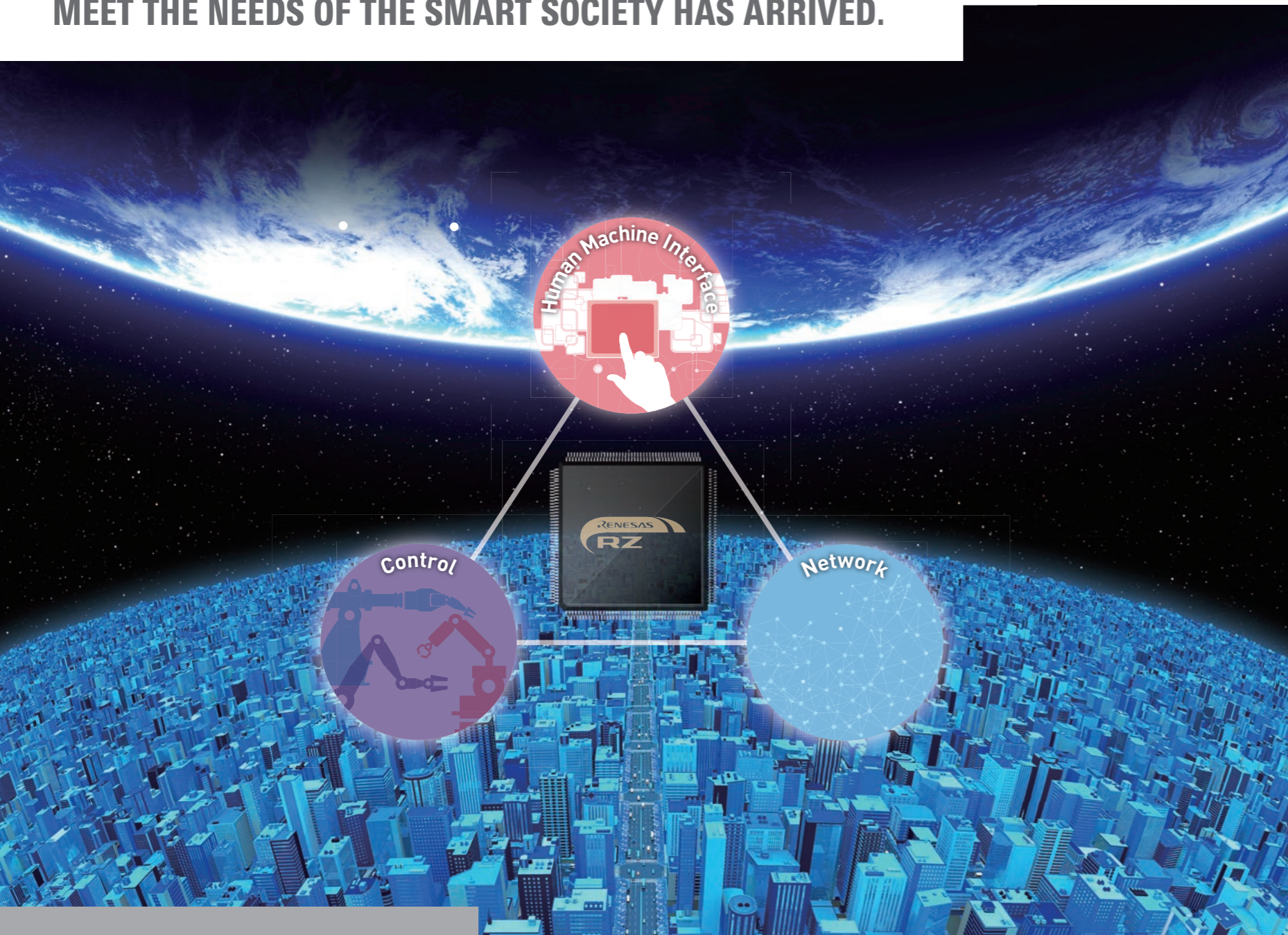


RZ FAMILY

Renesas Microprocessor



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



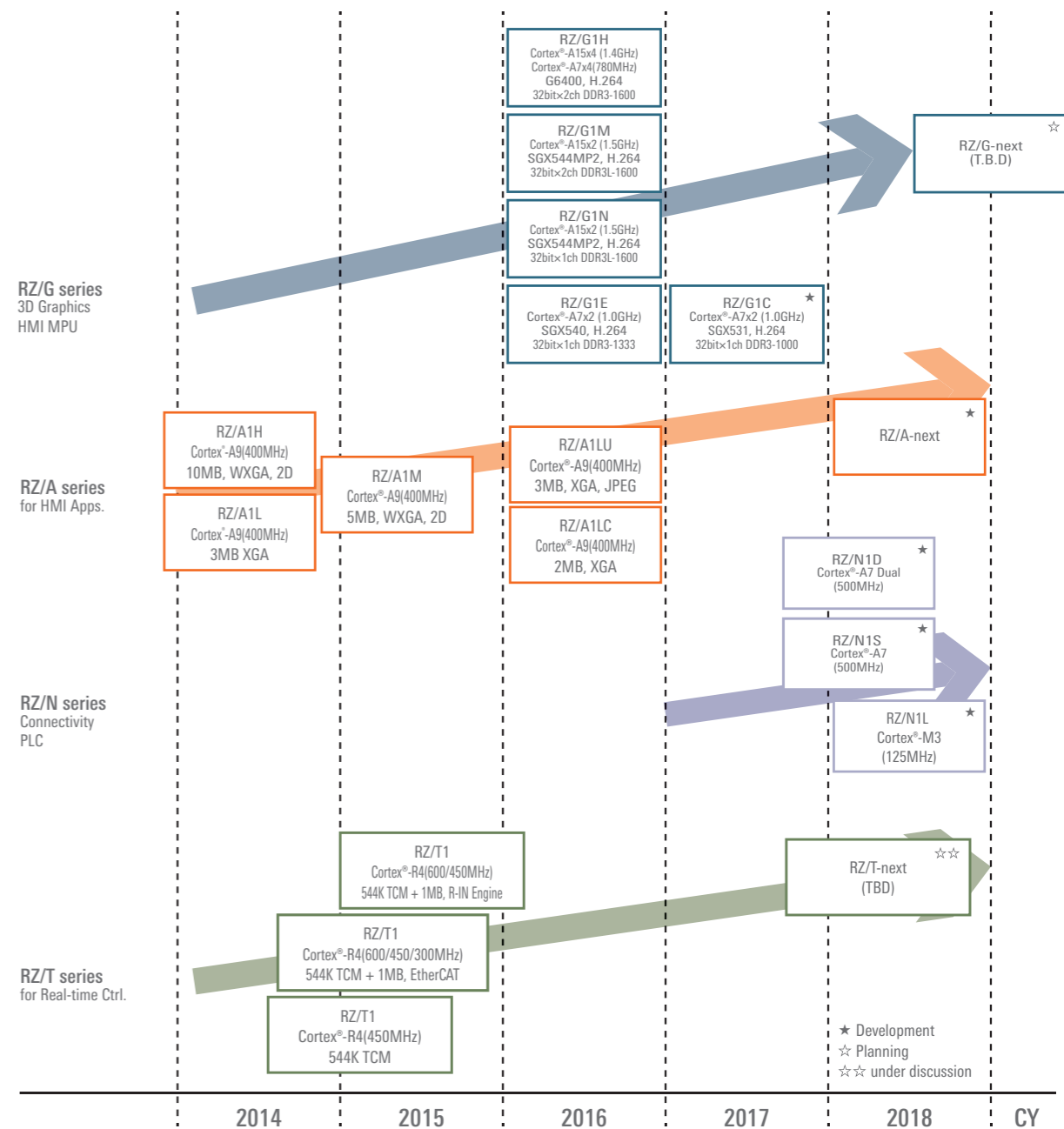
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The utilization of intelligent technology is advancing in all aspects of our lives, including electric household appliances, industrial equipment, building management, power grids, and transportation. The cloud-connected "smart society" is coming ever closer to realization. Microcontrollers are now expected to provide powerful capabilities not available previously, such as high-performance and energy-efficient control combined with interoperability 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 new RZ family of embedded processors. The lineup of these "next-generation processors that are as easy to use as conventional microcontrollers" spans four product series 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.

