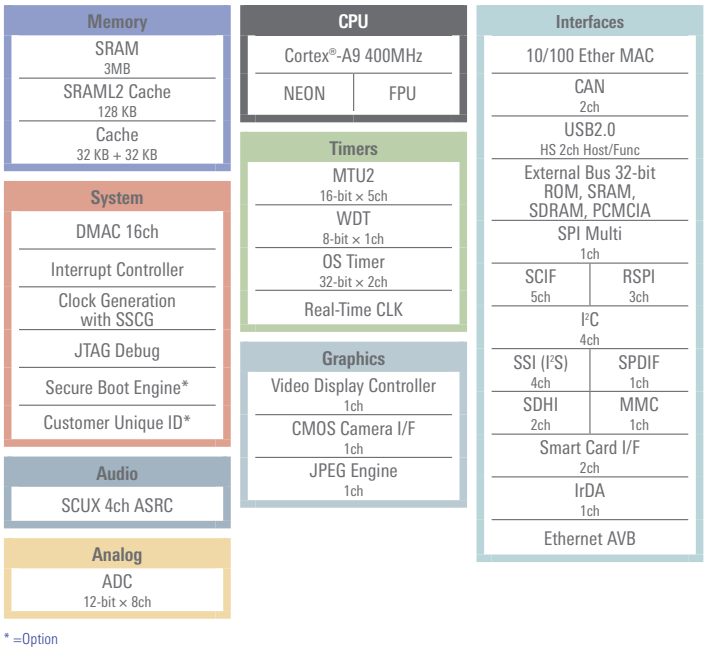
Main graphics and camera input functions
- LCD controller (VDC5): 1 channel
  LCD output: Max. WXGA
  Screen superimposition: 3 layers
  Video input: Max. XGA
- CMOS camera input (CEU): 1 channel
- JPEG coding engine: 1 channel

Main memory interface functions
- NOR flash, SDRAM
- QSPI serial flash: 1 channel (ability to run stored programs directly)
- SD host interface: 2 channels
- MMC host interface: 1 channel

Main communication functions
- USB 2.0 High Speed: 2 channels (Host/Function switchable)
- 10M/100M EtherMAC: 1 channel
- SCIF: 5 channels
- I²C: 4 channels
- SSI: 4 channels
- RSPI: 3 channels
- Ethernet AVB: 1 channel
- CAN: 2 channels

Package
- 176-LFBGA (8mm × 8mm,0.5mm pitch)
- 176-LFQFP (24mm × 24mm,0.5mm pitch)
- 208-LFQFP (28mm × 28mm,0.5mm pitch)

RZ/A1LU block diagram



* =Option

RZ/A1L, RZ/A1LC Group

CPU (Arm® Cortex®-A9)
- Operating frequency: 400MHz
- Single-precision/double-precision FPU
- Arm® NEON™

On-chip memory
- RZ/A1L: 3MB
- RZ/A1LC: 2MB

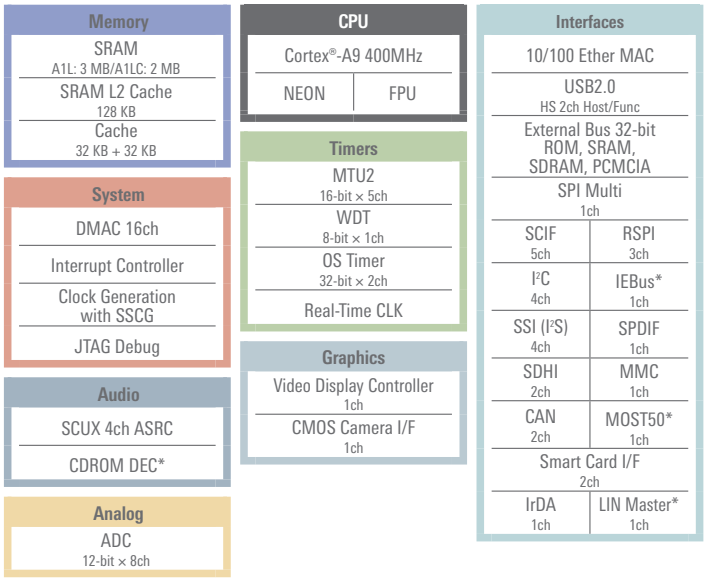
Main graphics and camera input functions
- LCD controller (VDC5): 1 channel
  LCD output: Max. WXGA
  Screen superimposition: 3 layers
  Video input: Max. XGA
- CMOS camera input (CEU): 1 channel

Main memory interface functions
- NOR flash, SDRAM, NAND flash
- QSPI serial flash: 1 channel (ability to run stored programs directly)
- SD host interface: 2 channels
- MMC host interface: 1 channel

Main communication functions
- USB 2.0 High Speed: 2 channels (Host/Function switchable)
- 10M/100M EtherMAC: 1 channel
- SCIF: 5 channels
- I²C: 4 channels
- SSI: 4 channels
- RSPI: 3 channels
- CAN: 2 channels

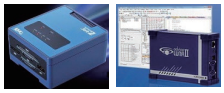
Package
- 176-LFBGA (8mm × 8mm,0.5mm pitch)
- 176-LFQFP (24mm × 24mm,0.5mm pitch)
- 208-LFQFP (28mm × 28mm,0.5mm pitch)
- 233-FBGA (15mm × 15mm, 0.8mm pitch)

RZ/A1L, RZ/A1LC block diagram



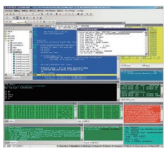
* RZ/A1L Group specification only.

RZ/A Series: Development Environments (Integrated Development Environments)

	arm	IAR SYSTEMS	eSOL	RENESAS
Development environments	• DS-5 	• IAR Embedded Workbench® for Arm® 	• eBinder 	• e² studio*3 
Compilers	• Arm CC*1	• IAR C/C++ compiler*2	• Arm CC*1	• GNU tool*4
ICEs	• DSTREAM™ • ULINKpro™ • ULINKproD™ • ULINK2™  	• I-jet™/I-jet Trace™ for Arm Cortex®-A/R/M • JTAGjet-Trace 	• PARTNER-Jet2 from Kyoto Microcomputer Co., Ltd. • adviceLUNAII from DTS INSIGHT Corporation 	• J-Link LITE from Segger • J-Link series from Segger*5 

*1. Arm CC is included in DS-5 Starter Kit for RZ/A and RZ/T, which is available free of charge, and in the popularly priced DS-5 RZ/A Edition. There is also a free evaluation version that provides full functionality but is limited to 30 days of use. Contact a DS-5 sales agent for details.
*2. A free evaluation license is available provided the 30-day time-limited evaluation or the permanent 32KB size-limited evaluation (www.iar.com/EWARM)
*3. Eclipse-based development environment from Renesas (https://www.renesas.com/e2studio)
*4. GNU TOOLS & SUPPORT Website (https://gcc-renesas.com)
*5. Renesas does not handle ICEs from Segger. Contact a sales agent for details.

RZ/A Series: Development Tools (Debuggers, ICEs)

	KUC Kyoto Microcomputer Co., Ltd.	DTS INSIGHT Our insight, your value	Computex
Debuggers	• PARTNER-Jet2 	• microVIEW-PLUS 	• CSIDE version 6 
ICEs		• adviceLUNA II 	• PALMiCE3 
Supported compilers	• exeGCC from Kyoto Microcomputer • GNU tool*1 • Arm CC*2 • IAR C/C++ compiler,*3 etc.	• Arm CC*2 • GNU tool,*1 etc.	• Arm CC*2 • IAR C/C++ compiler*3 • GNU tool,*1 etc.

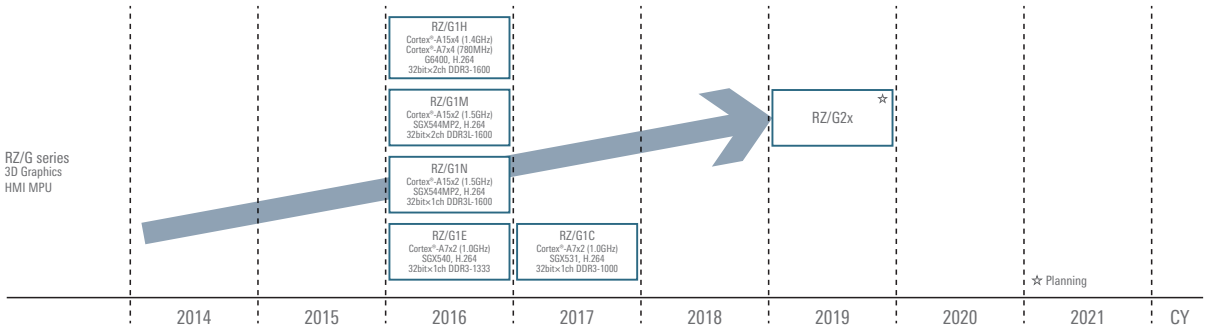
*1. GNU TOOLS & SUPPORT Website (https://gcc-renesas.com)
*2. Arm CC is included in DS-5 Starter Kit for RZ/A, which is available free of charge, and in the popularly priced DS-5 RZ/A Edition. There is also a free evaluation version that provides full functionality but is limited to 30 days of use. Contact a DS-5 sales agent for details.
*3. A free evaluation license is available provided the 30-day time-limited evaluation or the permanent 32KB size-limited evaluation (www.iar.com/EWARM)

RZ/A Series: Solutions from Partner Companies

Visit the webpage below for the latest information on RZ/A Series development tools, including solutions from partner companies.
https://www.renesas.com/products/microcontrollers-microprocessors/rz/softtools.html#rza

RZ/G Series

RZ/G Series: Roadmap



RZ/G Series Features

- High processing capacity
- Support for 3D graphics and Full HD video
- Scalability among products in the series
- Collaboration with partner companies

High processing capacity

Gigahertz-class dual-core CPU for high-performance operation processing

	RZ/G1H R8A77420	RZ/G1M•RZ/G1N R8A77430•R8A77440	RZ/G1E R8A77450	RZ/G1C R8A77470
Core	Cortex®-A15 Quad Cortex®-A7 Quad	Cortex®-A15 Dual	Cortex®-A7 Dual	Cortex®-A7 Dual
Operating frequency	1.4GHz (Cortex®-A15) 780MHz (Cortex®-A7)	1.5GHz	1.0GHz	1.0GHz
Processing performance	25000DMIPS	10500DMIPS	3800DMIPS	3800DMIPS
Cache	Cortex®-A15 L1 I/D cache 32KB/32KB L2cache 2MB Cortex®-A7 L1 I/D cache 32KB/32KB L2cache 512KB	L1 I/D cache 32KB/32KB L2cache 1MB	L1 I/D cache 32KB/32KB L2cache 512KB	L1 I/D cache 32KB/32KB L2cache 512KB
MMU	Supported	Supported	Supported	Supported
NEON	Supported	Supported	Supported	Supported
VFP	Supported (VFPv4)	Supported (VFPv4)	Supported (VFPv4)	Supported (VFPv4)

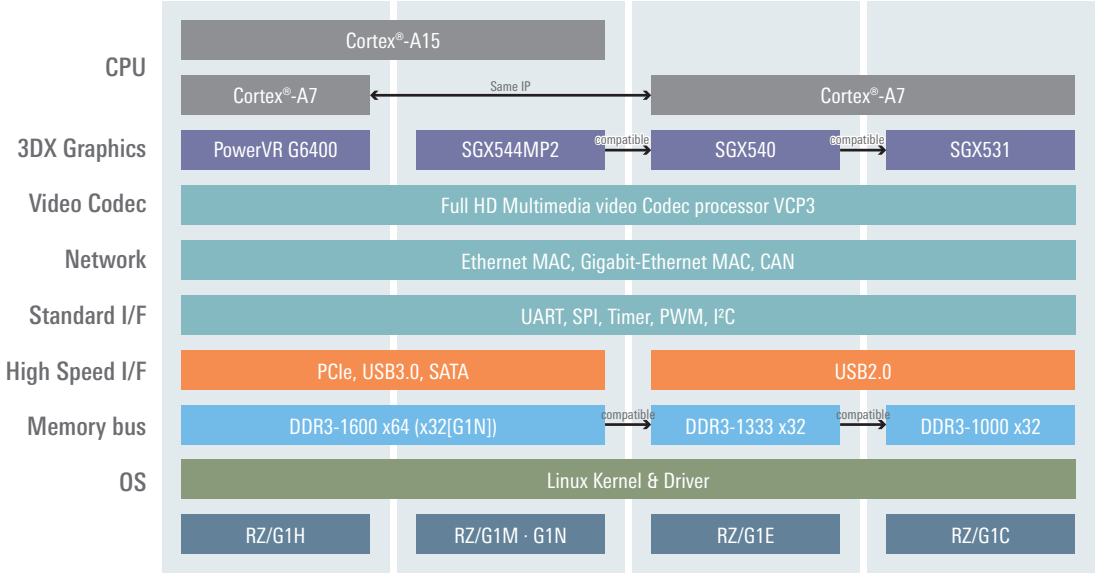
Support for 3D graphics and Full HD video

Capable of handling of Full HD video or 3D graphics with power to spare

	RZ/G1H R8A77420	RZ/G1M•RZ/G1N R8A77430•R8A77440	RZ/G1E R8A77450	RZ/G1C R8A77470
3D graphics	G6400 (520MHz)	SGX544MP2 (520MHz<G1M>) (312MHz<G1N>)	SGX540 (260MHz)	SGX531 (260MHz)
Video functions	• Video display channels: 3 Interfaces RGB888 × 1 channel LVDS × 2 channels • Video input interface × 4 channels • Video codec: VCP3 × 2 channels • IP converter module • Video image processing functions (color conversion, image enlargement/ reduction, filtering)	• Video display channels: 2 Interfaces RGB888 × 1 channel LVDS × 1 channel • Video input interface × 3 channels • Video codec: VCP3 × 1 channel • IP converter module • Video image processing functions (color conversion, image enlargement/ reduction, filtering)	• Video display channels: 2 Interfaces RGB888 × 2 channels • Video input interface × 2 channels • Video codec: VCP3 × 1 channel • IP converter module • Video image processing functions (color conversion, image enlargement/ reduction, filtering)	• Video display channels: 2 Interfaces RGB888 × 2 channels LVDS × 1 channel NTSC (CVBS) × 1 channel • Video input interface × 2 channels • Video codec: VCP3 × 1 channel • IP converter module • Video image processing functions (color conversion, image enlargement/ reduction, filtering)

Scalability among products in the series

Using the same architecture maintains compatibility with other product versions and software

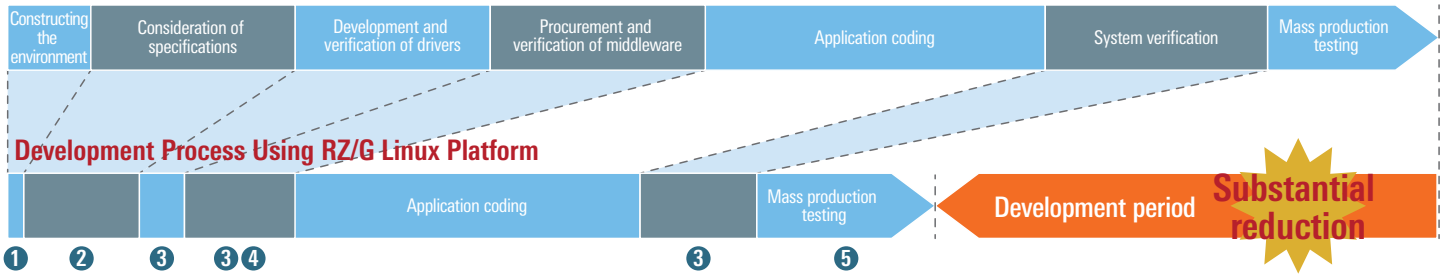


RZ/G Linux Platform

Linux is the recommended OS for use with the RZ/G Series. The RZ/G Linux Platform comprises five components to assist customers in system development. It constitutes a new support format for Linux, distributed by Renesas. In particular, the Civil Infrastructure Platform Super Long Term Support (CIP SLTS) Linux kernel, designed for ultra-long-term maintenance, reduces the maintenance burden on the customer while delivering improved reliability and realtime performance. Using the RZ/G Linux Platform lets you to simplify installation of the Linux environment and reduce the overall cost. You can devote the time you save to the development of competitive value-added services and innovation.