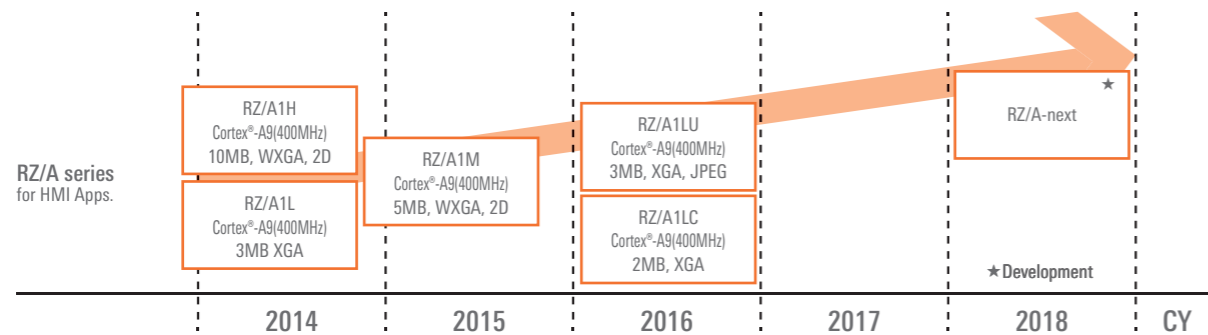
RZ Family Roadmap



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RZ/A Series

RZ/A Series: Roadmap



RZ/A Series: Application Fields

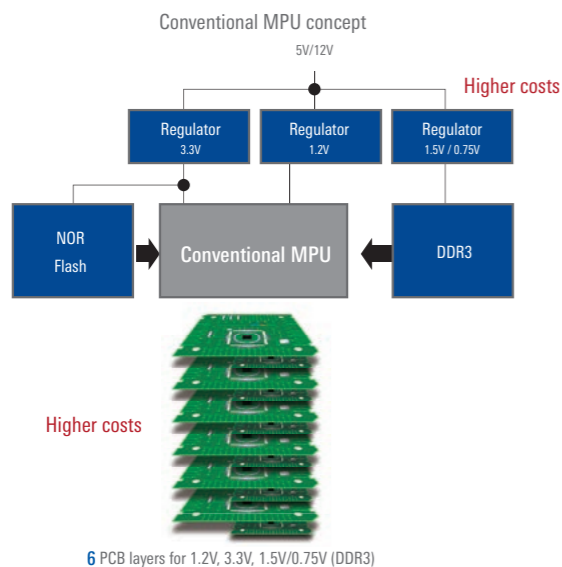


RZ/A Series Features

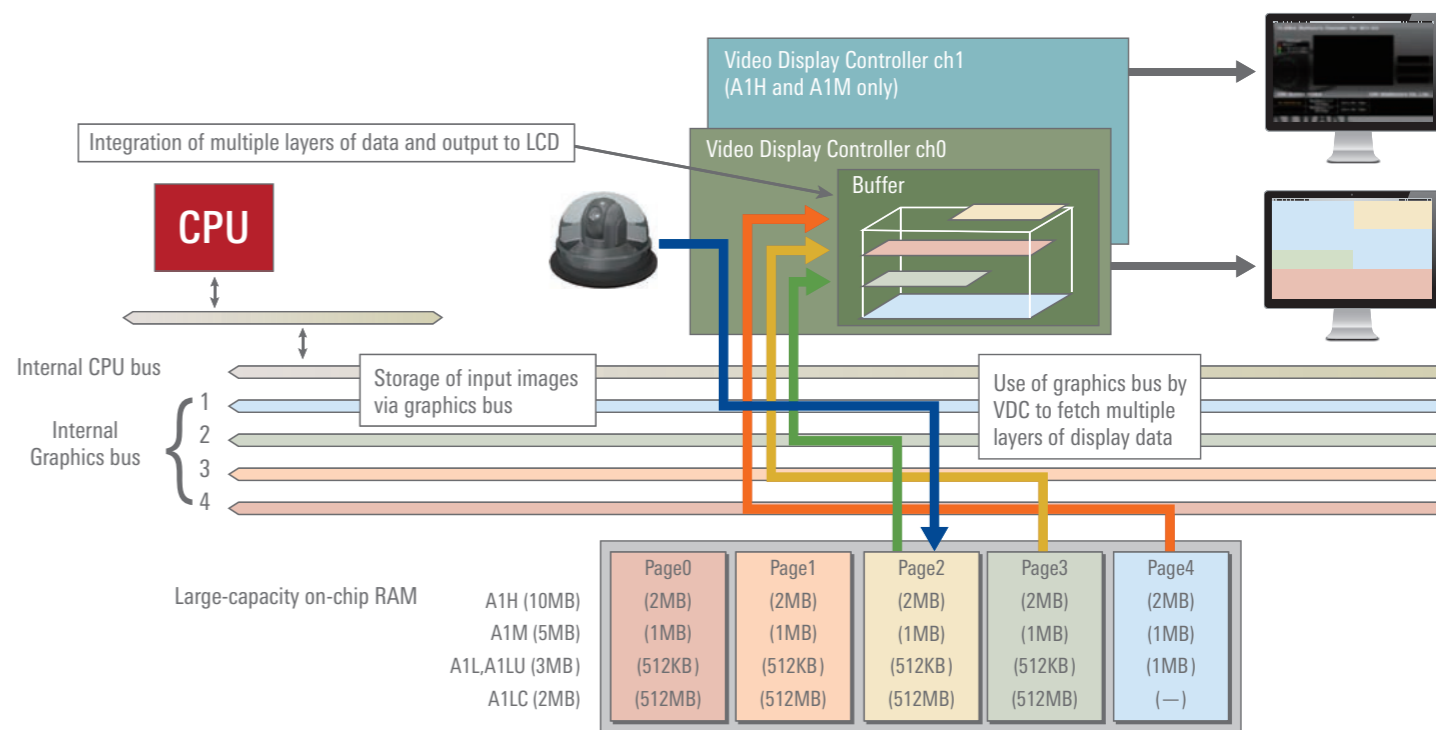
- Large-capacity on-chip RAM: 10MB
- Graphics display and camera input capabilities on a single chip
- Rich peripheral functions and software

Large-capacity on-chip RAM: 10MB

DRAM-less solution

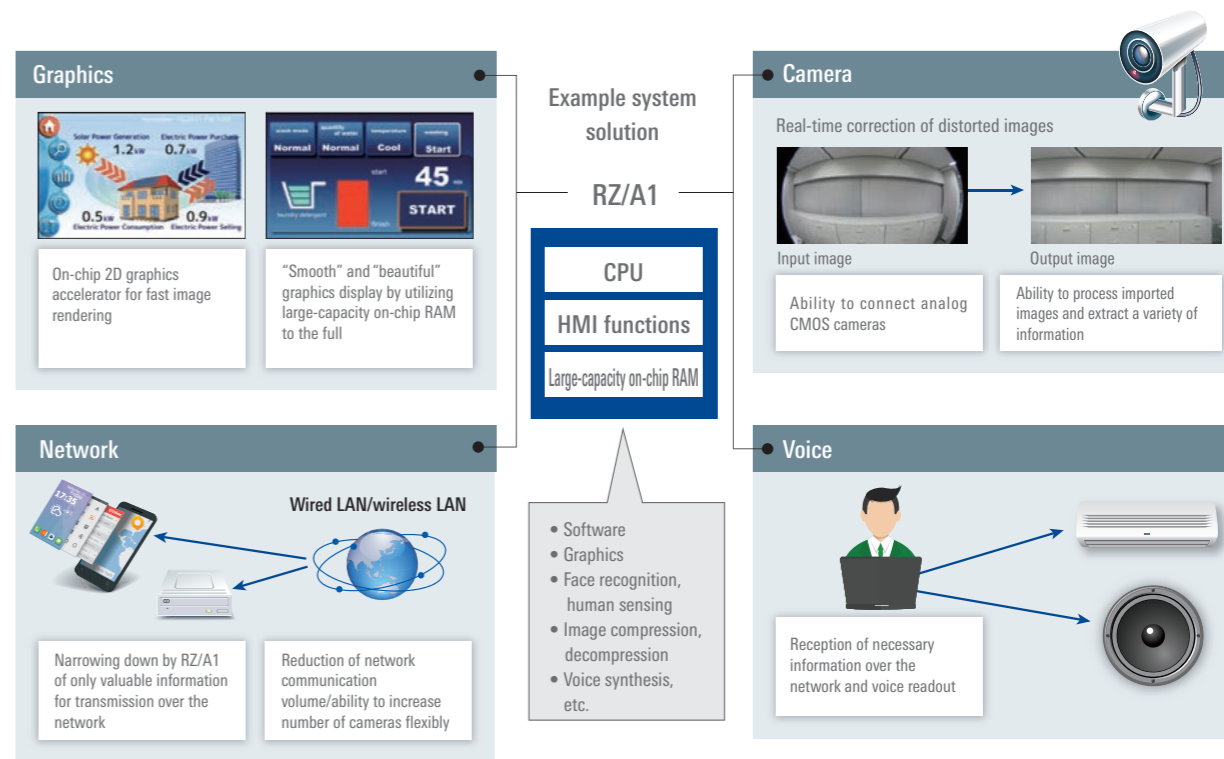


Graphics display and camera input capabilities on a single chip



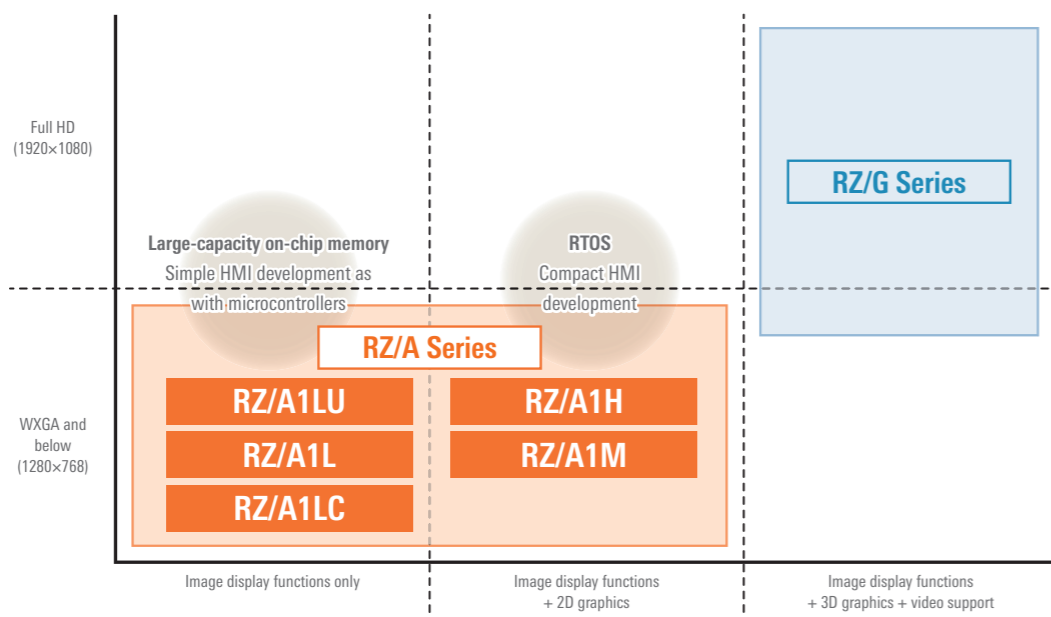
The bus configuration with independent buses for images and hardware-based superimposition processing make it easy to create graphical applications.

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

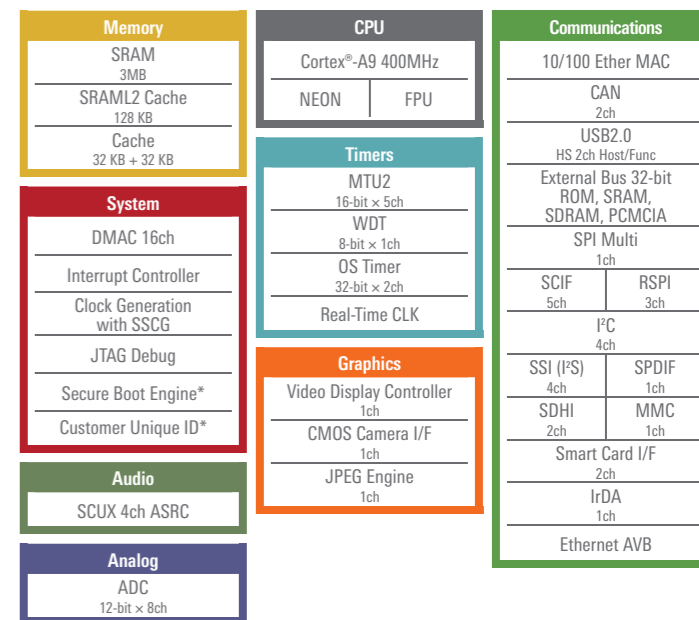


- HMI solutions optimized to match the image resolution, functions, and OS
- RZ/G series: Full HD, functions: 3D Gfx, vide, OS: Linux (RichOS)
- RZ/A series: WXGA and below, functions: 2D Gfx, camera input processing, OS: RTOS