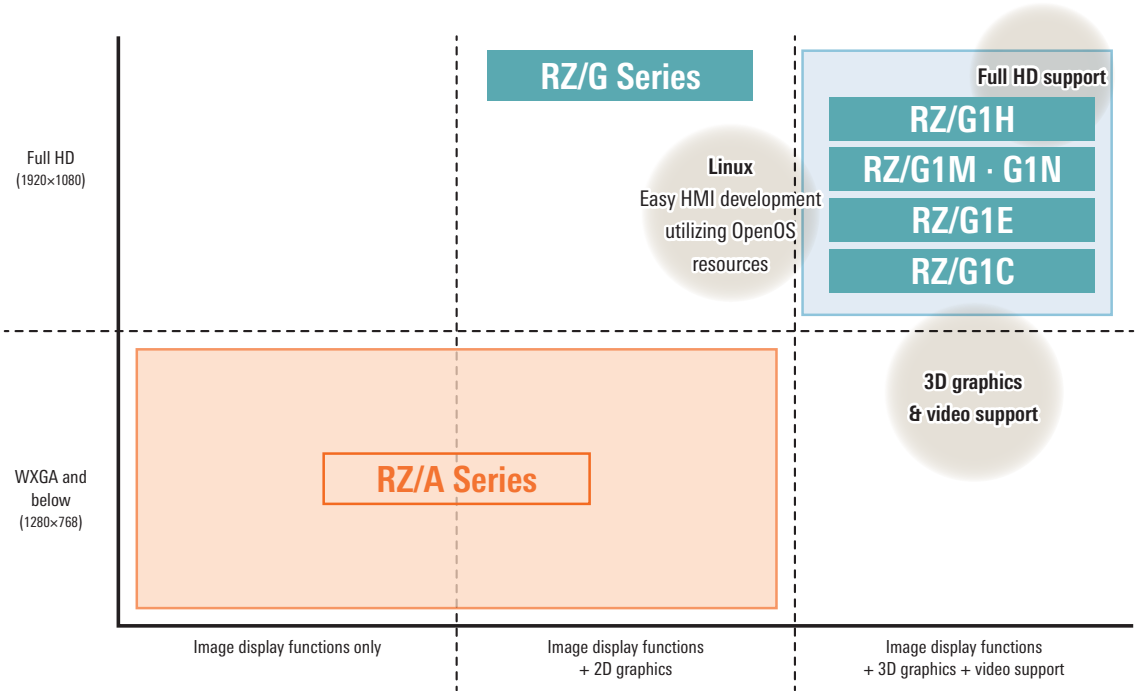
Detailed information on the RZ/G Linux Platform is available on Renesas Marketplace at the following webpage: https://mp.renesas.com/ja-jp/rzg/

Conventional Embedded Device Development Process (Illustration)



❶ RZ/G Linux development environment	Eliminates the need to construct your own Linux environment, including the Linux server.
❷ Verified Linux package	No need to procure OSS. Start and maintain development from a stable framework.
❸ Customization, verification, and analysis tools	These help you make debugging more efficient.
❹ Software add-ons	These make it easier to add functions and shorten the time needed for software verification.
❺ Mass production boards	Using mass production–ready boards reduces costs and workload at the prototyping and mass production stages.

HMI Solutions



- HMI solutions optimized to match the image resolution, functions, and OS
- RZ/G series: Full HD, functions: 3D Gfx, vide, OS: Linux (RichOS)
- RZ/A series: WXGA and below, functions: 2D Gfx, camera input processing, OS: RTOS

RZ/G1H (R8A77420)

CPU core
- Arm® Cortex®-A15, dual-core
  Max. operating frequency: 1.4GHz
- Arm® Cortex®-A7, quad-core
  Max. operating frequency: 780MHz

Cache memory (Cortex®-A15)
- L1 instruction cache: 32KB
- L1 data cache: 32KB
- L2 cache: 2MB

Cache memory (Cortex®-A7)
- L1 instruction cache: 32KB
- L1 data cache: 32KB
- L2 cache: 512KB

External memory
- Ability to connect DDR3L-SDRAM via DDR dedicated bus
- Max. operating frequency: 800MHz
- Data bus width: 32 bits × 2 channels

External expansion
- Ability to connect flash ROM or SRAM directly
- Data bus width: 8/16 bits
- PCI Express 2.0 (1 lane)

3D graphics
- PowerVR™ G6400

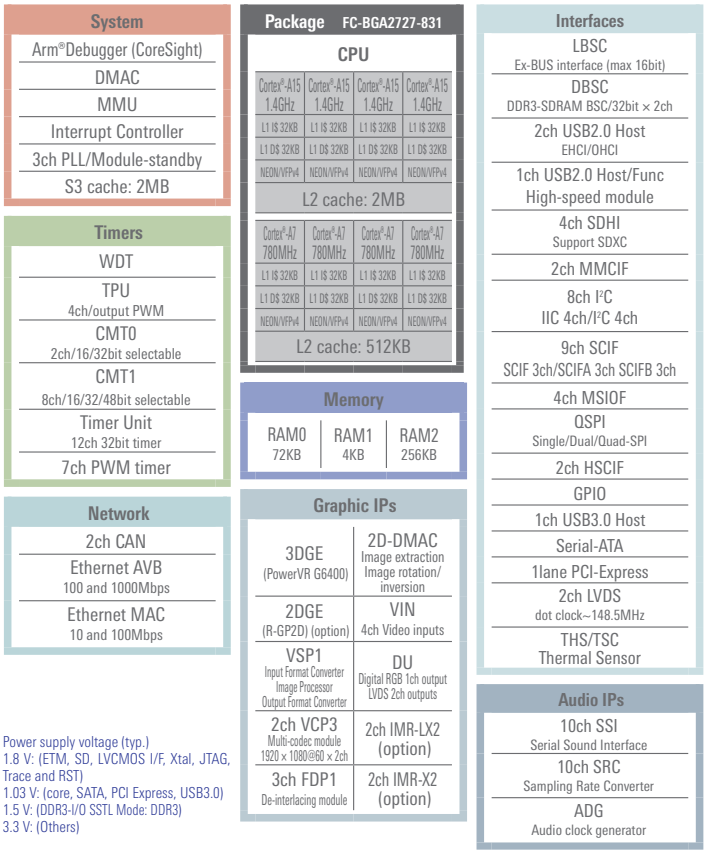
Video functions
- Video display interface × 3 channels (2 channel: LVDS, 1 channel: RGB888)
- Video input interface × 4 channels
- Video codec module: VCP3 × 2 channels
- IP converter module
- Video image processing functions (color conversion, image enlargement/reduction, filtering)

Audio functions
- Sampling rate converter × 10 channels
- Serial sound interface × 10 channels

Storage interfaces
- USB 3.0 host interface × 1 port (wPHY)
- USB 2.0 host interface × 3 ports (wPHY)
- SD host interface × 4 channels (SDXC and UHS-I support)
- Multimedia card interface × 2 channels
- Serial ATA interface × 2 channels

Other peripheral functions
- 32-bit timer × 12 channels
- PWM timer × 7 channels
- I²C bus interface × 8 channels
- Serial communication interface (SCIF) × 9 channels
- Quad serial peripheral interface (QSPI) × 1 channel (boot support)
- Clock-synchronous serial interface (MSIOF) × 4 channels (SPI/IIS support)
- Ethernet controller with AVB support (support for IEEE 802.1BA, IEEE 802.1AS, IEEE 802.1Qav, and IEEE 1722, GMII/MII interface, PHY device connection support)
- Ethernet controller (IEEE 802.3u–compliant MAC on-chip, RMII interface, ability to connect to PHY device)
- Controller area network (CAN) interface × 2 channels
- Interrupt controller (INTC)
- Clock generator (CPG): on-chip PLL
- On-chip debug function

RZ/G1H (R8A77420) block diagram



Power supply voltage (typ.)
1.8 V: (ETM, SD, LVCMOS I/F, Xtal, JTAG, Trace and RST)
1.03 V: (core, SATA, PCI Express, USB3.0)
1.5 V: (DDR3-I/O SSTL Mode: DDR3)
3.3 V: (Others)

RZ/G1M (R8A77430)

CPU core
- Arm® Cortex®-A15, dual-core Max. operating frequency: 1.5GHz

Cache memory
- L1 instruction cache: 32KB
- L1 data cache: 32KB
- L2 cache: 1MB

External memory
- Ability to connect DDR3L-SDRAM via DDR dedicated bus
- Max. operating frequency: 800MHz
- Data bus width: 32 bits × 2 channels

External expansion
- Ability to connect flash ROM or SRAM directly
- Data bus width: 8/16 bits
- PCI Express 2.0 (1 lane)

3D graphics
- PowerVR™ SGX544MP2

Video functions
- Video display interface × 2 channels (1 channel: LVDS, 1 channel: RGB888)
- Video input interface × 3 channels
- Video codec module: VCP3
- IP converter module
- Video image processing functions (color conversion, image enlargement/reduction, filtering)

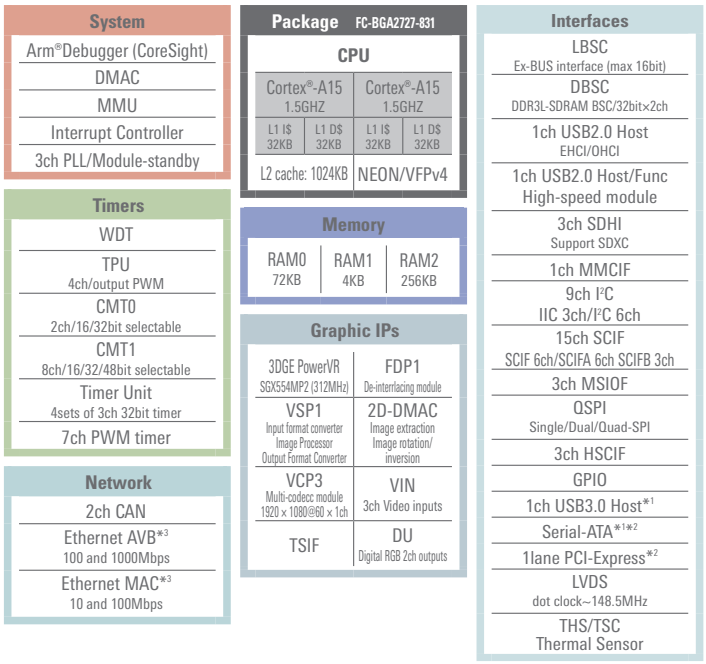
Audio functions
- Sampling rate converter × 10 channels
- Serial sound interface × 10 channels

Security solutions
- AES CBC symmetrical cryptography (128- or 256-bit)
- RSA asymmetric cryptography (1,024- or 2,048-bit)
- SHA-1 and SHA-256 hash algorithms

Storage interfaces
- USB 3.0 host interface × 1 port (wPHY)
- USB 2.0 host interface × 2 ports (wPHY)
- SD host interface × 3 channels (SDXC and UHS-I support)
- Multimedia card interface × 1 channel
- Serial ATA interface × 2 channels

Other peripheral functions
- 32-bit timer × 12 channels
- PWM timer × 7 channels
- I²C bus interface × 9 channels
- Serial communication interface (SCIF) × 15 channels
- Quad serial peripheral interface (QSPI) × 1 channel (boot support)
- Clock-synchronous serial interface (MSIOF) × 3 channels (SPI/IIS support)
- Ethernet controller with AVB support (support for IEEE 802.1BA, IEEE 802.1AS, IEEE 802.1Qav, and IEEE 1722, GMII/MII interface, PHY device connection support)
- Ethernet controller (IEEE 802.3u–compliant MAC on-chip, RMII interface, ability to connect to PHY device)
- Controller area network (CAN) interface × 2 channels
- Interrupt controller (INTC)
- Clock generator (CPG): on-chip PLL
- On-chip debug function

RZ/G1M (R8A77430) block diagram



Power supply voltage (typ.)
1.8 V: (ETM, SD, LVCMOS I/F, Xtal, JTAG, Trace and RST)
1.03 V: (core, SATA, PCI Express, USB3.0)
1.35 V: (DDR3-I/O SSTL Mode: DDR3L)
3.3 V: (Others)
*1. Since PHY is used by both the USB 3.0 and SATA-0 functions, only one of these functions may be selected.
*2. Since PHY is used by both the PCI-e and SATA-1 functions, only one of these functions may be selected.
*3. Due to pin multiplexing, only one of these functions may be selected.

RZ/G1N (R8A77440)

CPU core
- Arm® Cortex®-A15, dual-core Max. operating frequency: 1.5GHz

Cache memory (Cortex®-A15)
- L1 instruction cache: 32KB
- L1 data cache: 32KB
- L2 cache: 1MB

External memory
- Ability to connect DDR3L-SDRAM via DDR dedicated bus
- Max. operating frequency: 800MHz
- Data bus width: 32 bits × 1 channel

External expansion
- Ability to connect flash ROM or SRAM directly
- Data bus width: 8/16 bits
- PCI Express 2.0 (1 lane)

3D graphics
- PowerVR™ SGX544MP2

Video functions
- Video display interface × 2 channels (1 channel: LVDS, 1 channel: RGB888)
- Video input interface × 3 channels
- Video codec module: VCP3
- IP converter module
- Video image processing functions (color conversion, image enlargement/reduction, filtering)

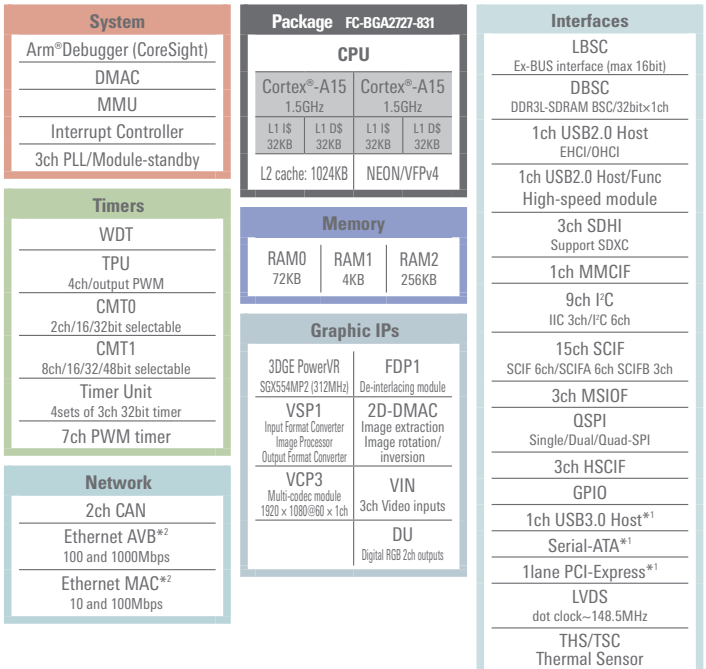
Audio functions
- Sampling rate converter × 10 channels
- Serial sound interface × 10 channels

Security solutions
- AES CBC symmetrical cryptography (128- or 256-bit)
- RSA asymmetric cryptography (1,024- or 2,048-bit)
- SHA-1 and SHA-256 hash algorithms

Storage interfaces
- USB 3.0 host interface × 1 port (wPHY)
- USB 2.0 host interface × 2 ports (wPHY)
- SD host interface × 3 channels (SDXC and UHS-I support)
- Multimedia card interface × 1 channel
- Serial ATA interface × 1 channel

Other peripheral functions
- 32-bit timer × 12 channels
- PWM timer × 7 channels
- I²C bus interface × 9 channels
- Serial communication interface (SCIF) × 15 channels
- Quad serial peripheral interface (QSPI) × 1 channel (boot support)
- Clock-synchronous serial interface (MSIOF) × 3 channels (SPI/IIS support)
- Ethernet controller with AVB support (support for IEEE 802.1BA, IEEE 802.1AS, IEEE 802.1Qav, and IEEE 1722, GMII/MII interface, PHY device connection support)
- Ethernet controller (IEEE 802.3u–compliant MAC on-chip, RMII interface, ability to connect to PHY device)
- Controller area network (CAN) interface × 2 channels
- Interrupt controller (INTC)
- Clock generator (CPG): on-chip PLL
- On-chip debug function

RZ/G1N (R8A77440) block diagram



Power supply voltage (typ.)
1.8 V: (ETM, SD, LVCMOS I/F, Xtal, JTAG, Trace and RST)
1.03 V: (core, SATA, PCI Express, USB3.0)
1.35 V: (DDR3-I/O SSTL Mode: DDR3L)
3.3 V: (Others)
*1. Since PHY is used by the USB 3.0, SATA-0, and PCI-e functions, only one of these functions may be selected.
*2. Due to pin multiplexing, either Ethernet AVB or Ethernet MAC must be selected.