RZ/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

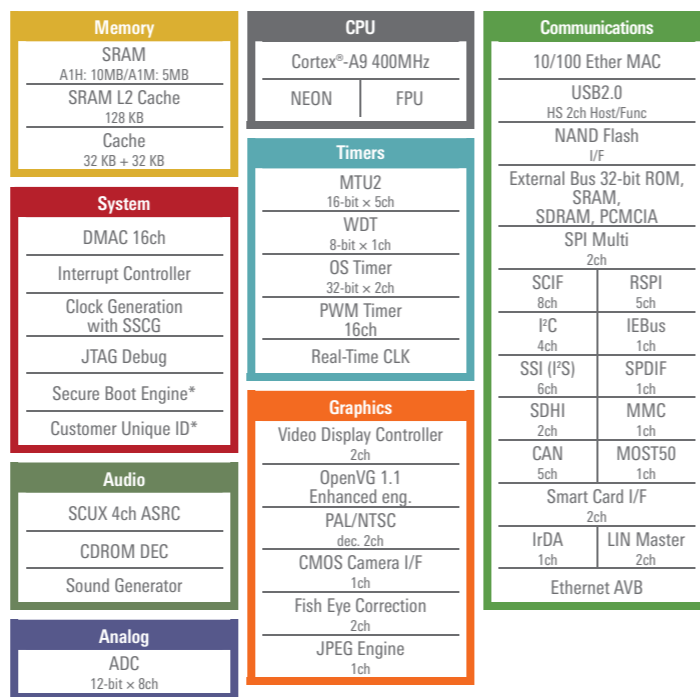


* =Option

RZ/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**
- LCD 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

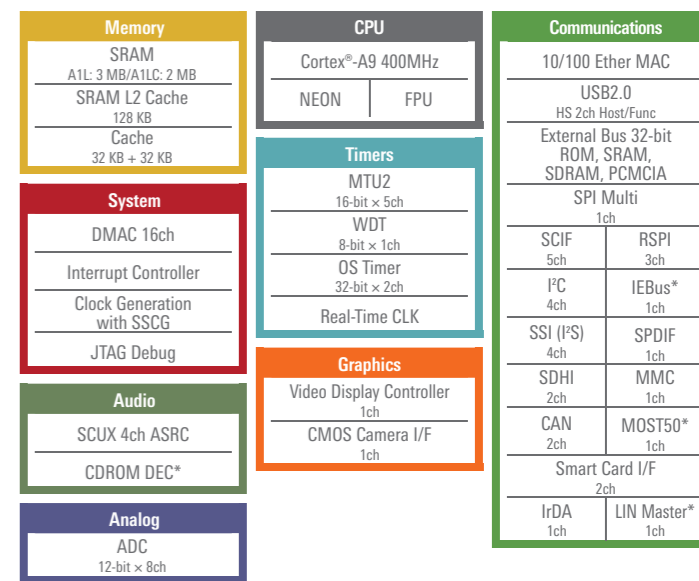


* =Option

RZ/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)

RZ/A1L, RZ/A1LC block diagram



* RZ/A1L Group specification only.

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

Development environments	<ul style="list-style-type: none"> DS-5 	<ul style="list-style-type: none"> IAR Embedded Workbench® for ARM® 	<ul style="list-style-type: none"> eBinder 	<ul style="list-style-type: none"> e²studio*3
Compilers	<ul style="list-style-type: none"> ARM CC*1 	<ul style="list-style-type: none"> IAR C/C++ compiler*2 	<ul style="list-style-type: none"> ARM CC*1 	<ul style="list-style-type: none"> GNU tool*4
ICEs	<ul style="list-style-type: none"> DSTREAM™ ULINKpro™ ULINKproD™ ULINK2™ 	<ul style="list-style-type: none"> I-jet™/I-jet Trace™ for ARM Cortex®-A/R/M JTAGjet-Trace 	<ul style="list-style-type: none"> PARTNER-Jet2 from Kyoto Microcomputer Co., Ltd. adviceLUNAII from DTS INSIGHT Corporation 	<ul style="list-style-type: none"> J-Link LITE from Segger J-Link series from Segger*5

*1. 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.

*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 (<http://japan.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)

Debuggers	<ul style="list-style-type: none"> PARTNER-Jet2 	<ul style="list-style-type: none"> microVIEW-PLUS 	<ul style="list-style-type: none"> CSIDE version 6
ICEs	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> adviceLUNA II 	<ul style="list-style-type: none"> PALMiCE3
Supported compilers	<ul style="list-style-type: none"> exeGCC from Kyoto Microcomputer GNU tool*1 ARM CC*2 IAR C/C++ compiler,*3 etc. 	<ul style="list-style-type: none"> ARM CC*2 GNU tool,*1 etc. 	<ul style="list-style-type: none"> 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.

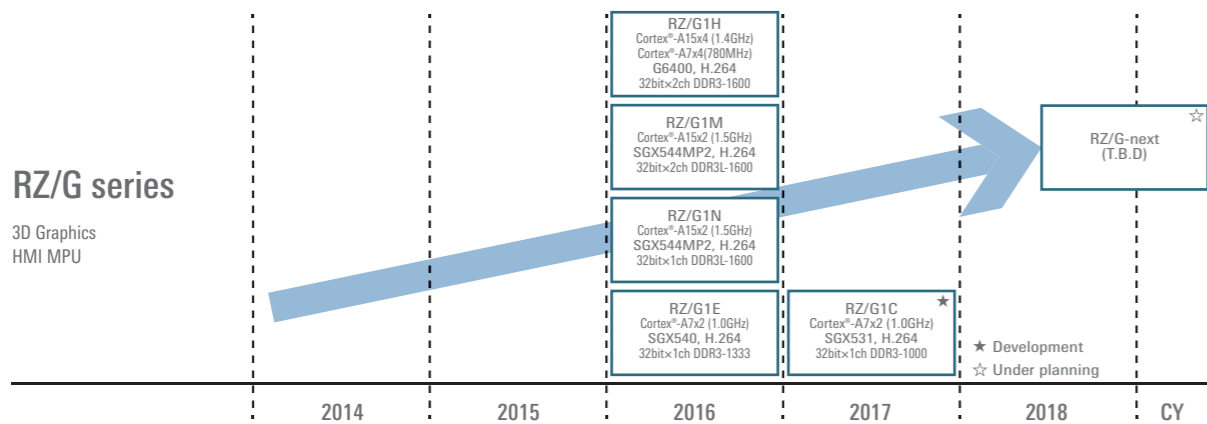
*3. A free evaluation license is available provided the 30-day time-limited evaluation or the permanent 32KB size-limited evaluation (www.iar.com/EWARM)

RZ/A Series: Solutions from Partner Companies

Development environments, compilers, code generation and evaluation support	
A.I. Corporation	TrueSTUDIO development environment
ARM Ltd.	DS-5 (development studio 5) development environment, ARM CC
eSOL Co., Ltd.	eBinder development environment
IAR Systems	EWARM (development environment, compiler, C-SPY debugger)
Emulators and related products	
ARM Ltd.	DSTREAM™, ULINKpro™, ULINKproD™, and ULINK2™ JTAG emulators
Computex Co., Ltd.	PALMiCE3 JTAG emulator, CSIDE, CodeRecorder dynamic text tool
DTS INSIGHT Corporation	adviceLUNA II JTAG emulator, TRQerS dynamic text/analysis tool
EmbitEK Co., Ltd.	J-Link and J-Link Lite JTAG emulators
IAR Systems	I-jet JTAG emulator
Kyoto Microcomputer Co., Ltd.	PARTNER-Jet2 JTAG emulator
Lauterbach GmbH	TRACE32 PowerDebug JTAG emulator
Starter kits, evaluation boards, platforms, etc.	
Akizuki Denshi Tsusho Co., Ltd.	GR-PEACH (mbed) evaluation board
AlphaProject Co., Ltd.	AP-RZA-0A (RZ/A1H) evaluation board
A-ONE Co., Ltd.	MP-RZA1H/FPGA-01 (RZ/A1H) embedded board
Chip One Stop, Inc.	GR-PEACH (mbed) evaluation board
Computex Co., Ltd.	CEV-RZ/A1L (RZ/A1L) evaluation board, CKB-RZ/A1H (RZ/A1H) embedded board
Core Corporation	Kiri ASURA (RZ/A1H) evaluation board
CoreStaff Co., Ltd.	GR-PEACH (mbed) evaluation board
Shimafuji Electric Inc.	SBEV-RZ/A1L (RZ/A1L) and Wallaby-721021 (RZ/A1L) evaluation boards
Wakamatsu Tsusyo Co., Ltd.	GR-PEACH (mbed) evaluation board
OS	
A.I. Corporation	RTOS TOPPERS specification
Coressent Technology, Inc.	RTOS smxOS
eForce Co., Ltd.	RTOS μC3/Standard for RZ/A
EmbitEK Co., Ltd.	RTOS embOS/TOPPERS-EM
Enea KK	EneaLinux embedded Linux distribution
eSOL Co., Ltd.	RTOS eT-Kernel
Grape Systems Inc.	RTOS ThreadX/ThreadX μTRON
MiSPO Co., Ltd.	RTOS NORTI Professional (RZ/ADS), NORTI Professional (RZ/EW)
Middleware, tools	
Access Co., Ltd.	paneE™ UI engine for embedded devices
Altia, Inc.	DeepScreen GUI development environment for embedded devices
Coressent Technology, Inc.	CT-View+ embedded software
CS Services Co., Ltd.	MicroEJ software platform for IoT devices
Data Technology Inc.	Cente series embedded middleware
DynaComware Corporation	DynaFont fonts
EmbitEK Co., Ltd.	emWin GUI development environment for embedded devices, emUSB middleware
eSOL Co., Ltd.	Middleware (file system, USB, network, graphics)
Grape Systems Inc.	UI Brain GUI development environments for embedded devices GR-QR, GR-BARCODE, GR-USB, GR-SD, and IVT BlueLet middleware
International Laboratory Corporation	GENWARE3 and GENWARE4 GUI development environments for embedded devices, INTALOGIC control engine for embedded devices
IT Access Corporation	Geal GUI development environment for embedded devices
Kyoto Software Research, Inc.	Fugue-NAND and eco-Fugue high-reliability flash file system, Galba high-reliability file system
PUX Corporation	FaceU® face recognition software, human detection software, RakuHira® handwriting recognition software
Techno Mathematical Co., Ltd.	H.264 BP SD encoder/decoder and hands-free video middleware
Tera Probe, Inc.	TeraFaces™ facial verification software
Ubiquitous Corporation	Ubiquitous Network Framework, DeviceSQL, QuickBoot, DTCP-IP, WPA/WPS/Wi-Fi Direct, ECHONET Litev embedded middleware
Uquest, Ltd.	MatrixQuestUSB series middleware
Zuken Elmic, Inc.	MirrorLink, Ethernet AVB, ONVIF, RTP, and TCP/IP (IPv4, IPv6) middleware

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)

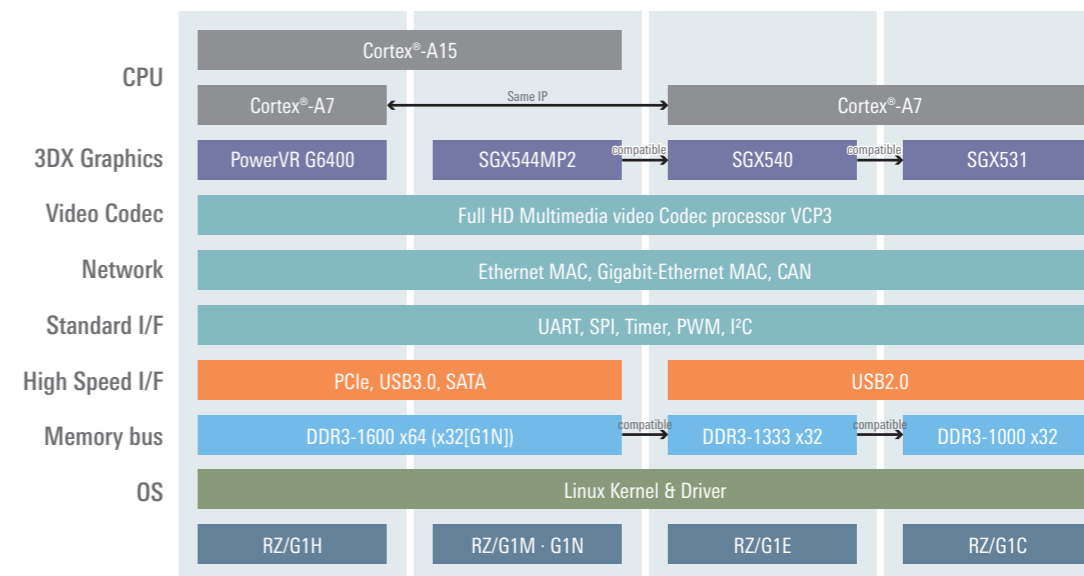
Support for 3D graphics and Full HD video

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	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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

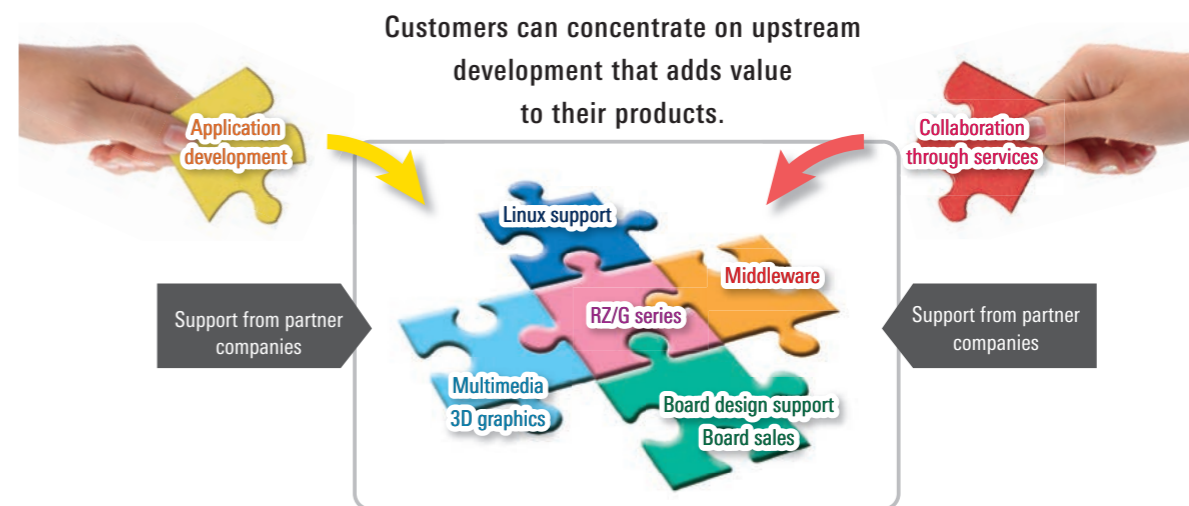
Using the same architecture maintains compatibility with other product versions and software



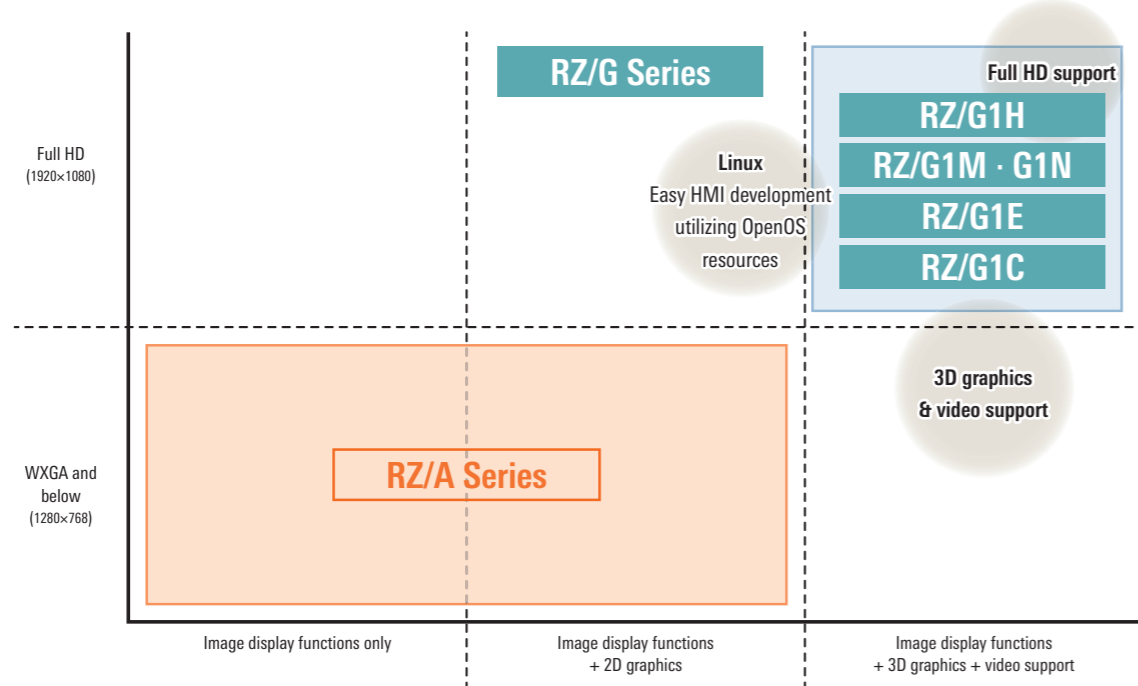
Collaboration with partner companies

Support from partner companies for complex system development

More than ten partner companies provide support in the form of hardware, software, development tools, and services.



HMI Solutions



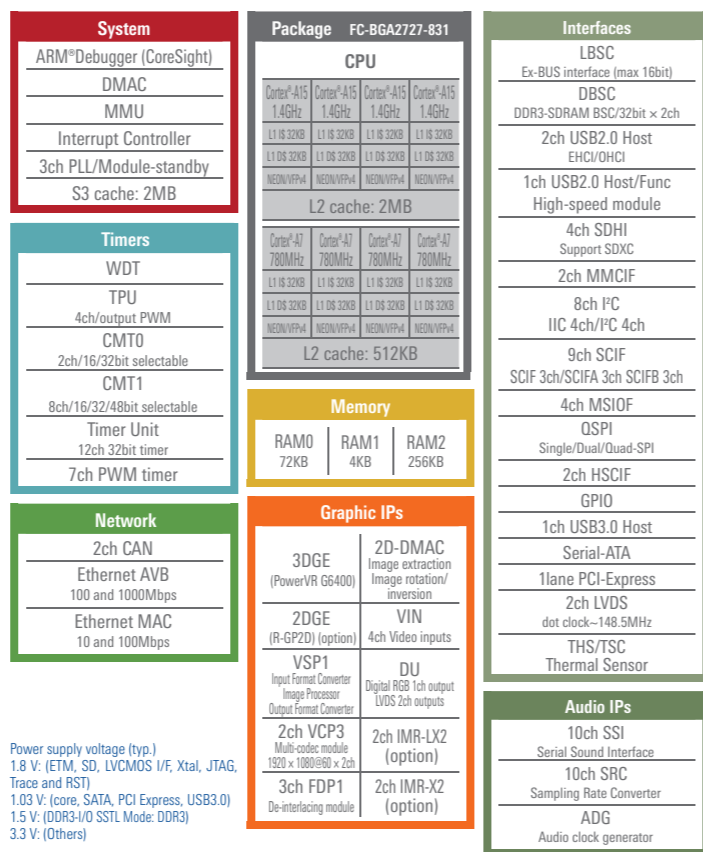
- HMI solutions optimized to match the image resolution, functions, and OS
- RZ/G series: Full HD, functions: 3D Gfx, vide, OS: Linux (RichOS)
- RZ/A series: WXGA and below, functions: 2D Gfx, camera input processing, OS: RTOS

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



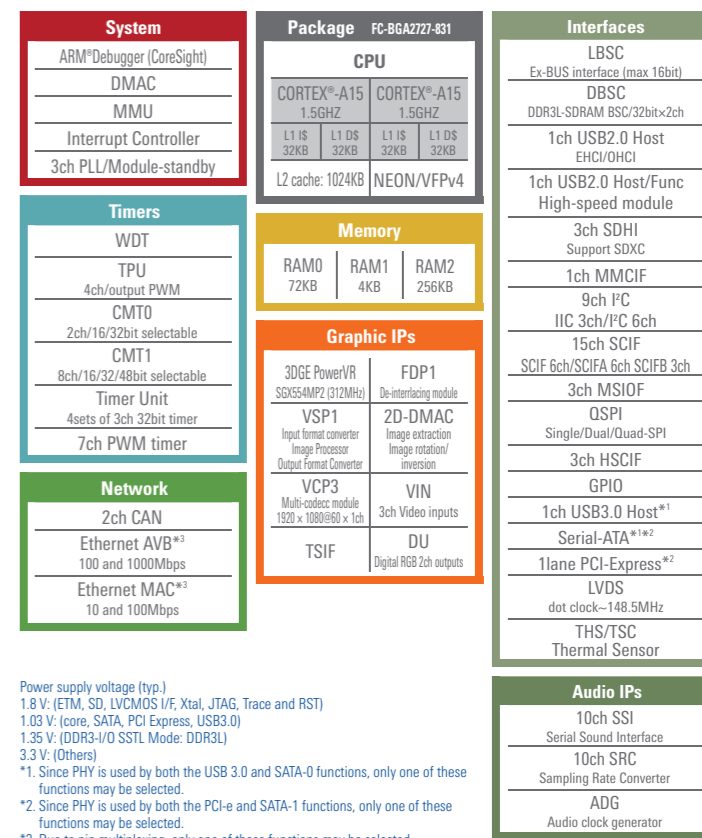
RZ/G1M (R8A77430)