RZ/G1E (R8A77450)

CPU core
- Arm® Cortex®-A7, dual-core Max. operating frequency: 1.0GHz

Cache memory
- L1 instruction cache: 32KB
- L1 data cache: 32KB
- L2 cache: 512KB

External memory
- Ability to connect DDR3-SDRAM via DDR dedicated bus
- Max. operating frequency: 666MHz
- Data bus width: 32 bits × 1channel

External expansion
- Ability to connect flash ROM or SRAM directly
- Data bus width: 8/16 bits

3D graphics
- PowerVR™ SGX540

Video functions
- Video display interface × 2 channels (RGB888)
- Video input interface × 2 channels
- Video codec module: VCP3
- IP converter module
- Video image processing functions (color conversion, image enlargement/reduction, filtering)

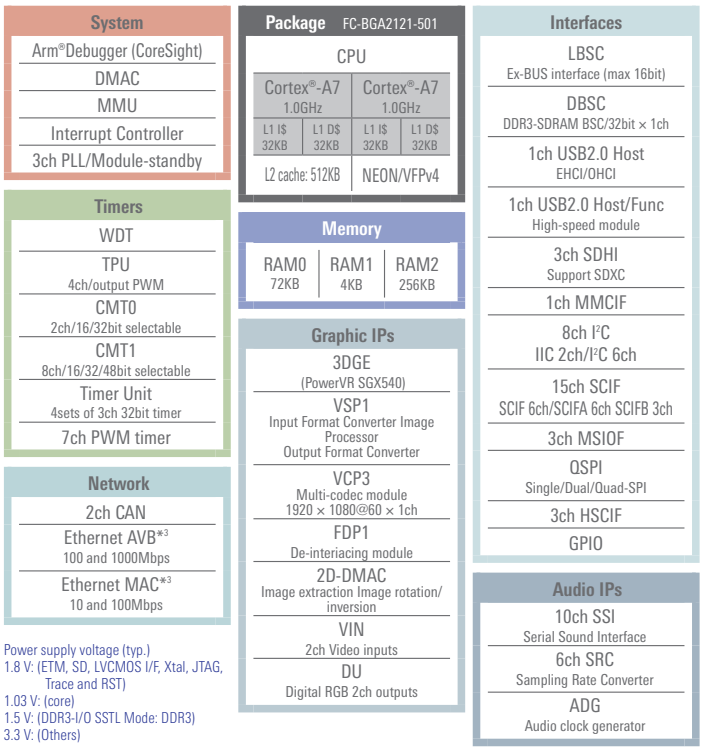
Audio functions
- Sampling rate converter × 6 channels
- Serial sound interface × 10 channels

Security solutions
- AES CBC symmetrical cryptography (128- or 256-bit)
- RSA asymmetric cryptography (1,024- or 2,048-bit)
- SHA-1 and SHA-256 hash algorithms

Storage interfaces
- USB 3.0 host interface × 1 port (wPHY)
- USB 2.0 host interface × 2 ports (wPHY)
- SD host interface × 3 channels (SDXC and UHS-I support)
- Multimedia card interface × 1 channel

Other peripheral functions
- 32-bit timer × 12 channels
- PWM timer × 7 channels
- I²C bus interface × 8 channels
- Serial communication interface (SCIF) × 15 channels
- Quad serial peripheral interface (QSPI) × 1 channel (boot support)
- Clock-synchronous serial interface (MSIOF) × 3 channels (SPI/IIS support)
- Ethernet controller with AVB support (support for IEEE 802.1BA, IEEE 802.1AS, IEEE 802.1Qav, and IEEE 1722, GMII/MII interface, PHY device connection support)
- Ethernet controller (IEEE 802.3u–compliant MAC on-chip, RMII interface, ability to connect to PHY device)
- Controller area network (CAN) interface × 2 channels
- Interrupt controller (INTC)
- Clock generator (CPG): on-chip PLL
- On-chip debug function

RZ/G1E (R8A77450) block diagram



RZ/G1C (R8A77470)

CPU core
- Arm® Cortex®-A7, dual-core Max. operating frequency: 1.0GHz

Cache memory (Cortex®-A15)
- L1 instruction cache: 32KB
- L1 data cache: 32KB
- L2 cache: 512KB

External memory
- Ability to connect DDR3L-SDRAM via DDR dedicated bus
- Max. operating frequency: 500MHz
- Data bus width: 32 bits × 1 channel

External expansion
- Ability to connect flash ROM or SRAM directly
- Data bus width: 8/16 bits

3D graphics
- PowerVR™ SGX531

Video functions
- Video display interface × 2 channels (1 channel: LVDS, 2 channels: RGB888, 1 channel: selected from NTSCk <CVBS>)
- Video input interface × 2 channels
- Video codec module: VCP3
- IP converter module
- Video image processing functions (color conversion, image enlargement/reduction, filtering)

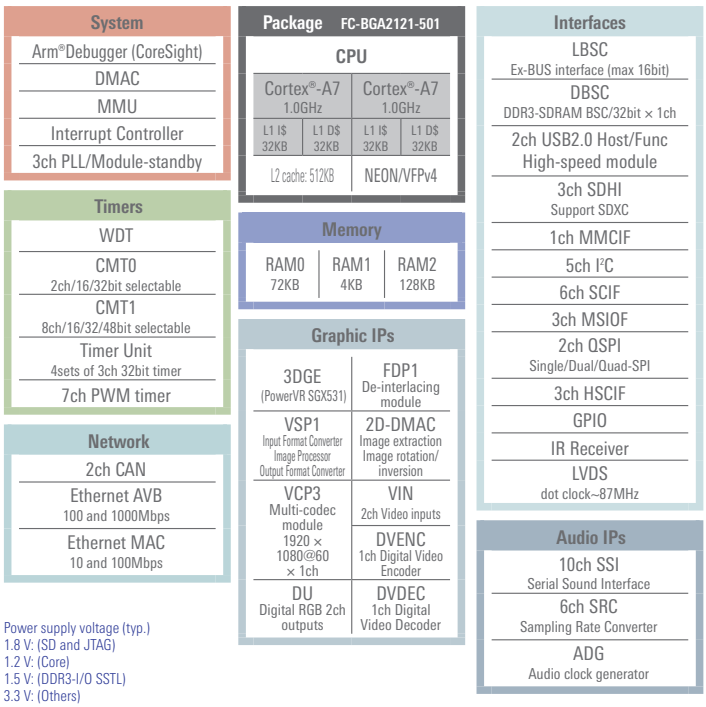
Audio functions
- Sampling rate converter × 6 channels
- Serial sound interface × 10 channels

Security solutions
- AES CBC symmetrical cryptography (128- or 256-bit)
- RSA asymmetric cryptography (1,024- or 2,048-bit)
- SHA-1 and SHA-256 hash algorithms

Storage interfaces
- USB 2.0 host interface × 2 ports (wPHY)
- SD host interface × 3 channels (SDXC and UHS-I support)
- Multimedia card interface × 1 channel

Other peripheral functions
- 32-bit timer × 12 channels
- PWM timer × 7 channels
- I²C bus interface × 5 channels
- Serial communication interface (SCIF) × 6 channels
- Quad serial peripheral interface (QSPI) × 2 channels (boot support)
- Clock-synchronous serial interface (MSIOF) × 3 channels (SPI/IIS support)
- Ethernet controller with AVB support (support for IEEE 802.1BA, IEEE 802.1AS, IEEE 802.1Qav, and IEEE 1722, GMII/MII interface, PHY device connection support)
- Ethernet controller (IEEE 802.3u–compliant MAC on-chip, RMII interface, ability to connect to PHY device)
- Controller area network (CAN) interface × 2 channels
- Interrupt controller (INTC)
- Clock generator (CPG): on-chip PLL
- On-chip debug function

RZ/G1C (R8A77470) block diagram



RZ/G Series: Application Fields

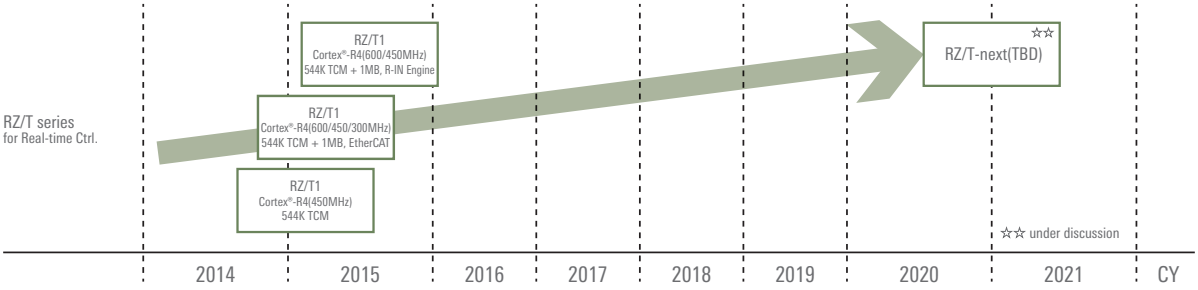
The HMI can be made more expressive by making full use of the 3D graphics and video capabilities.

RZ/G Linux Platform Solutions from Partner Companies

Visit the webpage below for the latest information on RZ/G Linux Platform development tools, including solutions from partner companies.
https://www.renesas.com/products/microcontrollers-microprocessors/rz/softtools.html#rzg

RZ/T Series

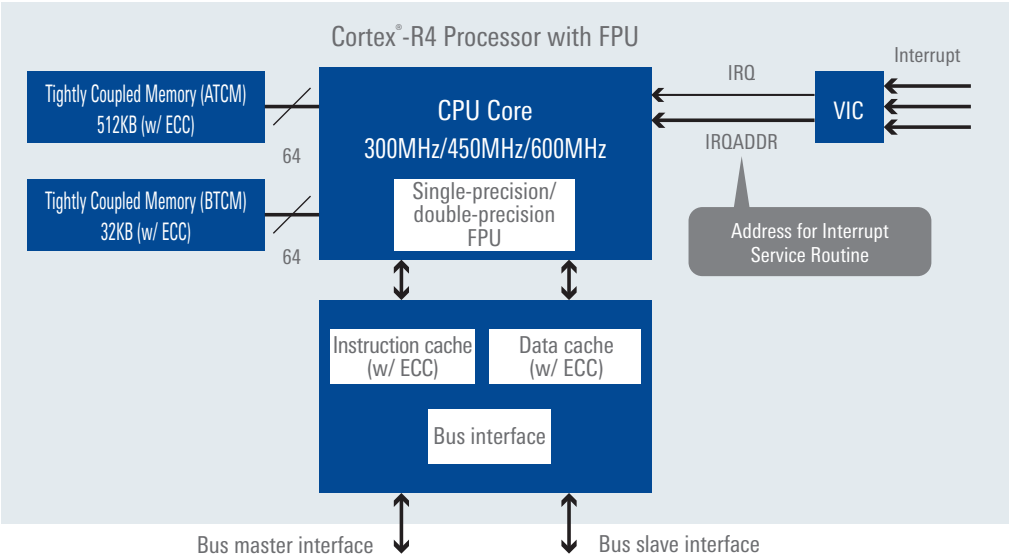
RZ/T Series: Roadmap



RZ/T Series Features

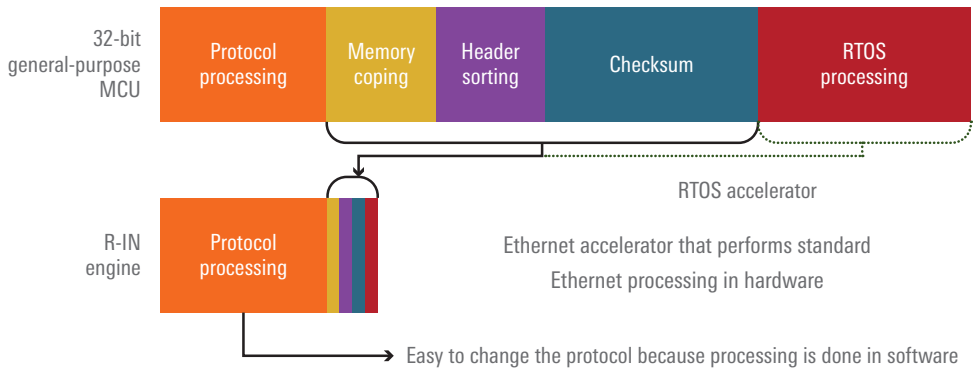
- High-performance, high-speed real-time control
- R-IN engine
- Integrated peripheral functions

High-performance, high-speed real-time control



- High-speed RAM directly connected to the CPU for high-speed processing and dependable real-time responsiveness without caching
- ECC for enhanced reliability
- Vectored Interrupt Controller (VIC) to assure interrupt responsiveness suitable for embedded control

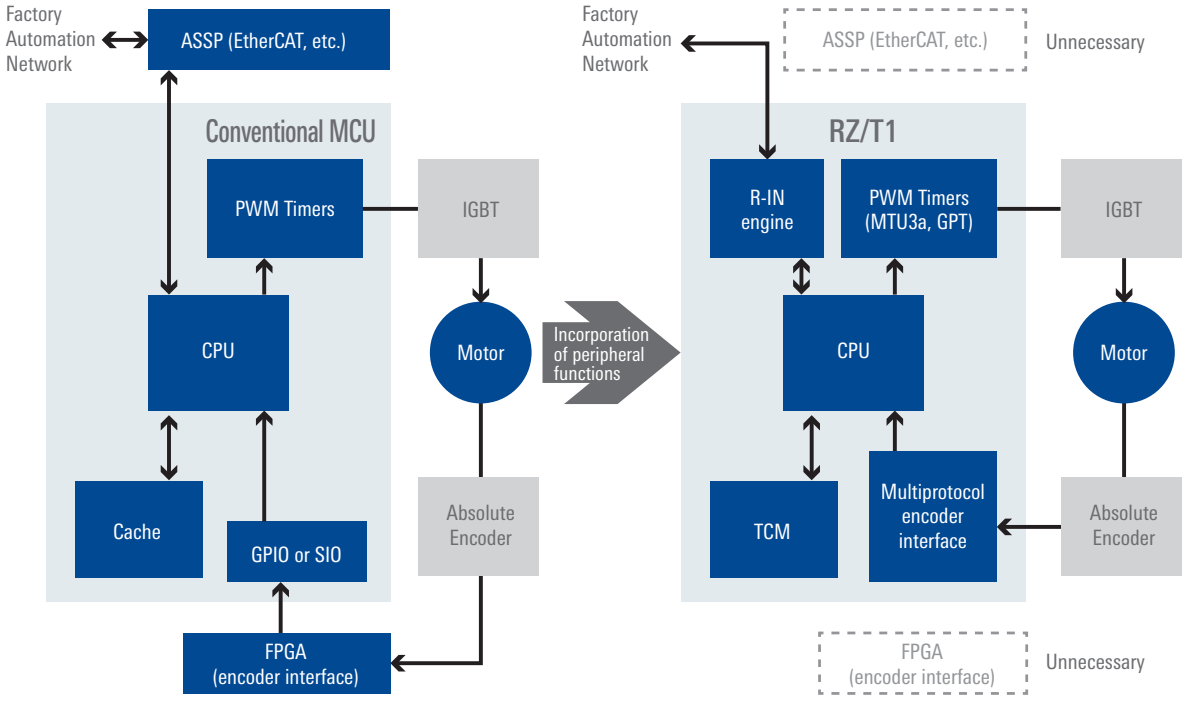
R-IN engine



High-speed, energy-efficient communication
Flexible support for multiple protocols

- R-IN engine industrial Ethernet communication accelerator performs standard Ethernet processing in hardware.
- Network processing is up to four times as fast.

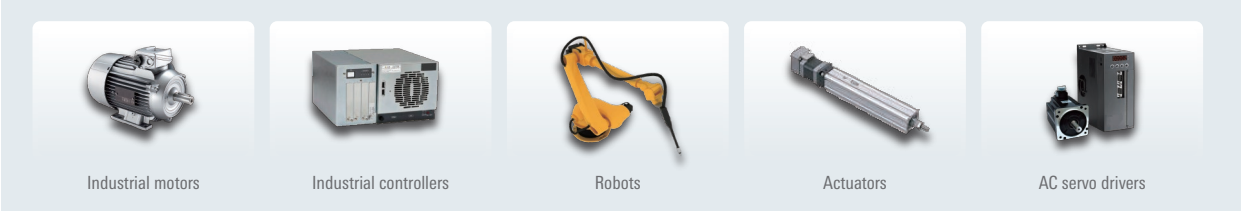
Integrated peripheral functions



- The encoder interface was external with conventional FPGA or ASIC approaches but is now integrated on-chip.
- This one-chip AC servo solution helps reduce the component count and save space.

RZ/T Series: Application Fields

High-speed operation at 300MHz/450MHz/600MHz provides higher performance and improved functionality for industrial equipment such as industrial motors or AC servo drivers. Products incorporating the R-IN engine accelerator for industrial Ethernet communication can also handle a variety of industrial Ethernet processing tasks without sacrificing real-time performance.