- 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
- 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

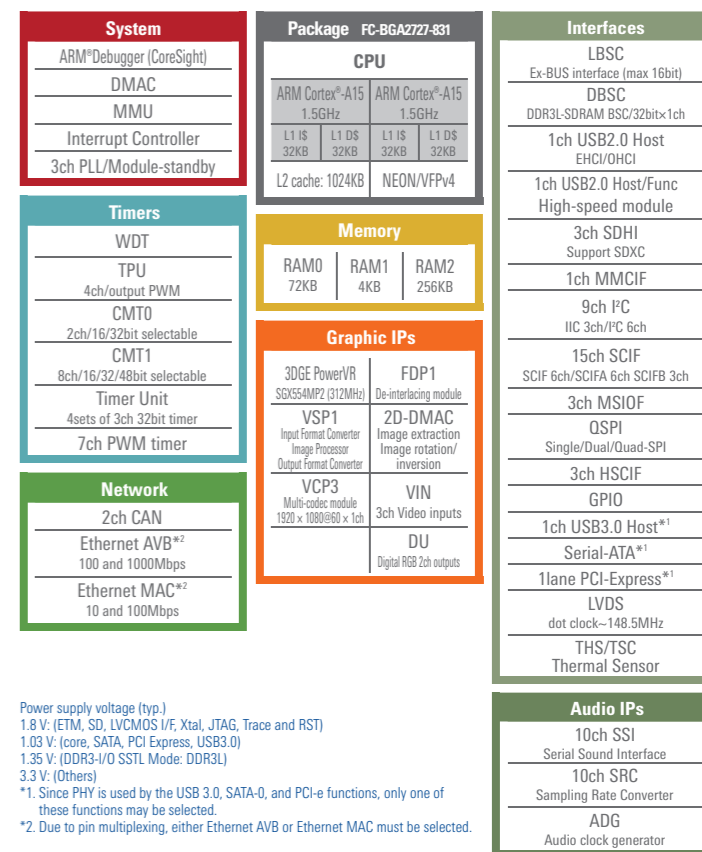
RZ/G1N (R8A77440)

- 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
- 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/G1M (R8A77430) block diagram



RZ/G1N (R8A77440) block diagram

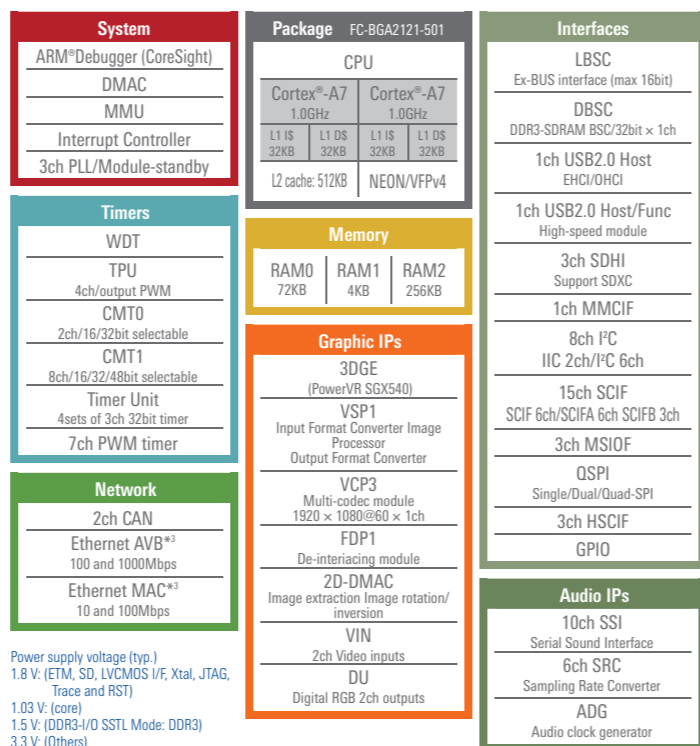


RZ/G1E (R8A77450)

- 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

- 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

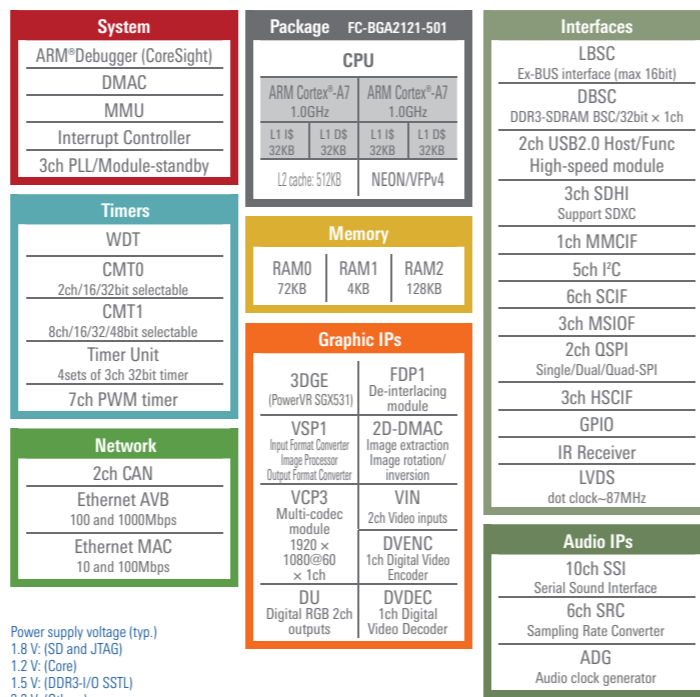


RZ/G1C (R8A77470)

- 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 NTSC <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
- 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 Series: Solutions from Partner Companies

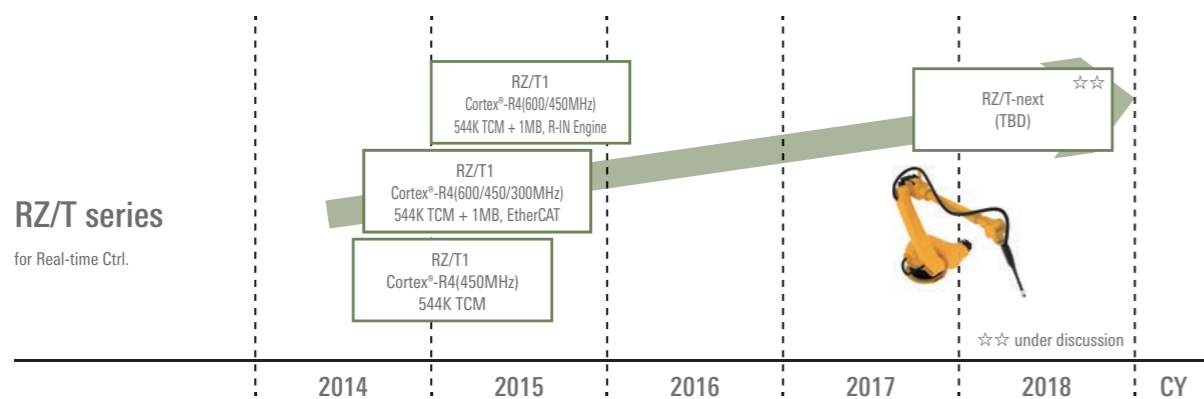
Partner companies provide a variety of services to support developers using the RZ/G series, including GUI frameworks, middleware, OS support, board design support, and sales of evaluation and mass production boards.

Development environments, emulators	
ARM Ltd.	DS-5 (development studio 5) development environment, ARM CC DSTREAM™ JTAG emulator
Computex Co., Ltd.	PALMiCE3 JTAG emulator
DTS INSIGHT Corporation	adviceLUNA II JTAG emulator, dynamic text/analysis tool, CAN logger, flash programmer
EmbitEK Co., Ltd.	J-Link JTAG emulator
Kyoto Microcomputer Co., Ltd.	PARTNER-Jet2 JTAG emulator, internal bus load, Linux debugging and dynamic analysis tool
Starter kits, evaluation boards, platforms, etc.	
Algo System Co., Ltd.	Contract development of panel computers employing RZ/G Series
Atmark Techno, Inc.	Armadillo-EVA 1500 RZ/G1M evaluation board
Hitachi ULSI Systems Co., Ltd.	Solution Engine G1 RZ/G1M evaluation board
iWave Japan, Inc.	Q7 specification (7 × 7cm) board populated with RZ/G Series
OS, middleware, tools	
ACCESS Co., Ltd.	ACCESS Connect and HTML browser for IoT
Acontis Technologies	EtherCAT Master Stack
eForce Co., Ltd.	RTOS μC3*
eSOL Co., Ltd.	RTOS eT-Kernel*
International Laboratory Corporation	GENWARE3 and GENWARE4 (2D support) GUI development environments for embedded devices
IT Access Co., Ltd.	SEGA Acroarts OpenGL based HMI, Telebeena entertainment platform for smartphones
Lineo Solutions, Inc.	Warp!! quick-start solution for embedded Linux
NEC Corporation	NeoFace (face recognition), FieldAnalyst (auto gender and age estimation system)
Software Research Associates, Inc.	"Qt" GUI framework support, development support
Zuken Elmic, Inc.	MirrorLink, Ethernet AVB, ONVIF, RTP, TCP/IP (IPv4, IPv6) middleware
Design house	
Hitachi Industry & Control Solutions, Ltd.	System integrator
NEC Corporation	System integrator

* Contact the partner vendor for information on supported peripheral functions. Multimedia (H.264 codec and graphics) functions are not supported when using an RTOS.