RZ/T1 (with multi-protocol support)

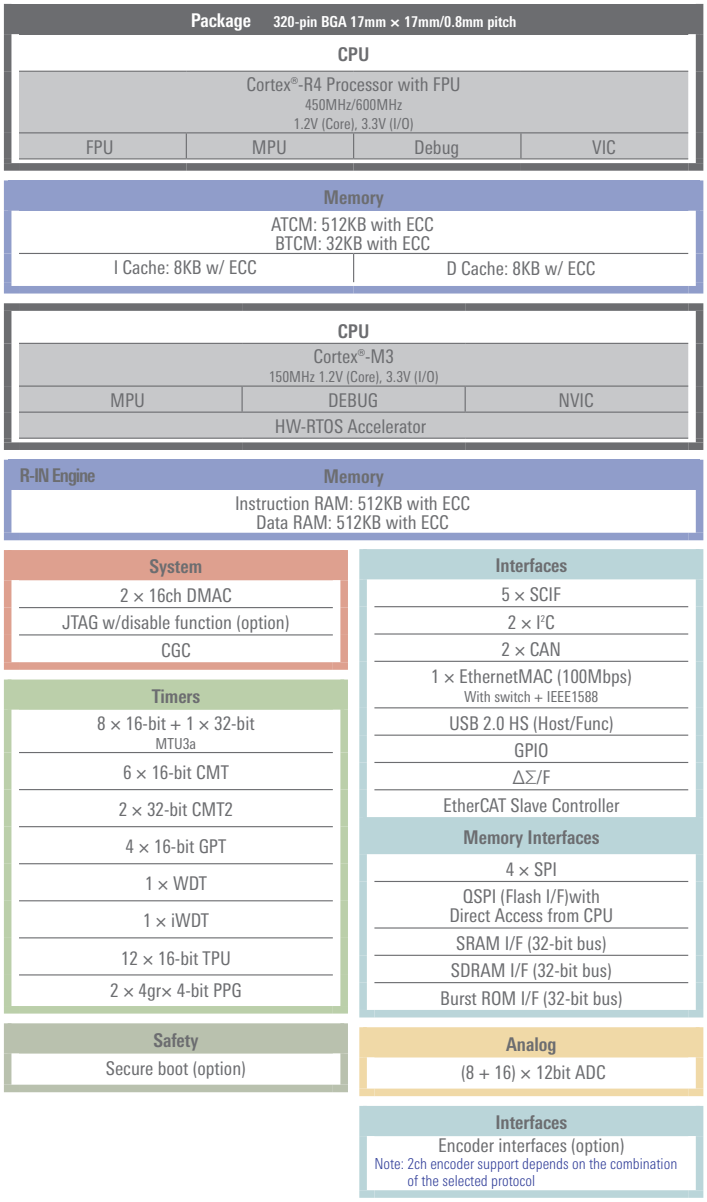
High performance CPU (Arm® Cortex®-R4 Processor with FPU)
- Operating frequency: 450MHz/600MHz
- High-performance, high-speed real-time control
- Single-precision/double-precision floating-point unit

On-chip memory
- Tightly Coupled Memory: 512KB (w/ ECC) + 32KB (w/ ECC)
- R-IN engine instruction memory: 512KB (w/ ECC) + data memory: 512KB (w/ ECC)

Features
- Industrial Ethernet communication accelerator with multi-protocol support (R-IN engine)
- EtherCAT slave controller
- PWM timers: MTU3a, GPT
- Encoder interface (Nikon A-format™/BiSS-C/EnDat2.2/HIPERFACE DSL®/Tamagawa) (option)
  Note: 2ch encoder support depends on the combination of the selected protocol
- High Speed USB
- Secure boot (option)
- Safety functions
  – ECC memory
  – CRC (32-bit)
  – Independent WDT: Operating on dedicated on-chip oscillator
- ΔΣ interface
- 100Mbps EtherMAC (with Ethernet switch)
- Ethernet accelerator
- Power supply voltage: 1.2V, 3.3V

Package
- FBGA 320pin (17mm × 17mm,0.8mm pitch)

RZ/T1 (with multi-protocol support) block diagram



RZ/T1 (with EtherCAT support)

High performance CPU (Arm® Cortex®-R4 Processor with FPU)
- Operating frequency: 300MHz/450MHz/600MHz
- High-performance, high-speed real-time control
- Single-precision/double-precision floating-point unit

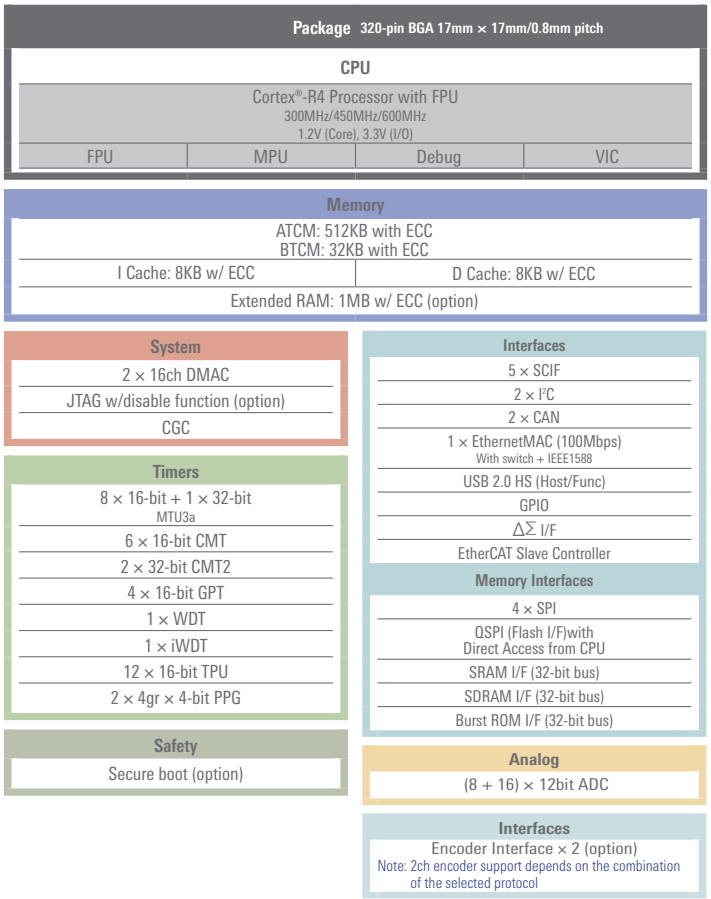
On-chip memory
- Tightly Coupled Memory: 512KB (w/ ECC) + 32KB (w/ ECC)
- Expanded RAM: 1MB, w/ ECC (option)

Features
- EtherCAT slave controller
- PWM timers: MTU3a, GPT
- Encoder interface (Nikon A-format™/BiSS-C/EnDat2.2/HIPERFACE DSL®/Tamagawa) (option)

  Note: 2ch encoder support depends on the combination of the selected protocol
- High Speed USB
- Secure boot (option)
- Safety functions
  - ECC memory
  - CRC (32-bit)
  - Independent WDT: Operating on dedicated on-chip oscillator
- ΔΣ interface
- 100Mbps EtherMAC (with Ethernet switch)
- Ethernet accelerator
- Power supply voltage: 1.2V, 3.3V

Package
- FBGA 320pin (17mm × 17mm, 0.8mm pitch)

RZ/T1 (with EtherCAT support) block diagram



RZ/T1 (no industrial communication support)

High performance CPU (Arm® Cortex®-R4)
- Operating frequency: 450MHz/600MHz
- High-performance, high-speed real-time control
- Single-precision/double-precision floating-point unit

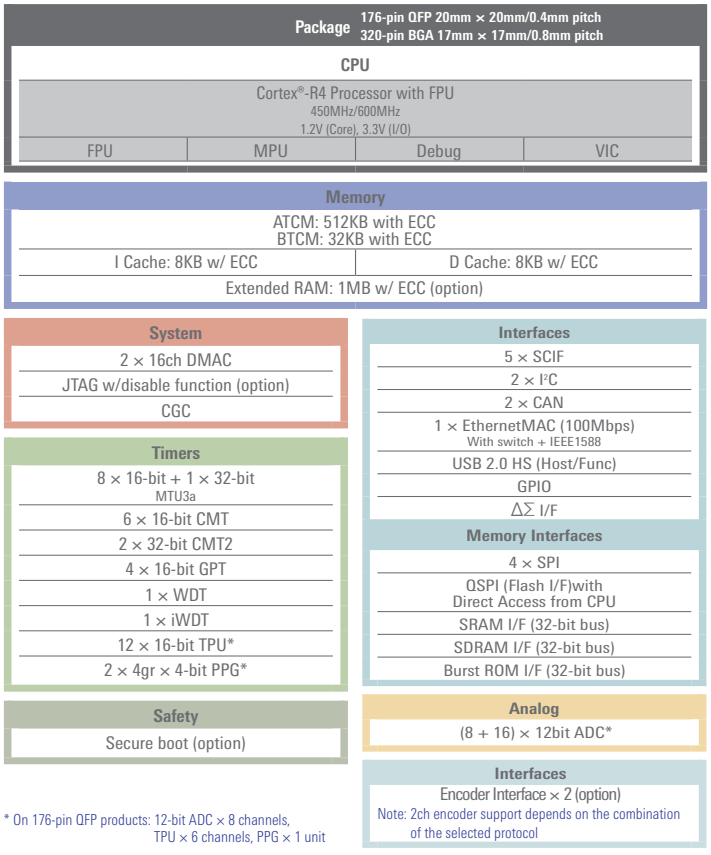
On-chip memory
- Tightly Coupled Memory: 512KB (w/ ECC) + 32KB (w/ ECC)
- Expanded RAM: 1MB, w/ ECC (option)

Features
- PWM timers: MTU3a, GPT
- Encoder interface (Nikon A-format™/BiSS-C/EnDat2.2/HIPERFACE DSL®/Tamagawa) (option)

  Note: 2ch encoder support depends on the combination of the selected protocol
- High Speed USB
- Secure boot (option)
- Safety functions
  - ECC memory
  - CRC (32-bit)
  - Independent WDT: Operating on dedicated on-chip oscillator
- ΔΣ interface
- 100Mbps EtherMAC (with Ethernet switch)
- Ethernet accelerator
- Power supply voltage: 1.2V, 3.3V

Package
- FBGA 320pin (17mm × 17mm,0.8mm pitch)
- QFP 176pin (20mm × 20mm,0.4mm pitch)

RZ/T1 (no industrial communication support) block diagram



* On 176-pin QFP products: 12-bit ADC × 8 channels,
TPU × 6 channels, PPG × 1 unit

Utilizing the Arm® Ecosystem

Utilizing Renesas' Experience and the Arm® Ecosystem

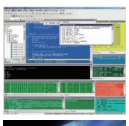
Customers can benefit from solutions combining Renesas' accumulated experience in the microcontroller industry and the global ecosystem of Arm® partners. Products such as development environments, OS, and middleware are available from partner companies supporting the RZ/T series.

RZ/T Series: Development Environments (Integrated Development Environments)

	IAR SYSTEMS	arm	RENESAS
Development environments	• IAR Embedded Workbench® for Arm® 	• DS-5 	• e² studio*1 
Compilers	• IAR C/C++ compiler*2	• Arm CC*3	• GNU tool*4
Other tools	• AP4 code generation tool from Renesas is compatible.	• AP4 code generation tool from Renesas is compatible.	• Code generation function available as a plug-in.
ICEs	• I-jet™/I-jet Trace™ for Arm Cortex®-A/R/M • JTAGjet-Trace  	• DSTREAM™ • ULINKpro™ • ULINKproD™ • ULINK2™ 	• J-Link LITE from Segger • J-Link series from Segger*5 

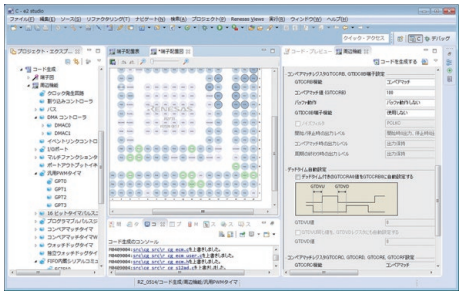
*1. Eclipse-based development environment from Renesas (http://renesas.com/e2studio)
*2. Two versions of the software are available for download free of charge. One limits the code size to 32KB and can be used with no time limitation. The other has no limit on code size and expires after 30 days. (www.iar.com/EWARM)
*3. Arm CC is included in DS-5. In addition to the popularly priced DS-5 RZ/A and RZ/T editions, a fully functional evaluation version of DS-5 that expires after 30 days is available free of charge. Contact your DS-5 dealer for details.
*4. GNU TOOLS & SUPPORT Website (https://gcc-renesas.com)
*5. Renesas does not handle ICEs from Segger. Contact a sales agent for details.

RZ/T Series: Development Tools (Debuggers, ICEs)

	KUC Kyoto Microcomputer Co., Ltd.	DTS INSIGHT Our insight, your value	Computex
Debuggers	• PARTNER-Jet2 	• microVIEW-PLUS 	• CSIDE version 6 
ICEs		• adviceLUNA II 	• PALMiCE3 
Supported compilers	• exeGCC from Kyoto Microcomputer • GNU tool*1 • Arm CC*2 • IAR C/C++ compiler,*3 etc.	• Arm CC*2 • GNU tool,*1 etc.	• Arm CC*2 • IAR C/C++ compiler*3 • GNU tool,*1 etc.

*1. GNU TOOLS & SUPPORT Website (https://gcc-renesas.com)
*2. Arm CC is included in DS-5. In addition to the popularly priced DS-5 RZ/A and RZ/T editions, a fully functional evaluation version of DS-5 that expires after 30 days is available free of charge. Contact your DS-5 dealer for details.
*3. Two versions of the software are available for download free of charge. One limits the code size to 32KB and can be used with no time limitation. The other has no limit on code size and expires after 30 days. (www.iar.com/EWARM)

e² studio: Integrated Development Environment Based on Eclipse

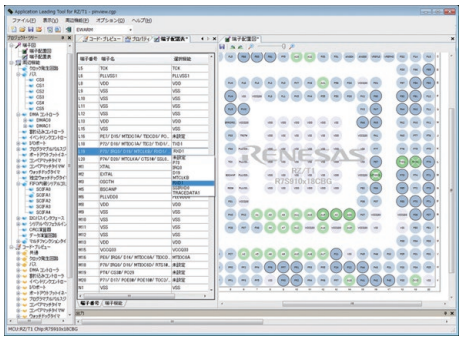


e² studio is an integrated development environment based on the Eclipse open source integrated development environment and CDT plug-ins supporting development in C/C++. The version of e² studio that is compatible with the RZ/T series provides support for a code generation plug-in.

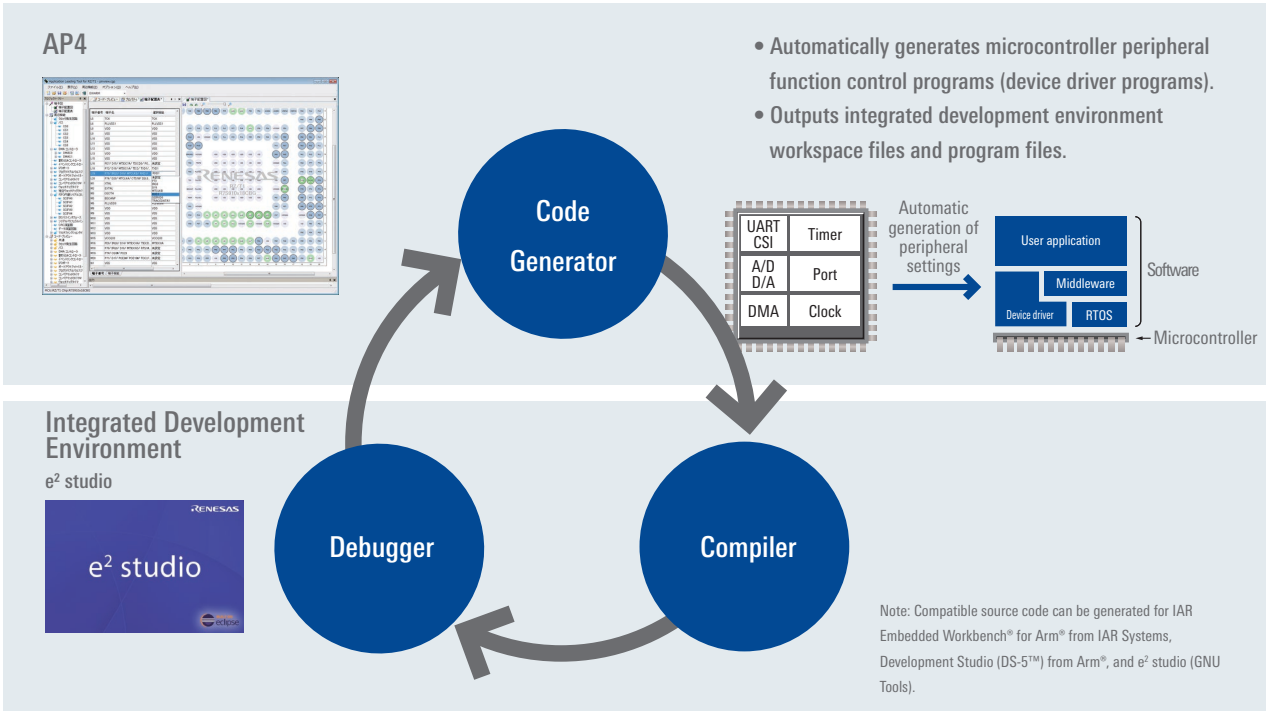
C/C++ perspective: code generation plug-in

A code generation plug-in is available that enables the user to generate device driver programs for peripheral functions of Renesas microcontrollers (timers, UART, A/D converter, etc.) by entering settings in a graphical user interface. It is possible to specify the processing of multiplexed pins in a pin table and view a pin assignment diagram to confirm the settings.

AP4: Code Generation Support Tool



AP4 is a standalone tool that automatically generates peripheral function control programs (device driver programs) based on settings entered by the user. The build tool (compiler) is selectable. This makes it possible to generate peripheral function control program code to match a specific build tool and enables interoperation with integrated development environments. (https://www.renesas.com/ap4)
The version of AP4 that is compatible with the RZ/T series can generate compatible source code for IAR Embedded Workbench® for Arm® from IAR Systems, Development Studio (DS-5™) from Arm®, and e² studio (GNU Tools).

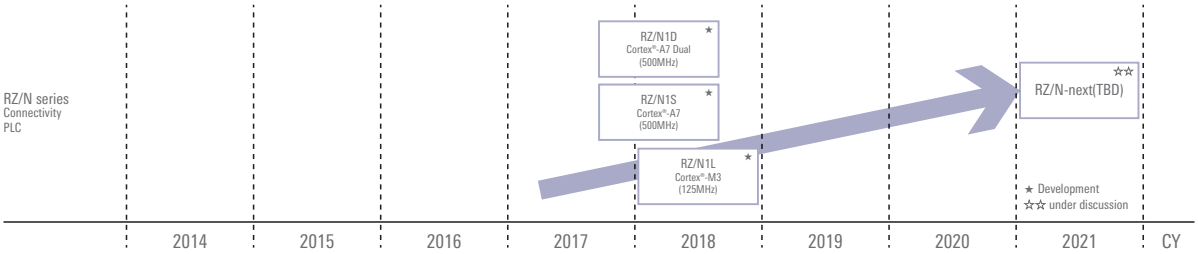


RZ/T Series: Solutions from Partner Companies

Visit the webpage below for the latest information on RZ/T Series development tools, including solutions from partner companies.
https://www.renesas.com/products/microcontrollers-microprocessors/rz/softtools.html#rzt

RZ/N Series

RZ/N Series: Roadmap

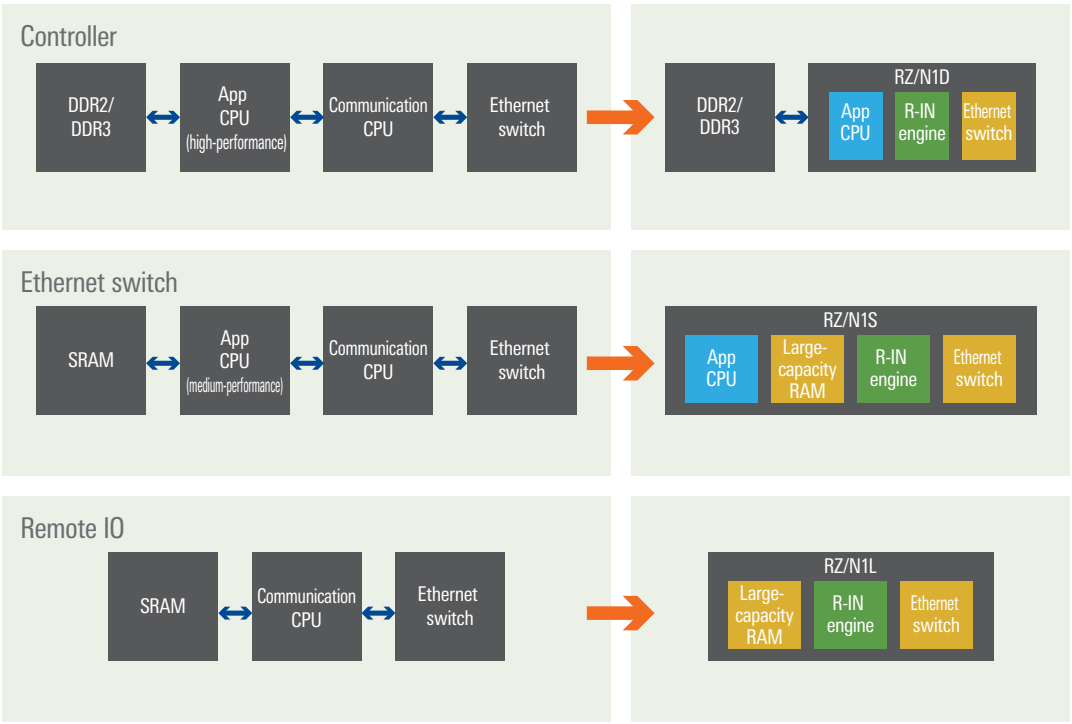


RZ/N Series Features

1. Provides optimized microcontrollers for a variety of industrial network applications.
2. On-chip R-IN engine enables implementation of major industrial Ethernet protocols (slave).
3. Redundant network configuration reduces network downtime to zero.

1.Provides optimized microcontrollers for a variety of industrial network applications.

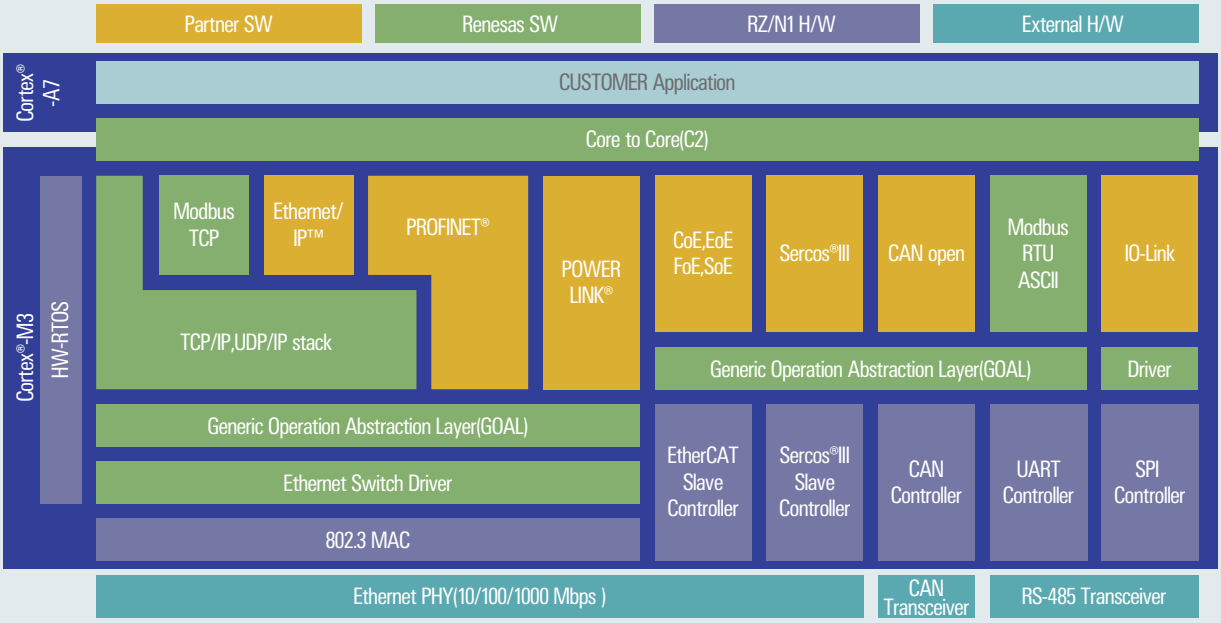
- Integrated 5-port gigabit Ethernet switch and lineup of three CPU types make it possible to provide the optimal microcontrollers for a wide range of industrial network applications.
  - ✓ 5-port gigabit Ethernet switch and two independent MAC units support applications such as PLC devices and Ethernet switches. Integration of peripheral components helps reduce BOM cost.
  - ✓ Lineup of three CPU types for excellent hardware scalability: Dual-core Cortex®-A7 (500MHz × 2), single-core Cortex®-A7 (500MHz), and R-IN engine only (125MHz).



2.On-chip R-IN engine enables implementation of major industrial Ethernet protocols (slave).

R-IN engine supports a wide range of protocols and high-speed communication processing.

The excellent CPU processing performance of the Cortex®-A7 and large-capacity memory support a variety of applications.



3.Redundant network configuration reduces network downtime to zero.

Advanced redundant network configuration support helps eliminate network downtime.

— Redundant network connections: Parallel Redundancy Protocol (PRP)

— Looped network connections: Rapid Spawning Trees (RSTP), High-Availability Seamless Redundancy (HSR)

RZ/N Series: Target Applications


PLC industrial controllers


Industrial switches


Sensor hubs


Gateways


Communication modules


Remote I/O

RZ/N1D Group

CPU core
- Arm® Cortex®-A7 dual-core processor
- Operating frequency: 500MHz

Cache memory
- L1 I-cache: 16KB × 2, D-cache: 16KB × 2
- L2: 256KB

Internal memory
- 2MB (ECC)

External memory
- DDR2/DDR3 controller
- Quad I/O SPI
- SDIO eMMC
- NAND flash controller

R-IN engine
- Arm® Cortex®-M3
- Operating frequency: 125MHz
- HW-RTOS accelerator
- Ethernet accelerator

Main Ethernet communication functions
- EtherCAT slave controller
- Sercos® III slave controller
- HSR switch (400-pin)
- 5-port Ethernet switch

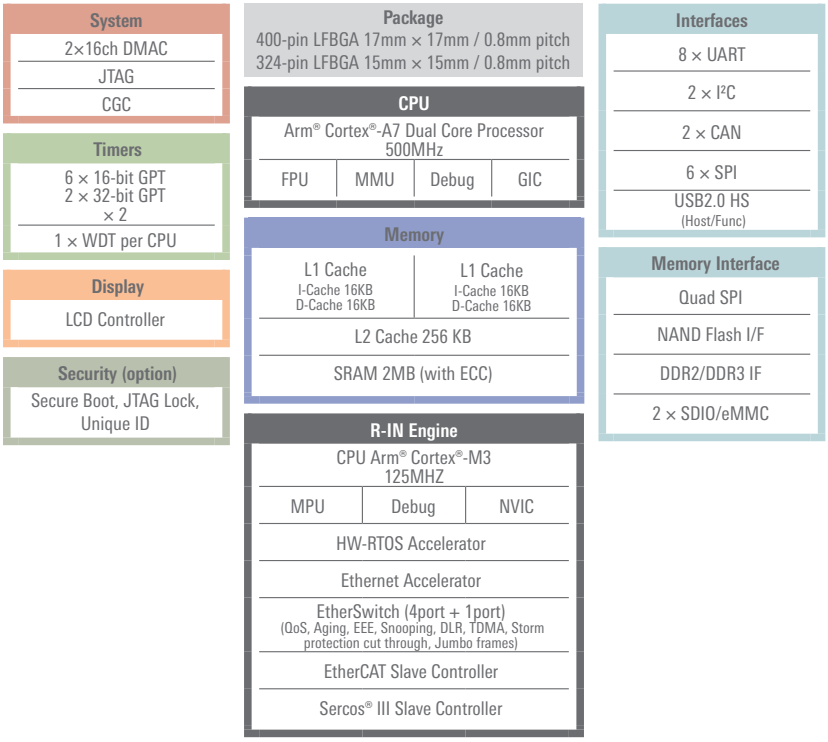
Other communication functions
- UART × 8 channels
- I²C × 2 channels
- USB Host/Function × 1 channel, Host 1 channel
- SPI × 6 channels (master × 4 channels, slave × 2 channels)
- CAN

Other functions
- LCD controller
- ADC: 12-bit × 8 channels × 2 units (400-pin)
- ADC: 12-bit × 8 channels × 1 unit (324-pin)

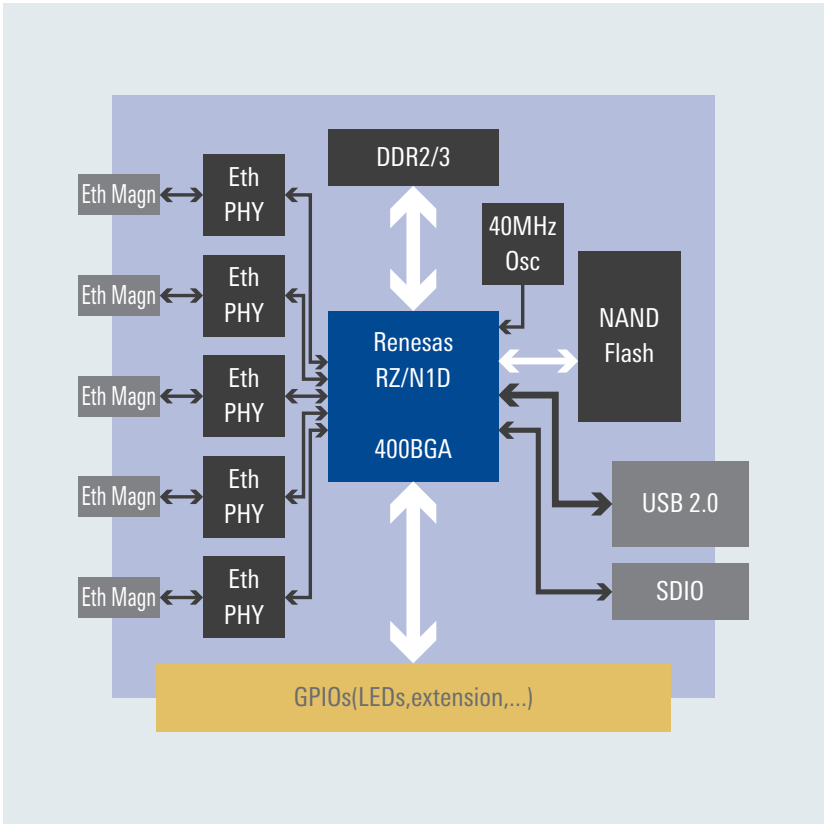
Package
- 400-pin: LFBGA, 17 × 17mm, 0.8mm pin pitch
- 324-pin: LFBGA, 15 × 15mm, 0.8mm pitch

Operating temperature
- Tj = –40°C to +110°C

RZ/N1D block diagram



Application example: Programmable logic controller Block diagram



RZ/N1S Group

CPU core
- Arm® Cortex®-A7 dual-core processor
- Operating frequency: 500MHz

Cache memory
- L1 I-cache: 16KB, D-cache: 16KB
- L2: 128KB

Internal memory
- 6MB (ECC)

External memory
- Quad I/O SPI
- SDIO eMMC
- NAND flash controller

R-IN engine
- Arm® Cortex®-M3
- Operating frequency: 125MHz
- HW-RTOS accelerator
- Ethernet accelerator

Main Ethernet communication functions
- EtherCAT slave controller
- Sercos® III slave controller
- 5-port Ethernet switch

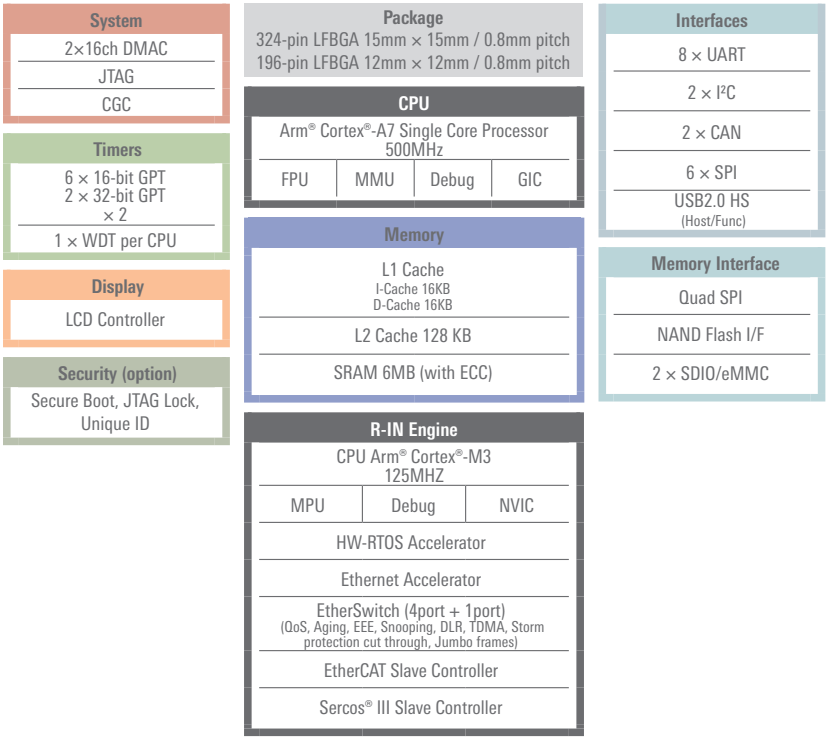
Other communication functions
- UART × 8 channels
- I²C × 2 channels
- USB Host/Function × 1 channel, Host 1 channel
- SPI × 6 channels (master × 4 channels, slave × 2 channels)
- CAN