RZ/T Series

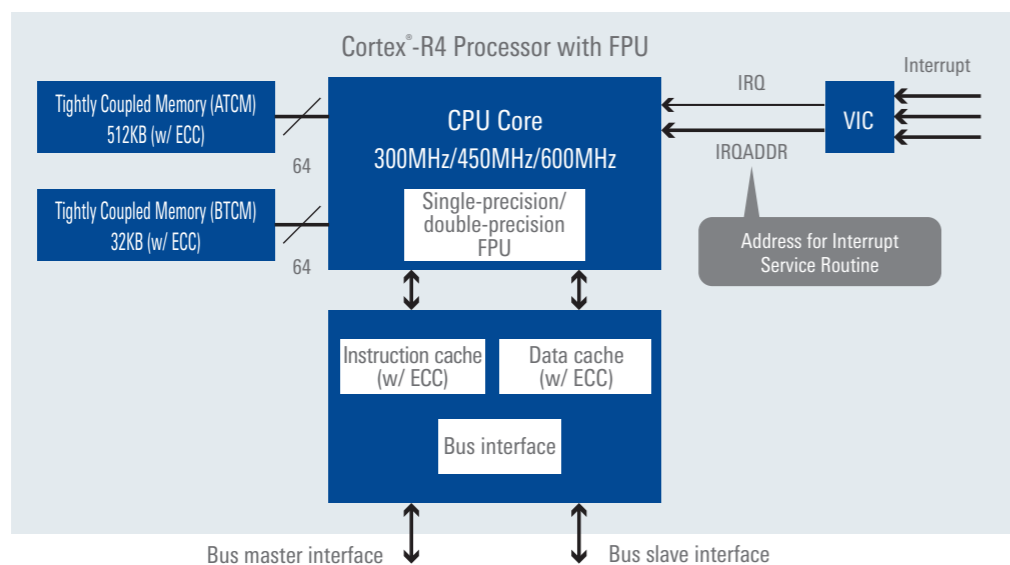
RZ/T Series: Roadmap



RZ/T Series Features

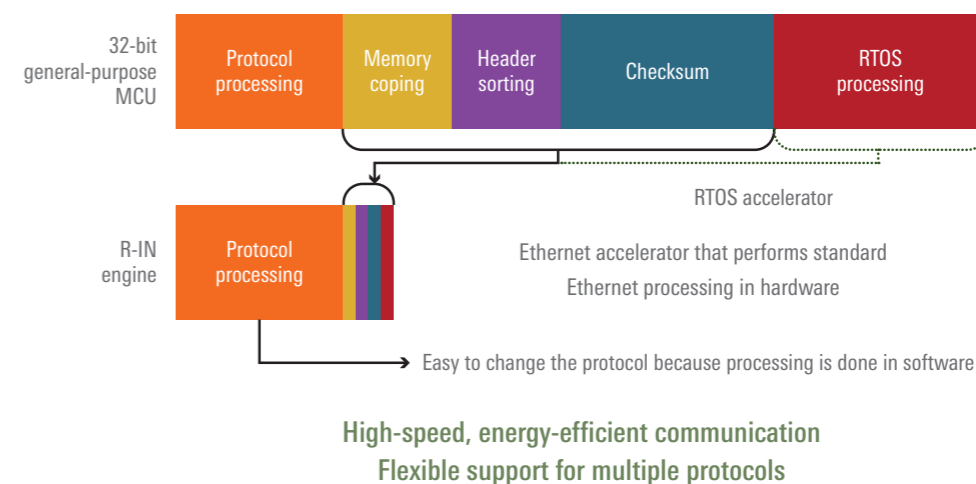
- High-performance, high-speed real-time control
- R-IN engine
- Integrated peripheral functions

High-performance, high-speed real-time control



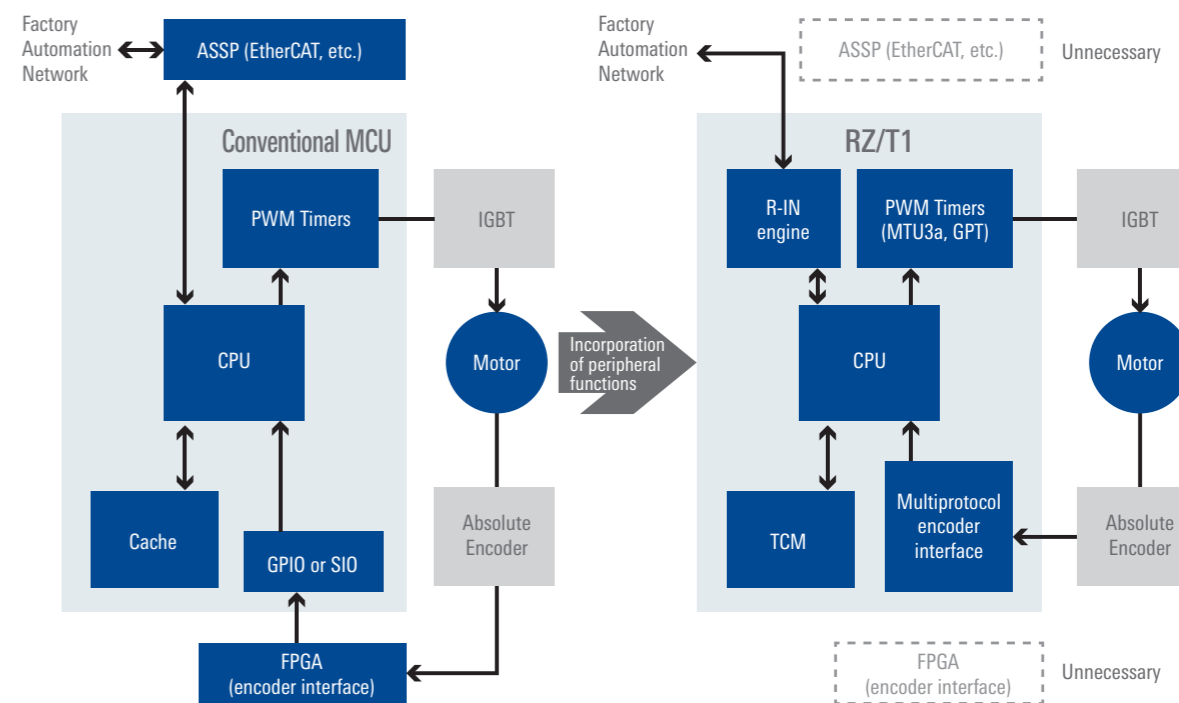
- High-speed RAM directly connected to the CPU for high-speed processing and dependable real-time responsiveness without caching
- ECC for enhanced reliability
- Vectored Interrupt Controller (VIC) to assure interrupt responsiveness suitable for embedded control

R-IN engine



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

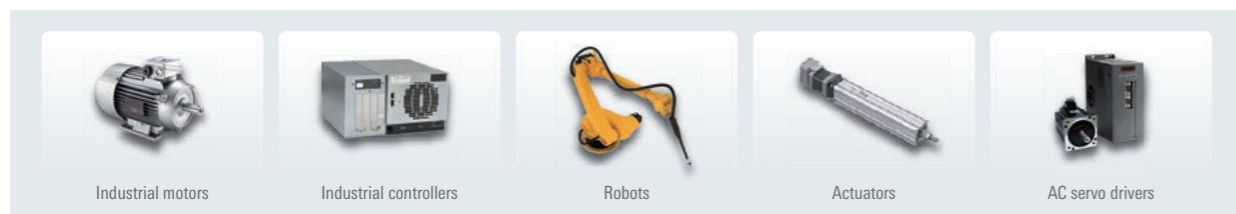
Integrated peripheral functions



- 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)

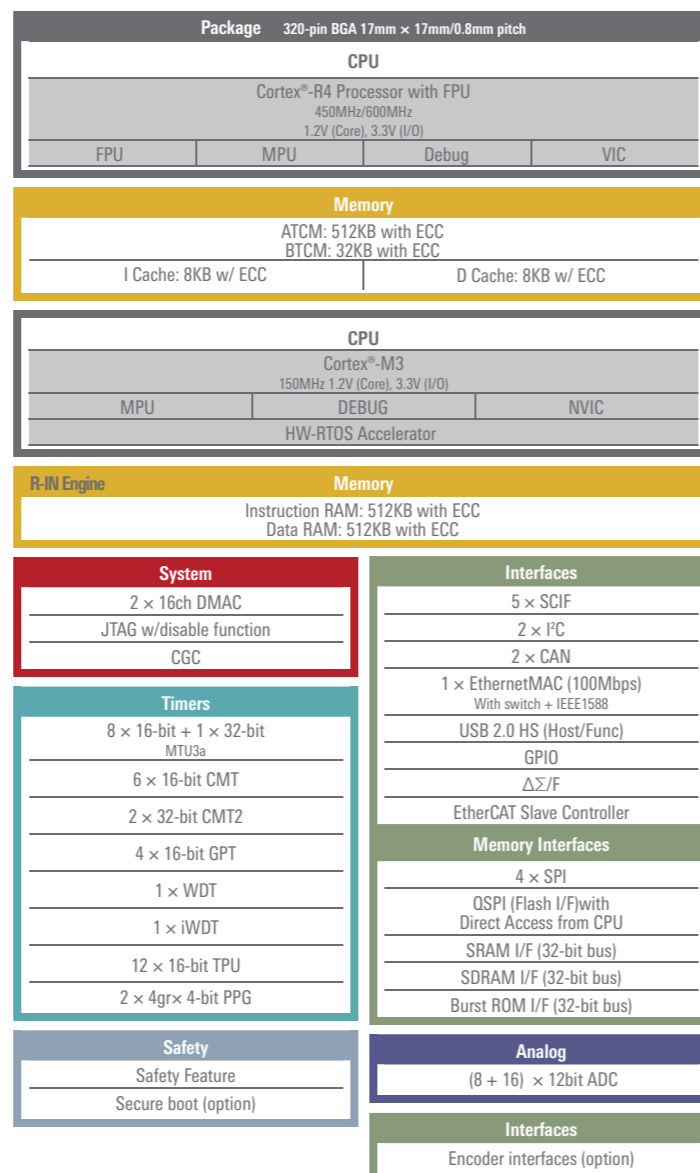
Features

- 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)
- 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)
- 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 (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)