Other functions
- LCD controller
- ADC: 12-bit × 8 channels × 1 unit

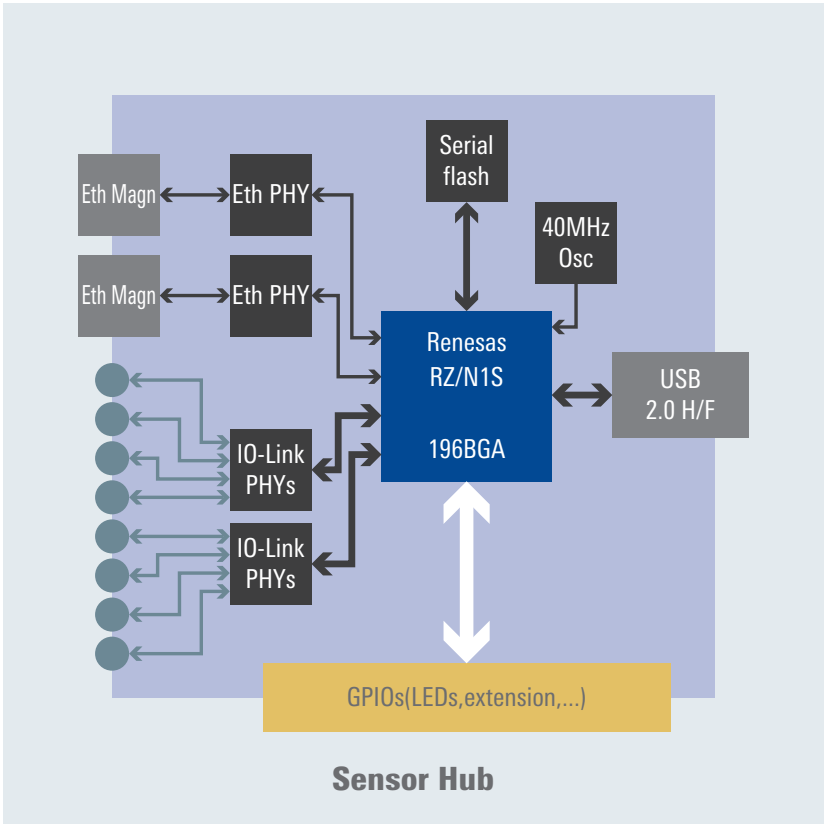
Package
- 324-pin: LFBGA, 15 × 15mm, 0.8mm pin pitch
- 196-pin: LFBGA, 12 × 12mm, 0.8mm pin pitch

Operating temperature
- Tj = –40°C to +110°C

RZ/N1S block diagram



Application example: Sensor Hub block diagram



RZ/N1L Group

R-IN engine
- Arm® Cortex®-M3
- Operating frequency: 125MHz
- HW-RTOS accelerator
- Ethernet accelerator

Internal memory
- 6MB (ECC)

External memory
- Quad I/O SPI
- SDIO eMMC
- NAND flash controller

Main Ethernet communication functions
- EtherCAT slave controller
- Sercos® III slave controller
- GbE Ethernet switch

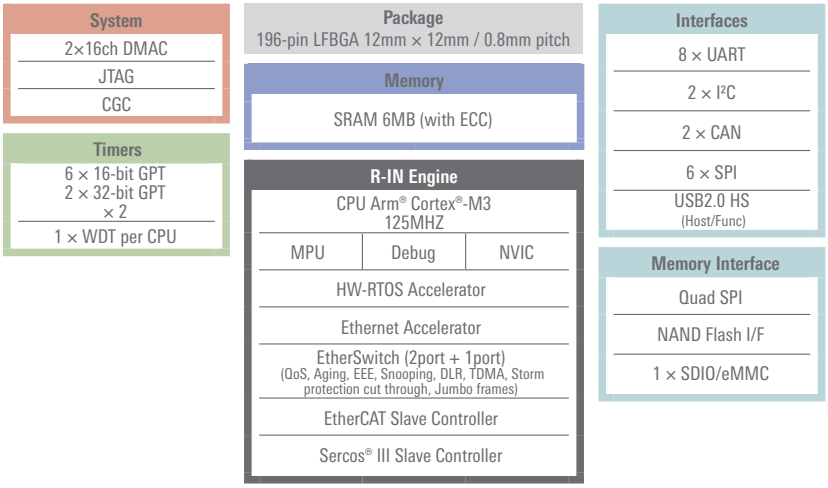
Other communication functions
- UART × 8 channels
- I²C × 2 channels
- USB Host/Function × 1 channel, Host 1 channel
- SPI × 6 channels (master × 4 channels, slave × 2 channels)
- CAN × 2 channels

Other functions
- ADC: 12-bit × 8 channels × 1 unit

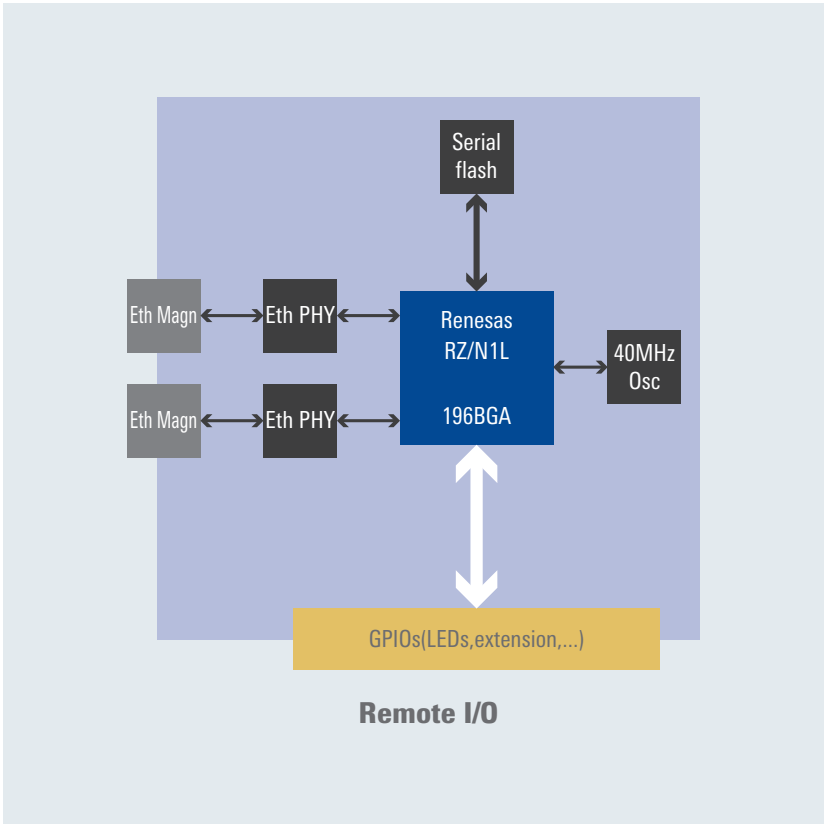
Package
- 196-pin: LFBGA, 12 × 12mm, 0.8mm pin pitch

Operating temperature
- Tj = –40°C to +110°C

RZ/N1L block diagram



Application example: Remote I/O



RZ/N Series: Development Environments

	IAR SYSTEMS	RENESAS
CPU Core	• Cortex®-A7 • Cortex®-M3	• Cortex®-A7 (for Linux)
Debugger	• Embedded • Workbench	• GDB
Compiler	• IAR • C/C++Compiler	• GCC
ICEs	• I-jet™	• J-Link (SEGGER)

RZ/N Series: Solutions from Renesas Partners

Visit the webpage below for the latest information on RZ/N Series development tools, including solutions from partner companies.
https://www.renesas.com/products/microcontrollers-microprocessors/rz/softtools.html#rzn

RZ Specifications

RZ/A2M (176-pin to 324-pin)

Group name	RZ/A2M			
Pin count	176-pin	256-pin	276-pin	324-pin
Part name	R7S921040VCBG	R7S921041VCBG	R7S921042VCBG	R7S921043VCBG
Quality level	Standard quality	Standard quality	Standard quality	Standard quality
CPU core	Arm® Cortex®-A9			
RAM (bytes)	4M			
Cache memory	Primary cache: 64KB (instruction32KB/data32KB), TLB128 Secondary cache: 128KB (Corelink™ Level 2 Cache Controller L2C-310)			
Max. operating frequency (MHz)	528			
Subclock (external: 32.768kHz)	Yes			
PLL	Yes			
Real-time clock	Yes			
Power-on reset	Yes			
Floating-point unit	Yes			
DMA	DMACx16ch			
External memory interfaces	Serial-Flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM, NAND-Flash			
External interrupt pins	41			
I/O ports	70	115	115	151
16-/32-bit timer (channels)	5/3	8/3	8/3	8/3
Watchdog timer (channels)	1			
Other timers	General-purpose PWM timer × 5	General-purpose PWM timer × 6	General-purpose PWM timer × 6	General-purpose PWM timer × 8
PWM output	10	13	13	15
3-phase PWM output function	Yes			
12-bit A/D converter (channels)	8			
CAN (channels)	2 (CAN-FD support)			
Ethernet	2			
IEEE1588PTP	Yes			
USB host function	Yes			
USB peripheral function	Yes			
USB (channels)	1	2	2	2
USB High Speed support	Yes			
USB endpoints	16			
USB isochronous transfer support	Yes			
USB additional information	Low-speed Support (Host only)			
SD host interface (channels)	1	2	2	2
MMC host interface (channels)	1	2	2	2
Clock-synchronous serial interface (channels)	6			
SPI (channels)	3			
UART (channels)	7			
I²C (channels)	4			
LIN (channels)	–			
IEBus (channels)	–			
Serial additional information	SCIF (CSI: 2ch/UART: 5ch), SCI (CSI: 2ch), RSPI (SPI: 3ch), SPI multi (SPI: 1ch), SSI (CSI: 4ch), SPDIF (CSI: 1ch)			
Other display functions	VDC6: WXGA (1280 x 768), JPEG Engine, 2D Accelerator, Sprite engine			
Power supply voltage (V)	1.2/1.8/3.3			
Power supplies	Vcc = LVDSPLLVcc = PLLVcc = 1.14 to 1.26V, PVcc_HO = MIPIAVcc18 = 1.7 to 1.9V PVcc = USBDPVcc1 = USBDPVcc0 = AVcc = USBAPVcc1 = USBAPVcc0 = LVDSAPVcc = 3.0 to 3.6V, PVcc_SPI = PVcc_SD0 = PVcc_SD1 = 3.0 to 3.6V / 1.7 to 1.9V (Refer to the measurement conditions for each item.)			
Operating temperature (°C)	TA = -40 to 85°C			
Package (size [mm])	176-LFBGA (13mm×13mm)	256-LFBGA (11mm×11mm)	272-FBGA (17mm×17mm)	324-FBGA (19mm×19mm)

RZ/A1M (256-pin to 324-pin)

Group name	RZ/A1M				
Pin count	256-pin			324-pin	
Part name	R7S721010VCBG	R7S721010VCFP	R7S721010VLFP	R7S721011VCBG	R7S721011VLBG
Quality level	Standard quality	Standard quality	High quality	Standard quality	High quality
CPU core	Arm® Cortex®-A9				
RAM (bytes)	5M				
Cache memory	Primary cache: 64KB (instruction32KB/data32KB), TLB128 Secondary cache: 128KB (Corelink™ Level 2 Cache Controller L2C-310)				
Max. operating frequency (MHz)	400				
Subclock (external: 32.768kHz)	YES				
PLL	YES				
Real-time clock	YES				
Power-on reset	YES				
Floating-point unit	YES				
DMA	DMAC × 16 ch				
External memory interfaces	Serial flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM, NAND flash				
External interrupt pins	148			180	
I/O ports	139			171	
16-/32-bit timer (channels)	5/2				
Watchdog timer (channels)	1				
Other timers	Motor Control PWM Timer × 8				
PWM output	16				
3-phase PWM output function	YES				
12-bit A/D converter (channels)	8				
CAN (channels)	5				
Ethernet	YES				
Ethernet AVB	YES				
USB host function	YES				
USB peripheral function	YES				
USB (channels)	2				
USB High Speed support	YES				
USB endpoints	16				
USB isochronous transfer support	YES				
USB additional information	Low-speed Support (Host only)				
SD host interface (channels)	2				
MMC host interface (channels)	1				
Clock-synchronous serial interface (channels)	17				
SPI (channels)	5				
UART (channels)	8				
I²C (channels)	4				
LIN (channels)	2				
IEBus (channels)	1				
Serial additional information	SCIF (CSI: 8ch/UART: 8ch), SCI (CSI: 2ch), RSPI (SPI: 5ch), SPI multi (SPI: 2ch), SSI (CSI: 6ch), SPDIF (CSI: 1ch)				
Other display functions	VDC5: WXGA (1280 × 768), JPEG Engine, OpenVG Accelerator (2D)				
Power supply voltage (V)	3.3V/1.18V				
Power supplies	VCC = PLLVCC = LVDSPLLVCC = USBAVCC = USBUVCC = USBDVCC = 1.10 to 1.26 V, PVCC = AVCC = USBAPVCC = VDAVCC = LVDSAPVCC = USBDPVCC = 3.0 to 3.6 V, VSS = AVSS = 0 V				
Operating temperature (°C)	T_A = -40 to 85°C				
Package (size [mm])	256-LFBGA (11 × 11mm)	256-LFQFP (28 × 28mm)		324-FBGA (19 × 19mm)	

RZ/A1H (256-pin to 324-pin)

Group name	RZ/A1H				
Pin count	256-pin			324-pin	
Part name	R7S721000VCBG	R7S721000VCFP	R7S721000VLFP	R7S721001VCBG	R7S721001VLBG
Quality level	Standard quality	Standard quality	High quality	Standard quality	High quality
CPU core	Arm® Cortex®-A9				
RAM (bytes)	10M				
Cache memory	Primary cache: 64KB (instruction32KB/data32KB), TLB128 Secondary cache: 128KB (Corelink™ Level 2 Cache Controller L2C-310)				
Max. operating frequency (MHz)	400				
Subclock (external: 32.768kHz)	YES				
PLL	YES				
Real-time clock	YES				
Power-on reset	YES				
Floating-point unit	YES				
DMA	DMAC × 16 ch				
External memory interfaces	Serial flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM, NAND flash				
External interrupt pins	148			180	
I/O ports	139			171	
16-/32-bit timer (channels)	5/2				
Watchdog timer (channels)	1				
Other timers	Motor Control PWM Timer × 8				
PWM output	16				
3-phase PWM output function	YES				
12-bit A/D converter (channels)	8				
CAN (channels)	5				
Ethernet	YES				
Ethernet AVB	YES				
USB host function	YES				
USB peripheral function	YES				
USB (channels)	2				
USB High Speed support	YES				
USB endpoints	16				
USB isochronous transfer support	YES				
USB additional information	Low-speed Support (Host only)				
SD host interface (channels)	2				
MMC host interface (channels)	1				
Clock-synchronous serial interface (channels)	17				
SPI (channels)	5				
UART (channels)	8				
I²C (channels)	4				
LIN (channels)	2				
IEBus (channels)	1				
Serial additional information	SCIF (CSI: 8ch/UART: 8ch), SCI (CSI: 2ch), RSPI (SPI: 5ch), SPI multi (SPI: 2ch), SSI (CSI: 6ch), SPDIF (CSI: 1ch)				
Other display functions	VDC5: WXGA (1280 × 768), JPEG Engine, OpenVG Accelerator (2D)				
Power supply voltage (V)	3.3V/1.18V				
Power supplies	VCC = PLLVCC = LVDSPLLVCC = USBAVCC = USBUVCC = USBDVCC = 1.10 to 1.26 V, PVCC = AVCC = USBAPVCC = VDAVCC = LVDSAPVCC = USBDPVCC = 3.0 to 3.6 V, VSS = AVSS = 0 V				
Operating temperature (°C)	T_A = -40 to 85°C				
Package (size [mm])	256-LFBGA (11 × 11mm)	256-LFQFP (28 × 28mm)		324-FBGA (19 × 19mm)	

Renesas classifies the quality level of its products as either "standard quality" or "high quality." Products are assigned these quality levels based on their intended applications, as follows.
Standard quality: Computers, office equipment, communication equipment, measuring equipment, audio and video equipment, household appliances, machine tools, personal devices, industrial robots, etc.
High quality: Transport equipment (automobiles, trains, ships, etc.), communication signaling equipment, fire and crime prevention equipment, safety equipment of various types, etc.