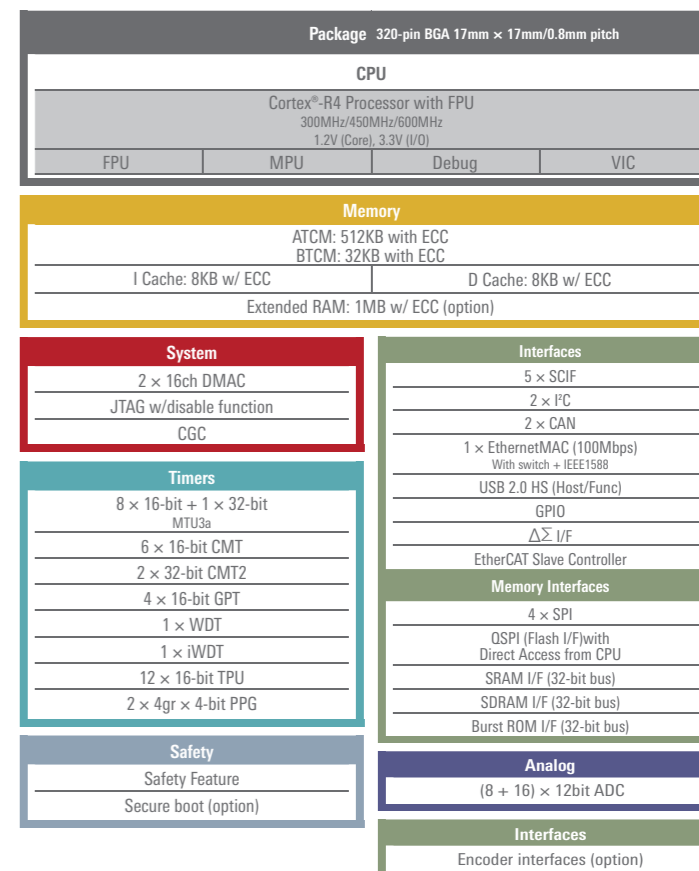
Features

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

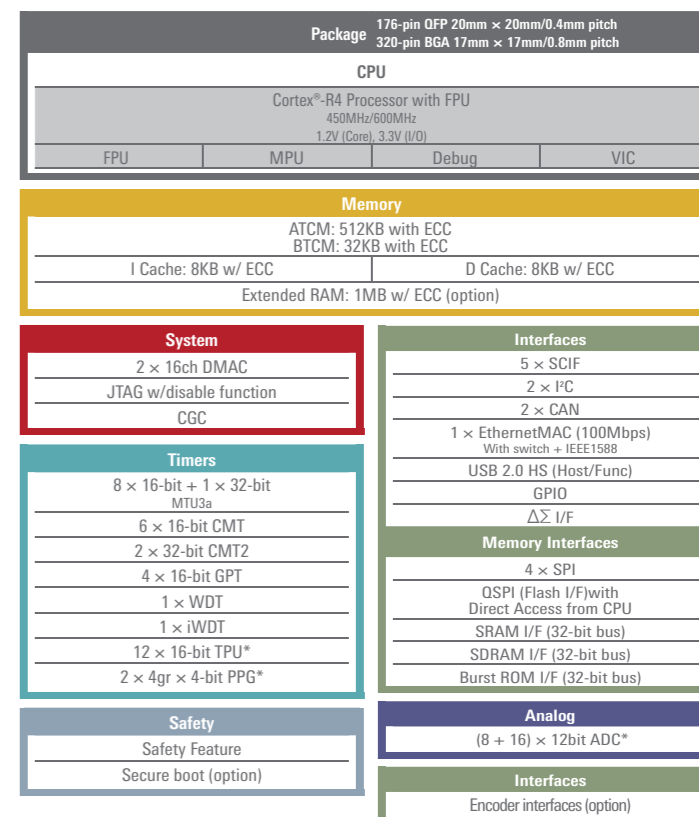
Package

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

RZ/T1 (with EtherCAT support) block diagram



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)

Development environments	<ul style="list-style-type: none"> IAR Embedded Workbench® for ARM® 	<ul style="list-style-type: none"> DS-5 	<ul style="list-style-type: none"> e² studio*1
Compilers	<ul style="list-style-type: none"> IAR C/C++ compiler*2 	<ul style="list-style-type: none"> ARM CC*3 	<ul style="list-style-type: none"> GNU tool*4
Other tools	<ul style="list-style-type: none"> AP4 code generation tool from Renesas is compatible. 	<ul style="list-style-type: none"> AP4 code generation tool from Renesas is compatible. 	<ul style="list-style-type: none"> Code generation function available as a plug-in.
ICEs	<ul style="list-style-type: none"> I-jet™/I-jet Trace™ for ARM Cortex®-A/R/M JTAGjet-Trace 	<ul style="list-style-type: none"> DSTREAM™ ULINKpro™ ULINKproD™ ULINK2™ 	<ul style="list-style-type: none"> J-Link LITE from Segger J-Link series from Segger*5

*1. Eclipse-based development environment from Renesas (<http://japan.renesas.com/e2studio>)

*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. ARM CC is available in a free evaluation version that provides full functionality but is limited to 30 days of use. Contact a DS-5 sales agent 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)

Debuggers	<ul style="list-style-type: none"> PARTNER-Jet2 	<ul style="list-style-type: none"> microVIEW-PLUS 	<ul style="list-style-type: none"> CSIDE version 6
ICEs		<ul style="list-style-type: none"> adviceLUNA II 	<ul style="list-style-type: none"> PALMiCE3
Supported compilers	<ul style="list-style-type: none"> exeGCC from Kyoto Microcomputer GNU tool*1 ARM CC*2 IAR C/C++ compiler,*3 etc. 	<ul style="list-style-type: none"> ARM CC*2 GNU tool,*1 etc. 	<ul style="list-style-type: none"> 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 available in a free evaluation version that provides full functionality but is limited to 30 days of use. Contact a DS-5 sales agent for details.

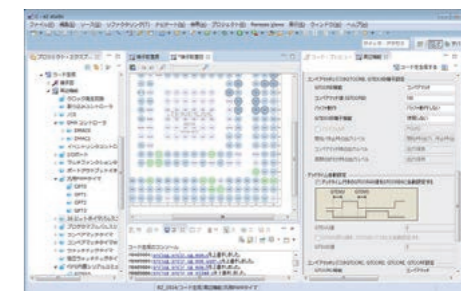
*3. A free evaluation license is available provided the 30-day time-limited evaluation or the permanent 32KB size-limited evaluation (www.iar.com/EWARM)

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.

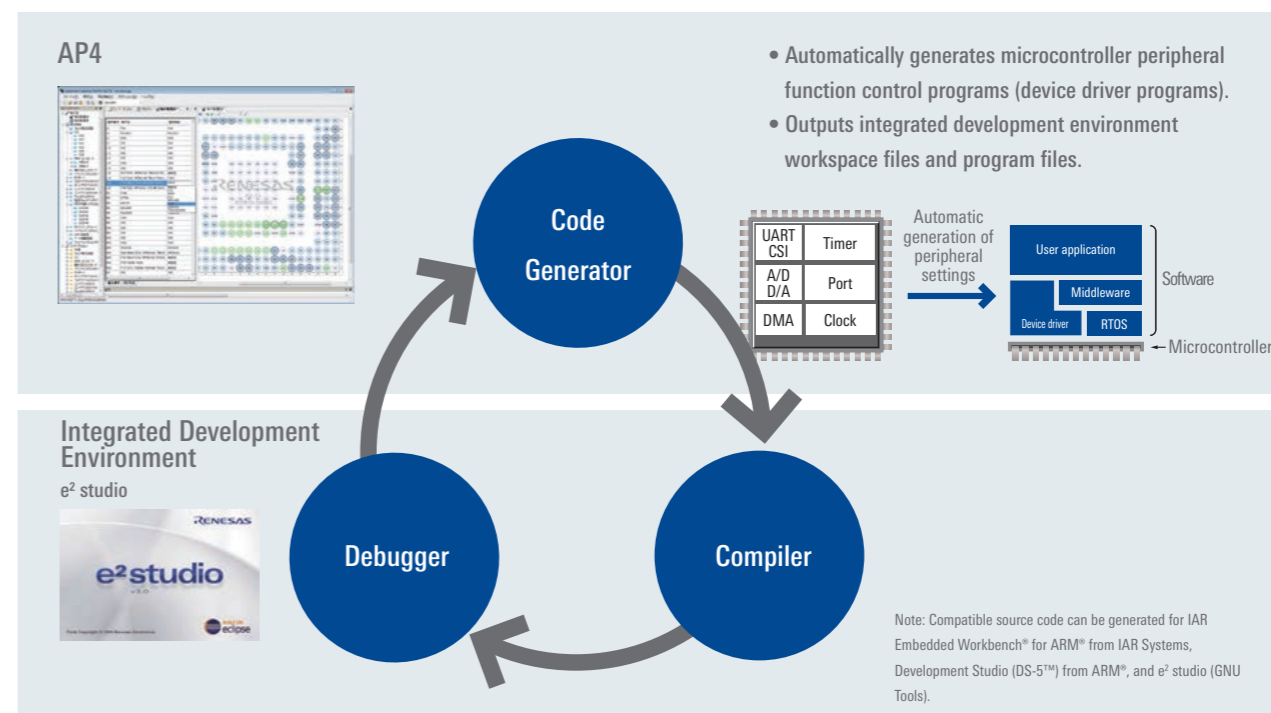
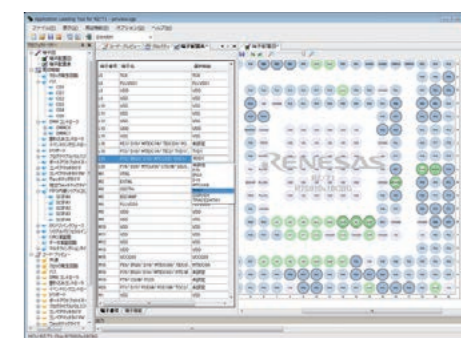
C/C++ perspective: code generation plug-in

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.



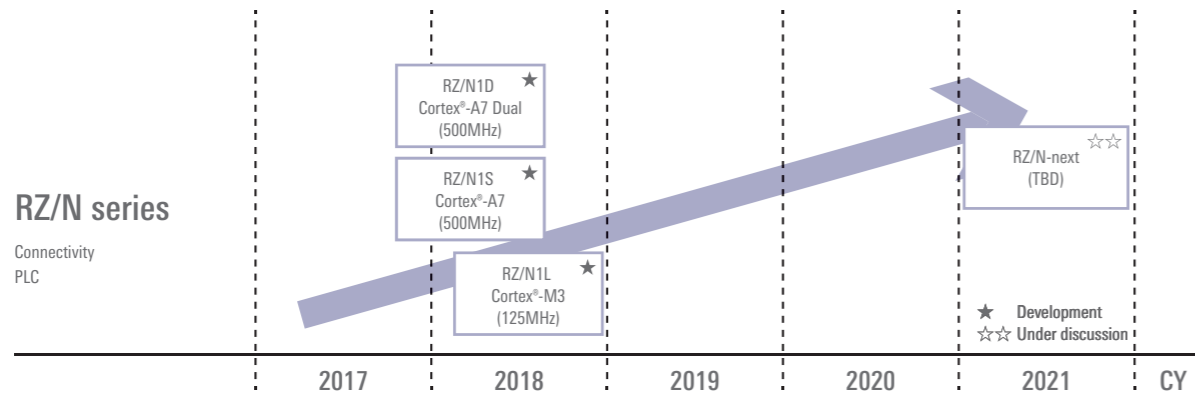
AP4: Code Generation Support Tool

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 interoperability with integrated development environments. 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/N Series