RZ/A1LU (176-pin to 233-pin)

Group name	RZ/A1LU						
Pin count	176-pin			208-pin		233-pin	
Part name	R7S721030VCBG	R7S721030VCFP	R7S721030VLFP	R7S721031VCFP	R7S721031VLFP	R7S721031VCBG	R7S721031VLCBG
Quality level	Standard quality	Standard quality	High quality	Standard quality	High quality	Standard quality	High quality
CPU core	Arm® Cortex®-A9						
RAM (bytes)	3M						
Cache memory	Primary cache: 64KB (instruction32KB/data32KB), TLB128 Secondary cache: 128KB (Corelink™ Level 2 Cache Controller L2C-310)						
Max. operating frequency (MHz)	400						
Subclock (external: 32.768kHz)	YES						
PLL	YES						
Real-time clock	YES						
Power-on reset	YES						
Floating-point unit	YES						
DMA	DMAC × 16 ch						
External memory interfaces	Serial flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM						
External interrupt pins	109			131			
I/O ports	100			122			
16-/32-bit timer (channels)	5/2						
Watchdog timer (channels)	1						
Other timers	-						
PWM output	16						
3-phase PWM output function	YES						
12-bit A/D converter (channels)	8						
CAN (channels)	2						
Ethernet	YES						
Ethernet AVB	YES						
USB host function	YES						
USB peripheral function	YES						
USB (channels)	2						
USB High Speed support	YES						
USB endpoints	16						
USB isochronous transfer support	YES						
USB additional information	Low-speed Support (Host only)						
SD host interface (channels)	2						
MMC host interface (channels)	1						
Clock-synchronous serial interface (channels)	12						
SPI (channels)	3						
UART (channels)	5						
I²C (channels)	4						
LIN (channels)	-						
IEBus (channels)	-						
Serial additional information	SCIF (CSI: 5ch/UART: 5ch), SCI (CSI: 2ch), RSPI (SPI: 2ch), SPI multi (SPI: 1ch), SSI (CSI: 4ch), SPDIF (CSI: 1ch)						
Other display functions	VDC5: WXGA (1280 × 768), JPEG Engine						
Power supply voltage (V)	3.3V/1.18V						
Power supplies	VCC = PLLVCC = LVDSPLLVCC = USBAVCC = USBUVCC = USBDVCC = 1.10 to 1.26 V, PVCC = AVCC = USBAPVCC = VDAVCC = LVDSAPVCC = USBDPVCC = 3.0 to 3.6 V, VSS = AVSS = 0 V						
Operating temperature (°C)	T_A = -40 to 85°C						
Package code	176-LFBGA (8 × 8mm)	176-LFQFP (24 × 24mm)		208-LFQFP (28 × 28mm)		233-FBGA (15 x 15mm)	

RZ/A1L (176-pin to 208-pin), RZ/A1LC (176-pin)

Group name	RZ/A1L					RZ/A1LC
Pin count	176-pin			208-pin		176-pin
Part name	R7S721020VCBG	R7S721020VCFP	R7S721020VLFP	R7S721021VCFP	R7S721021VLFP	R7S721034VCBG
Quality level	Standard quality	Standard quality	High quality	Standard quality	High quality	Standard quality
CPU core	Arm® Cortex®-A9					
RAM (bytes)	3M					2M
Cache memory	Primary cache: 64KB (instruction32KB/data32KB), TLB128 Secondary cache: 128KB (Corelink™ Level 2 Cache Controller L2C-310)					
Max. operating frequency (MHz)	400					
Subclock (external: 32.768kHz)	YES					
PLL	YES					
Real-time clock	YES					
Power-on reset	YES					
Floating-point unit	YES					
DMA	DMAC × 16 ch					
External memory interfaces	Serial flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM					
External interrupt pins	109			131		109
I/O ports	100			122		100
16-/32-bit timer (channels)	5/2					
Watchdog timer (channels)	1					
Other timers	-					
PWM output	16					
3-phase PWM output function	YES					
12-bit A/D converter (channels)	8					
CAN (channels)	2					
Ethernet	YES					
Ethernet AVB	-					
USB host function	YES					
USB peripheral function	YES					
USB (channels)	2					
USB High Speed support	YES					
USB endpoints	16					
USB isochronous transfer support	YES					
USB additional information	Low-speed Support (Host only)					
SD host interface (channels)	2					
MMC host interface (channels)	1					
Clock-synchronous serial interface (channels)	12					
SPI (channels)	3					
UART (channels)	5					
I²C (channels)	4					
LIN (channels)	1					—
IEBus (channels)	1					—
Serial additional information	SCIF (CSI: 5ch/UART: 5ch), SCI (CSI: 2ch), RSPI (SPI: 2ch), SPI multi (SPI: 1ch), SSI (CSI: 4ch), SPDIF (CSI: 1ch)					
Other display functions	VDC5: WXGA (1280 × 768)					
Power supply voltage (V)	3.3V/1.18V					
Power supplies	VCC = PLLVCC = LVDSPLLVCC = USBAVCC = USBUVCC = USBDVCC = 1.10 to 1.26 V, PVCC = AVCC = USBAPVCC = VDAVCC = LVDSAPVCC = USBDPVCC = 3.0 to 3.6 V, VSS = AVSS = 0 V					
Operating temperature (°C)	T_A = -40 to 85°C					
Package code	176-LFBGA (8 × 8mm)	176-LFQFP (24 × 24mm)		208-LFQFP (28 × 28mm)		176-LFBGA (8 × 8mm)

RZ/G1H, RZ/G1M, RZ/G1N (831-pin)

Group name	RZ/G1H	RZ/G1M	RZ/G1N
Pin count	831-pin	831-pin	831-pin
Part name	R8A77420HA01BG	R8A77430HA01BG	R8A77440HA01BG
Quality level	Standard quality	Standard quality	Standard quality
CPU core	Arm® Cortex®-A15 (Quad) Arm® Cortex®-A7 (Quad)	Arm® Cortex®-A15 (Dual)	Arm® Cortex®-A15 (Dual)
RAM (bytes)	RAM0 of 72 KB/RAM1 of 4 KB/ RAM2 of 256 KB	RAM0 of 72 KB/RAM1 of 4 KB/ RAM2 of 256 KB	RAM0 of 72 KB/RAM1 of 4 KB/ RAM2 of 256 KB
Cache memory	Cortex®-A15: L1 I/D cache 32/32 KB, L2 cache 2048 KB Cortex®-A7: L1 I/D cache 32/32 KB, L2 cache 512 KB	L1 I/D cache 32/32 KB, L2 cache 1024 KB	L1 I/D cache 32/32 KB, L2 cache 1024 KB
Max. operating frequency (MHz)	Cortex®-A15: 1.4GHz Cortex®-A7: 780MHz	1.5GHz	1.5GHz
Subclock (external: 32.768kHz)	-	-	-
PLL	YES	YES	Yes
Real-time clock	-	-	-
Power-on reset	YES	YES	Yes
Floating-point unit	YES	YES	Yes
DMA	LBSC DMAC: 3 ch/SYS-DMAC: 30 ch/ Audio-DMAC: 26 ch/ Audio (peripheral)-DMAC: 29 ch	LBSC DMAC: 3 ch/SYS-DMAC: 30 ch/ Audio-DMAC: 26 ch/ Audio (peripheral)-DMAC: 29 ch	LBSC DMAC: 3 ch/SYS-DMAC: 30 ch/ Audio-DMAC: 26 ch/ Audio (peripheral)-DMAC: 29 ch
External bus expansion	YES	YES	YES
External interrupt pins	4	10	10
I/O ports	188	244	244
16-/32-bit timer (channels)	4/12	4/12	4/12
Watchdog timer (channels)	1	1	1
Other timers	Compare match timer0 (CMT0) × 2 Compare match timer1 (CMT1) × 8	Compare match timer0 (CMT0) × 2 Compare match timer1 (CMT1) × 8	Compare match timer0 (CMT0) × 2 Compare match timer1 (CMT1) × 8
PWM output	7	7	7
3-phase PWM output	-	-	-
12-bit A/D converter (channels)	-	-	-
CAN (channels)	2	2	2
Ethernet	YES	YES	YES
USB host function	YES	YES	YES
USB peripheral function	YES	YES	YES
USB (channels)	USB3.0 Host × 1 USB2.0 Host × 2/Host/Function × 1	USB3.0 Host × 1 USB2.0 Host × 1/Host/Function × 1	USB3.0 Host × 1 USB2.0 Host × 1/Host/Function × 1
USB High Speed support	YES	YES	YES
USB endpoints	15	15	15
USB isochronous transfer support	YES	YES	YES
USB additional information	-	-	-
Clocked serial interface (channels)	4	3	3
SPI (channels)	1	1	1
UART (channels)	11	18	18
I²C (channels)	4	6	6
LIN (channels)	-	-	-
IEBus (channels)	-	-	-
Serial additional information	SCIF: 3ch, SCIFA: 3ch, SCIFB: 3ch. HSCIF: 2ch, MSIOF: 4ch, QSPI: 1ch	SCIF: 6ch, SCIFA: 6ch, SCIFB: 3ch, HSCIF: 3ch, MSIOF: 3ch, QSPI: 1ch	SCIF: 6ch, SCIFA: 6ch, SCIFB: 3ch, HSCIF: 3ch, MSIOF: 3ch, QSPI: 1ch
Other display functions	PowerVR G6400 (520MHz) (3D) Video signal processor1 (VSP1) Video processing unit (VCP3)	PowerVR SGX544MP2 (520MHz) (3D) Video signal processor1 (VSP1) Video processing unit (VCP3)	PowerVR SGX544MP2 (312MHz) (3D) Video signal processor1 (VSP1) Video processing unit (VCP3)
Power supply voltage (V)	3.3V/1.8V/1.5V/1.0V	3.3V/1.8V/1.35V/1.0V	3.3V/1.8V/1.35V/1.0V
Power supplies	VDD=0.98to1.08V, VCCQ=3.0to3.6V, VCCQ_SD0toVCCQ_SD3, VCCQ_MMC_SD=3.0to3.6V, VCCQ_ISO=1.7to1.9V, VCCQ18=1.7to1.9V, VCCQ18_MLBP=1.7to1.9V, VCCQ_SD0toVCCQ_SD3, VCCQ_MMC_SD=1.7to1.9V, VDDQ_LVDS=1.7to1.9V, VDDQ_M0, VDDQ_M1, VDDQ_M1A=1.425to1.575V, VDDA_SATA0=1.7to1.9V, VDDD_SATA0=0.98to1.08V, VDDA_SATA1=1.7to1.9V, VDDD_SATA1=0.98to1.08V, VDDA_SATA0, VDDA_SATA1=1.7to1.9V, VDDD_SATA0, VDDD_SATA1=0.98to1.08V, VDD_CPGPLL=1.7to1.9V, VDDQ_M0DPLL, VDDQ_M1DPLL, VDDQ_M1MPLL, VDDQ_M0APLL, VDDQ_M1APLL=1.7to1.9V, DU/DU0_LVDS0/LVDS_PLL1_VCC=1.7to1.9V, AVDD=1.7to1.9V, VD331=3.0to3.6V, VD181=1.7to1.9V, VDD_DVFS=0.98to1.08	VDD=0.98to1.08V, VCCQ=3.0to3.6V, VCCQ_SD0toVCCQ_SD3, VCCQ_MMC_SD=3.0to3.6V, VCCQ_ISO=1.7to1.9V, VCCQ18=1.7to1.9V, VCCQ_SD0toVCCQ_SD3, VCCQ_MMC_SD=1.7to1.9V, VDDQ_LVDS=1.7to1.9V, VDDQ_M0, VDDQ_M1, VDDQ_M1A=1.283to1.450V, VDDA_SATA0=1.7to1.9V, VDDD_SATA0=0.98to1.08V, VDDA_SATA1=1.7to1.9V, VDDD_SATA1=0.98to1.08V, VDDA_SATA0, VDDA_SATA1=1.7to1.9V, VDDD_SATA0, VDDD_SATA1=0.98to1.08V, VDD_CPGPLL=1.7to1.9V, VDDQ_M0DPLL, VDDQ_M1DPLL, VDDQ_M1MPLL, VDDQ_M0APLL, VDDQ_M1APLL=1.7to1.9V, DU/DU0_LVDS0/LVDS_PLL1_VCC=1.7to1.9V, AVDD=1.7to1.9V, VD331=3.0to3.6V, VD181=1.7to1.9V, VDD_DVFS=0.98to1.08	VDD=0.98 to 1.08V, VCCQ=3.0 to 3.6V, VCCQ33_MLBP=3.0 to 3.6V. VCCQ_SD0 to VCCQ_SD3, VCCQ_MMC_SD=3.0 to 3.6V. VCCQ_ISO=1.7 to 1.9V, VCCQ18=1.7 to 1.9V, VCCQ_SD0 to VCCQ_SD3, VCCQ_MMC_SD=1.7 to 1.9V. VDDQ_LVDS=1.7 to 1.9V, VDDQ_M0=1.283 to 1.450V, VDDA_SATA0=1.7 to 1.9V, VDDD_SATA0=0.98 to 1.08V, VDDA_SATA0=1.7 to 1.9V, VDDD_SATA0=0.98 to 1.08V, VDD_CPGPLL=1.7 to 1.9V. VDDQ_M0DPLL. VDDQ_M0APLL=1.7 to 1.9V. DU/DU0_LVDS0/LVDS_PLL1_VCC=1.7 to 1.9V, AVDD=1.7 to 1.9V, VD331=3.0 to 3.6V, VD181=1.7 to 1.9V. VDD_DVFS=0.98to1.08
Operating temperature (°C)	T_A = -40 to 85°C	T_A = -40 to 85°C	T_A = -40 to 85°C
Package (size [mm])	831-FBGA (27 × 27mm)	831-FBGA (27 × 27mm)	831-FBGA (27 × 27mm)

RZ/G1E, RZ/G1C (501-pin)

Group name	RZ/G1E	RZ/G1C
Pin count	501-pin	501-pin
Part name	R8A77450HA01BG	R8A77470HA01BG
Quality level	Standard quality	Standard quality
CPU core	Arm® Cortex®-A7 (Dual)	Arm® Cortex®-A7 (Dual)
RAM (bytes)	RAM0 of 72 KB/RAM1 of 4 KB/RAM2 of 256 KB	RAM0 of 72 KB/RAM1 of 4 KB/RAM2 of 128 KB
Cache memory	L1 I/D cache 32/32 KB, L2 cache 512 KB	L1 I/D cache 32/32 KB, L2 cache 512 KB
Max. operating frequency (MHz)	1.0GHz	1.0GHz
Subclock (external: 32.768kHz)	-	-
PLL	YES	YES
Real-time clock	-	-
Power-on reset	YES	YES
Floating-point unit	YES	YES
DMA	LBSC DMAC: 3 ch/SYS-DMAC: 30 ch/Audio-DMAC: 13 ch/ Audio (peripheral)-DMAC: 29 ch	LBSC DMAC: 3ch/SYS-DMAC: 30 ch/ Audio-DMAC: 13 ch/Audio (peripheral)-DMAC: 29 ch
External bus expansion	YES	YES
External interrupt pins	10	10
I/O ports	208	156
16-/32-bit timer (channels)	4/12	0/12
Watchdog timer (channels)	1	1
Other timers	Compare match timer0 (CMT0) × 2 Compare match timer1 (CMT1) × 8	Compare match timer0 (CMT0) × 2 Compare match timer1 (CMT1) × 8
PWM output	7	7
3-phase PWM output	-	-
12-bit A/D converter (channels)	-	-
CAN (channels)	2	2
Ethernet	YES	YES
USB host function	YES	YES
USB peripheral function	YES	YES
USB (channels)	USB2.0 Host × 1/Host/Function × 1	Host/Function × 2
USB High Speed support	YES	YES
USB endpoints	15	15
USB isochronous transfer support	YES	YES
USB additional information	-	-
Clocked serial interface (channels)	3	
SPI (channels)	1	
UART (channels)	18	
I²C (channels)	6	5
LIN (channels)	-	-
IEBus (channels)	-	-
Serial additional information	SCIF: 6ch, SCIFA: 6ch, SCIFB: 3ch, HSCIF: 3ch, MSIOF: 3ch, QSPI: 1ch	SCIF: 6ch, HSCIF: 3ch, MSIOF: 3ch, QSPI: 2ch
Other display functions	PowerVR SGX540 (260MHz) (3D) Video signal processor1 (VSP1) Video processing unit (VCP3)	PowerVR SGX531 (260MHz) (3D) Video signal processor1 (VSP1) Video processing unit (VCP3)
Power supply voltage (V)	3.3V/1.8V/1.5V/1.0V	3.3V/1.8V/1.5V/1.2V
Power supplies	VDD=0.98to1.08V, VCCQ=3.0to3.6V, VCCQ_SD0toVCCQ_SD3, VCCQ_MMC_SD=3.0to3.6V (3.3V-I/O), VCCQ18=1.7to1.9V, VCCQ_SD0toVCCQ_SD3, VCCQ_MMC_SD=1.7to1.9V (1.8V-I/O), VDDQ_M0, VDDQ_M1, VDDQ_M1A=1.425to1.575V, VDD_CPGPLL=1.7to1.9V, VDDQ_M0DPLL, VDDQ_M1DPLL. VDDQ_M1MPLL, VDDQ_M0APLL, VDDQ_M1APLL=1.7to1.9V, AVDD=1.7to1.9V, VD331=3.0to3.6V, VD181=1.7to1.9V	VDD=1.16to1.26V, VCCQ=3.0to3.6V, VCCQ_SD0toVCCQ_SD2, VCCQ_MMC=3.0to3.6V (3.3V-I/O), VCCQ18=1.7to1.9V, VCCQ_SD0toVCCQ_SD2, VCCQ_MMC=1.7to1.9V (1.8V-I/O), VDDQ_M0=1.425to1.575V, VDD_CPGPLL0, VDD_CPGPLL1, VDD_CPGPLL3=1.16to1.26V, VDD_DDRPLL1, VDD_DDRPLL2=1.16to1.26V, VDDA_USBPLL=1.16to1.26V, VCCQA_USB=3.0to3.6V, VCCQA_LVDS=3.0to3.6V, VDDA_LVDSPLL=1.16to1.26V, VCCQA_ADC=3.0to3.6V, VCCQA_DAC=3.0to3.6V
Operating temperature (°C)	T_A = -40 to 85°C	T_A = -40 to 85°C
Package (size [mm])	501-FBGA (21 × 21mm)	501-FBGA (21 × 21mm)

RZ/T1 (176-pin to 320-pin)

Group name	RZ/T1							
Pin count	176-pin	320-pin						
Part name	R7S910001CFP	R7S910002CBG	R7S910006CBG	R7S910007CBG	R7S910011CBG	R7S910013CBG	R7S910015CBG	R7S910016CBG
Quality Level	Standard quality							
CPU core	Arm® Cortex®-R4 Processor with FPU							
RAM (bytes)	544K		1568K		544K	1568K		
Cache memory	Primary cache: 16KB (instruction8KB / data8KB)							
Max. operating frequency (MHz)	450			600	450	600	450	
On-chip oscillator frequency (MHz)	0.24							
PLL	YES							
Power-on reset	YES							
Floating-point unit	YES							
DMA	DMAC × 2Unit (16ch × 2)							
External memory interfaces	Serial flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM							
External interrupt pins	20							
I/O ports	97	209						
16-/32-bit timer (channels)	24 / 1							
Watchdog timer (channels)	2							
Other timers	General PWM Timer × 4							
PWM output	4							
3-phase PWM output	YES							
12-bit A/D converter (channels)	1 Unit: 8ch	2 Unit (Unit 0: 8ch. Unit 1: 16ch)						
CAN (channels)	2							
Ethernet	10 / 100Mbps							
R-IN engine	—						YES	
Industrial network	—						Multi Protocol	
Encoder I/F	—					YES	—	YES
USB host function	YES							
USB peripheral function	YES							
USB (channels)	1							
USB High Speed support	YES							
USB endpoints	10							
USB isochronous transfer support	YES							
Clock-synchronous serial interface (channels)	9							
RSPI (channels)	4							
UART (channels)	9							
I^2C (channels)	2							
Power supply voltage (V)	3.3V (I/O block), 1.2V (internal)							
Power supplies	VDD = PLLVDD0 = PLLVDD1 = DVDD_USB = 1.14 to 1.26 V, VCCQ33 = AVCC0 = AVCC1 = VREFH0 = VREFH1 = VDD33_USB = 3.0 to 3.6 V							
Operating temperature (°C)	Tj = -40 to 125°C							
Package (size [mm])	176-HLQFP (20 × 20mm)	320-FBGA (17 × 17mm)						

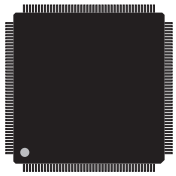
RZ/T1 (320-pin)

Group name	RZ/T1							
Pin count	320-pin							
Part name	R7S910017CBG	R7S910018CBG	R7S910025CBG	R7S910026CBG	R7S910027CBG	R7S910028CBG	R7S910035CBG	R7S910036CBG
Quality Level	Standard quality							
CPU core	Arm® Cortex®-R4 Processor with FPU							
RAM (bytes)	1568K						544K	
Cache memory	Primary cache: 16KB (instruction8KB / data8KB)							
Max. operating frequency (MHz)	600		450		600		300	
On-chip oscillator frequency (MHz)	0.24							
PLL	YES							
Power-on reset	YES							
Floating-point unit	YES							
DMA	DMAC × 2Unit (16ch × 2)							
External memory interfaces	Serial flash (eXecute-In-Place (XIP) support), SRAM, SDRAM, burst ROM							
External interrupt pins	20							
I/O ports	209							
16-/32-bit timer (channels)	24 / 1							
Watchdog timer (channels)	2							
Other timers	General PWM Timer × 4							
PWM output	4							
3-phase PWM output	YES							
12-bit A/D converter (channels)	2 Unit (Unit 0: 8ch. Unit 1: 16ch)							
CAN (channels)	2							
Ethernet	10 / 100Mbps							
R-IN engine	YES		—					
Industrial network	Multi Protocol		EtherCAT					
Encoder I/F	—	YES	—	YES	—	YES	—	YES
USB host function	YES							
USB peripheral function	YES							
USB (channels)	1							
USB High Speed support	YES							
USB endpoints	10							
USB isochronous transfer support	YES							
Clock-synchronous serial interface (channels)	9							
RSPI (channels)	4							
UART (channels)	9							
I^2C (channels)	2							
Power supply voltage (V)	3.3V (I/O block), 1.2V (internal)							
Power supplies	VDD = PLLVDD0 = PLLVDD1 = DVDD_USB = 1.14 to 1.26 V, VCCQ33 = AVCC0 = AVCC1 = VREFH0 = VREFH1 = VDD33_USB = 3.0 to 3.6 V							
Operating temperature (°C)	Tj = -40 to 125°C							
Package (size [mm])	320-FBGA (17 × 17mm)							

RZ/N1D (324-pin to 400-pin), RZ/N1S (196-pin to 324-pin), RZ/N1L (196-pin)

Group name	RZ/N1D		RZ/N1S		RZ/N1L
Pin count	400-pin	324-pin	324-pin	196-pin	196-pin
Part name	R9A06G032NGBG	R9A06G032VGBA	R9A06G033NGBG	R9A06G033VGBA	R9A06G034VGBA
CPU core	Dual Arm® Cortex®-A7 + Arm® Cortex®-M3 (R-IN engine)		Arm® Cortex®-A7 + Arm® Cortex®-M3 (R-IN engine)		Arm® Cortex®-M3 (R-IN engine)
SRAM (with ECC)	2 MB		6 MB		6 MB
Cache memory	L1 I/D Cache 16KB/16KB ×2 L2 Cache 256 KB		L1 I/D-cache: 16KB/16KB L2 cache: 128KB		-
Max. operating frequency (MHz)	A7: 500, M3: 125		A7: 500, M3: 125		125
PLL	YES				
Real-time clock	YES				-
Floating-point unit	YES				-
DMA	DMAC × 2 units (16 channels)				
16-/32-bit timers	(6 / 2) × 2 units				
Watchdog timer	For Arm® Cortex®-A7 core and for Arm® Cortex®-M3 core				-
DDR2/DDR3 Controller	YES		-		
NAND Flash Controller	YES				
Quad-I/O SPI (channels)	1		2		1
SDIO-eMMC (channels)	2				1
I/O ports	170	132	160	95	95
Display Functions	LCD controller		LCD controller		-
R-IN engine	YES				
Ethernet Ports	5 ports	3 ports	5 ports	3 ports	
	Selectable among GMAC, EtherCAT®, and Sercos® III				
Independent GMAC	Max. 2 ports	N/A (1 port usable via switch)	Max. 2 ports	Max. 1 port	
EtherCAT Slave Controller	Max. 3 ports			Max. 2 ports	
Sercos®III Slave Controller	2 ports				
HSR/PRP (Option)	HSR/PRP	-	PRP	-	
12-bit A/D converter	8 channels × 2 units	8 channels × 1 unit			
CAN (channels)	2				
SPI	Master × 4 channels + slave × 2 channels				
UART (channels)	8				
I^2C (channels)	2				
MSEBI (Parallel bus interface)	Master / Slave				Slave
USB (channels)	2ch (Host/Function, Host)				
USB High Speed support	YES				
USB endpoint	16				
Supply voltage	3.3 V for I/O, 1.15V for CPU 1.5V for DDR3 or 1.8V for DDR2		3.3 V for I/O, 1.15 V for CPU		3.3 V for I/O, 1.15V for CPU
Package (size [mm])	400-pin LFBGA 17 × 17 mm, 0.8mm pin pitch	324-pin LFBGA 15 × 15 mm, 0.8 mm pin pitch	324-pin LFBGA 15 × 15 mm, 0.8 mm pin pitch	196-pin LFBGA 12 × 12 mm, 0.8 mm pin pitch	196-pin LFBGA 12 × 12 mm, 0.8 mm pin pitch
Operating temperature (°C)	Tj = -40 to +110°C				

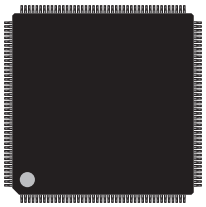
RZ Family Package Lineup



Pin-type: **176**-HLQFP
Size: 20 × 20 mm
Pitch: 0.40 mm
Thickness: 1.70 mm
Group: RZ/T1

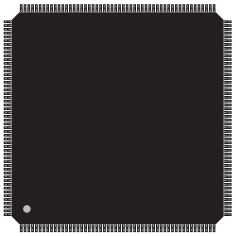
176-LFBGA
8 × 8 mm
0.50 mm
1.40 mm
RZ/A1L, A1LC, A1LU

176-LFBGA
13 × 13 mm
0.80 mm
1.40 mm
RZ/A2M



176-LFQFP
24 × 24 mm
0.50 mm
1.70 mm
RZ/A1L, A1LU

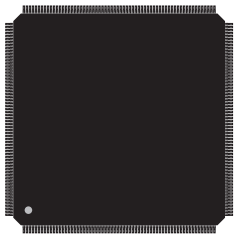
Pin-type: **196**-LFBGA
Size: 12 × 12 mm
Pitch: 0.80 mm
Thickness: 1.70 mm
Group: RZ/N1L, N1S



208-LFQFP
28 × 28 mm
0.50 mm
1.70 mm
RZ/A1L, A1LU

233-FBGA
15 × 15 mm
0.80 mm
1.9 mm
RZ/A1LU

256-LFBGA
11 × 11 mm
0.50 mm
1.40 mm
RZ/A2M, A1H, A1M

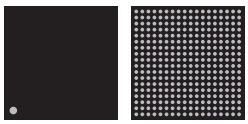


Pin-type: **256**-LFQFP
Size: 28 × 28 mm
Pitch: 0.40 mm
Thickness: 1.70 mm
Group: RZ/A1H, A1M

272-FBGA
17 × 17 mm
0.8 mm
1.90 mm
RZ/A2M

320-FBGA
17 × 17 mm
0.80 mm
2.30 mm
RZ/T1

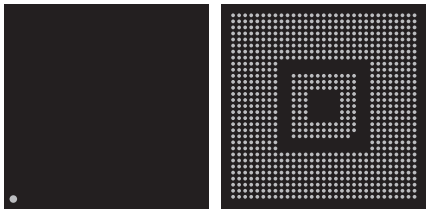
Pin-type: **324**-FBGA
Size: 19 × 19 mm
Pitch: 0.80 mm
Thickness: 2.10 mm
Group: RZ/A2M, A1H, A1M



324-LFBGA
15 × 15 mm
0.80 mm
1.70 mm
RZ/N1D, N1S

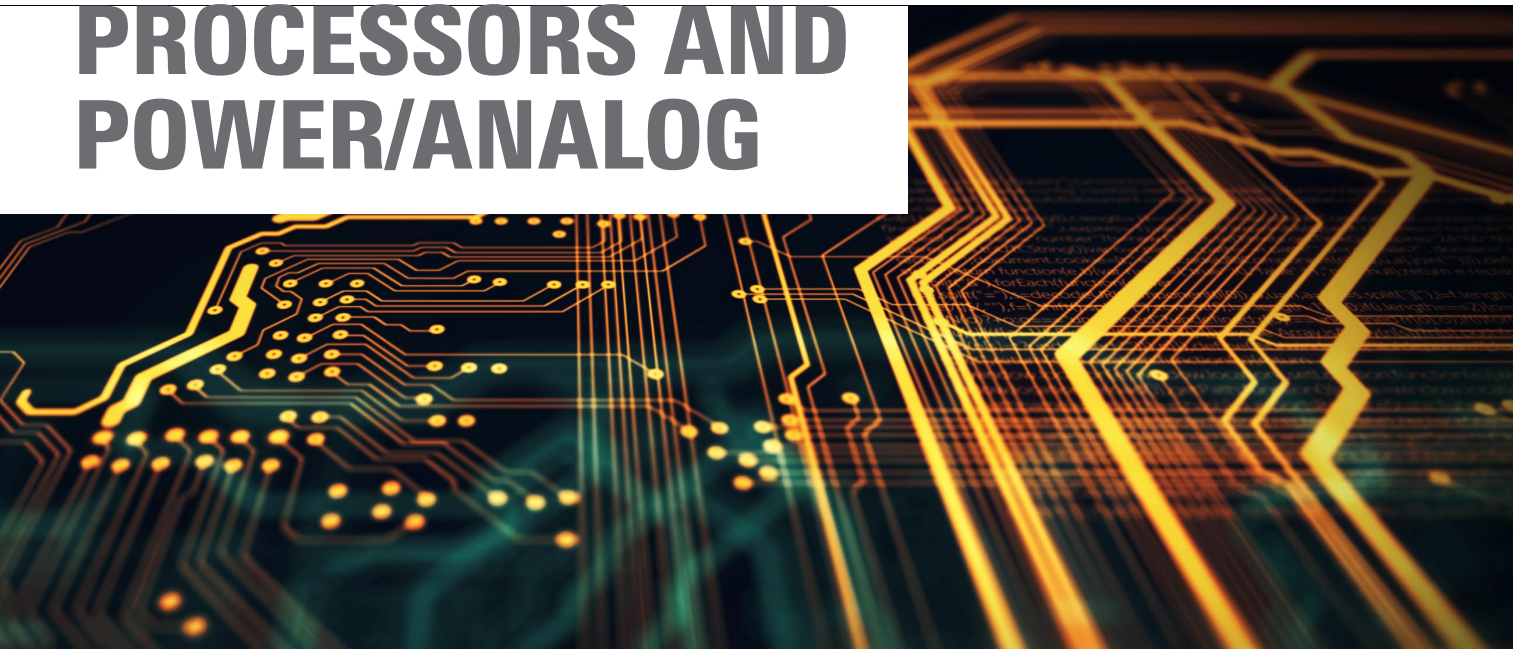
400-LFBGA
17 × 17 mm
0.80 mm
1.70 mm
RZ/N1D

Pin-type: **501**-FBGA
Size: 21 × 21 mm
Pitch: 0.80 mm
Thickness: 2.40 mm
Group: RZ/G1E, G1C



831-FBGA
27 × 27 mm
0.80 mm
2.40 mm
RZ/G1H, G1M, G1N

PROCESSORS AND POWER/ANALOG



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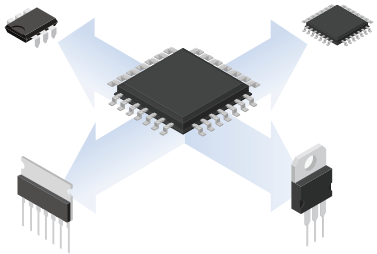

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