RZ/N Series: Roadmap

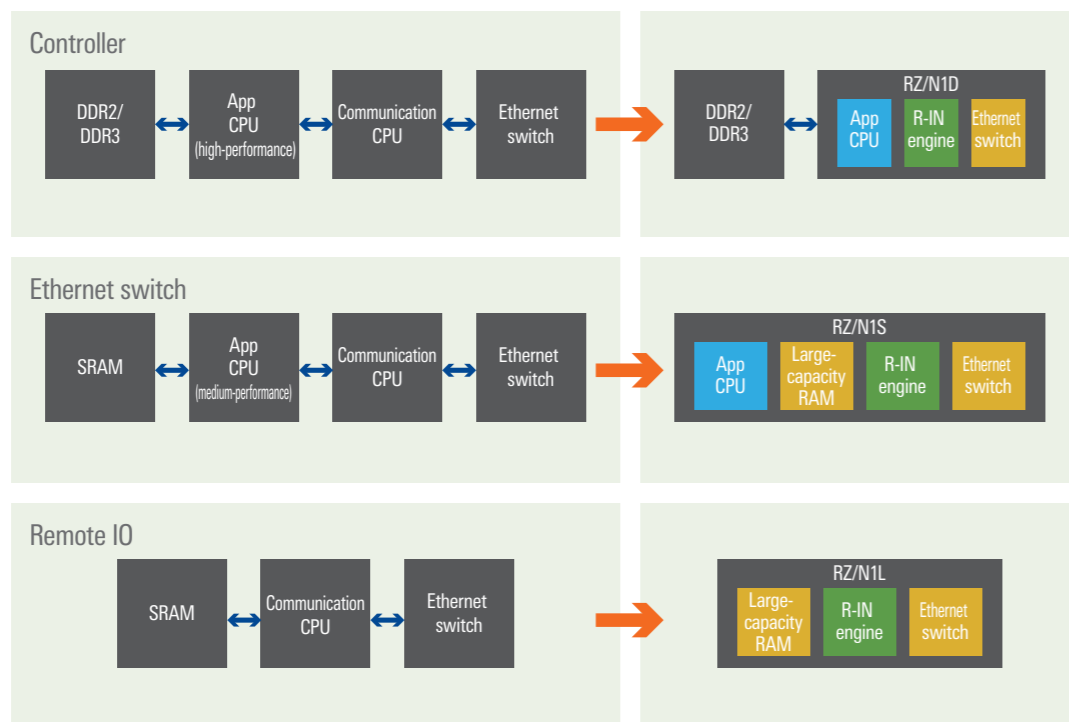


RZ/N Series Features

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.

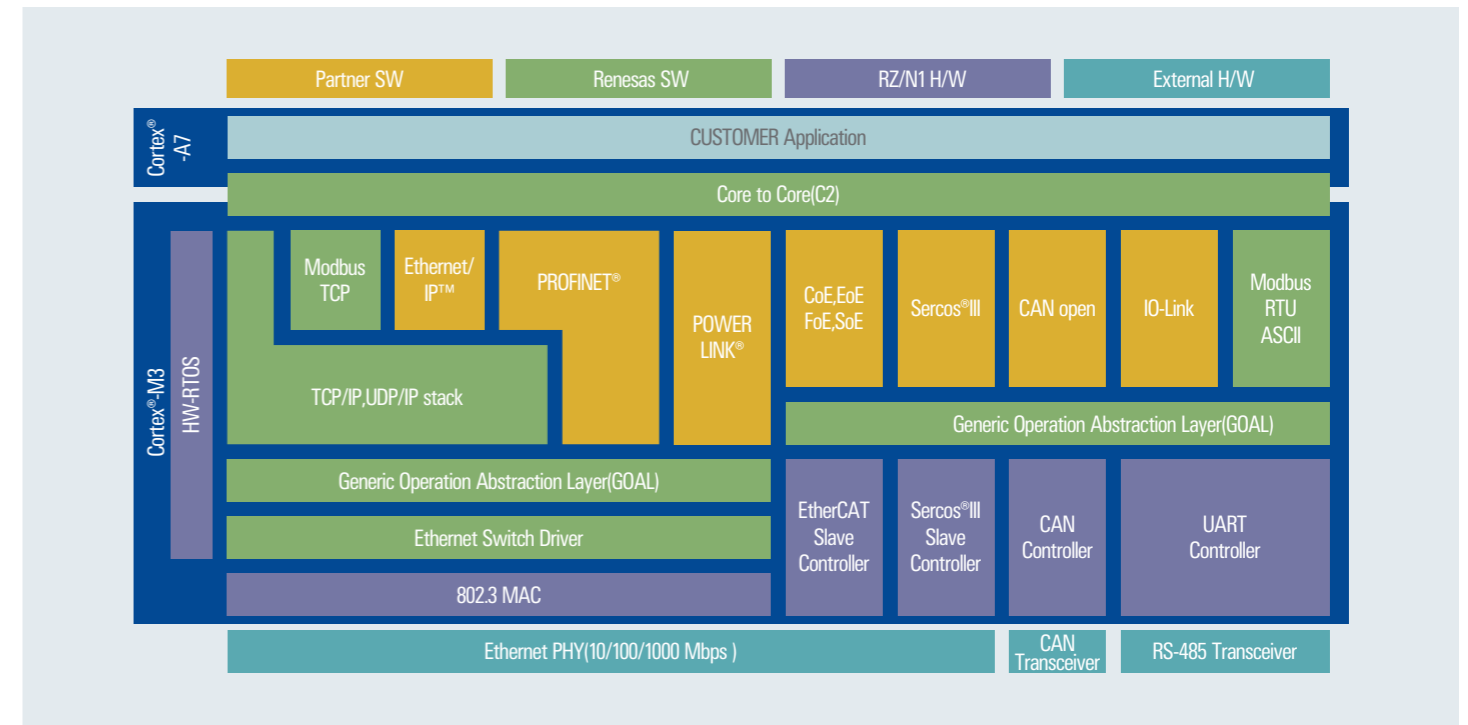
- Integrated 5-port gigabit Ethernet switch and lineup of three CPU types make it possible to provide the optimal microcontrollers for a wide range of industrial network applications.
- ✓ 5-port gigabit Ethernet switch and two independent MAC units support applications such as PLC devices and Ethernet 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 Spanning Trees (RSTP), High-Availability Seamless Redundancy (HSR)

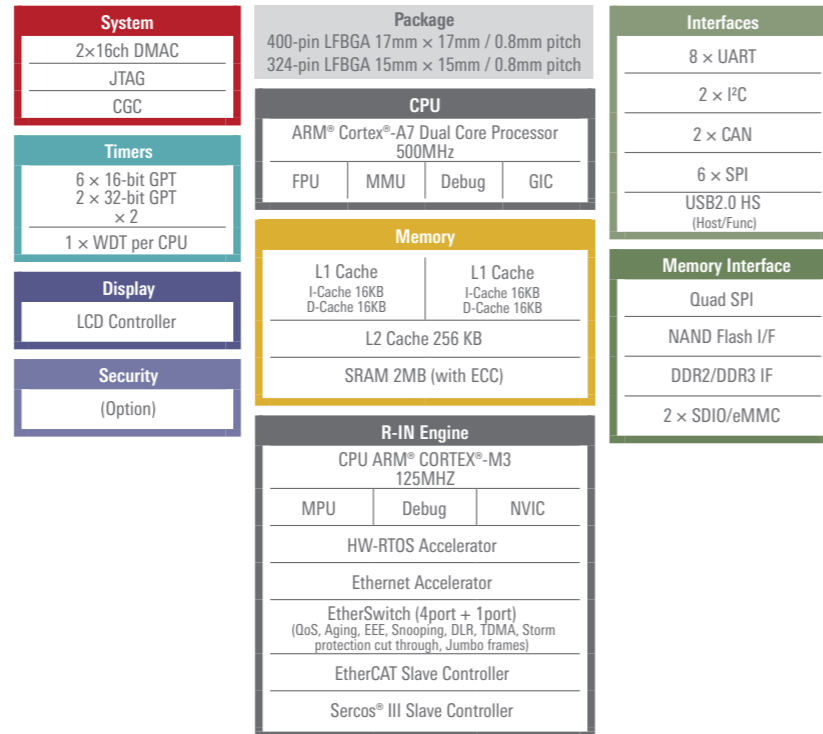
RZ/N Series: Target Applications



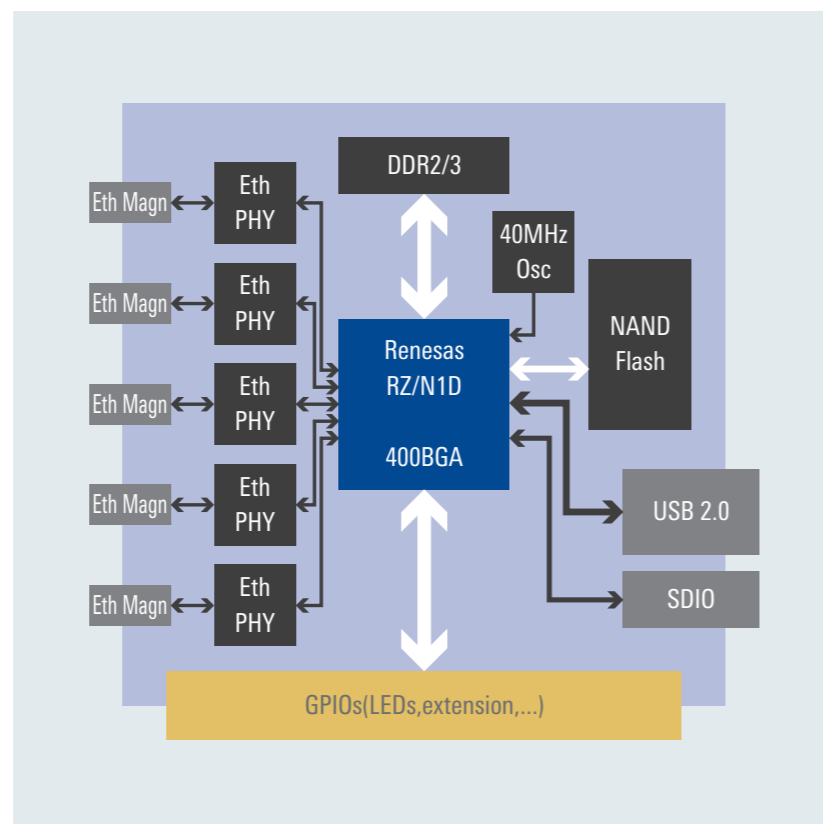
RZ/N1D Group

- 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 pin pitch
- Operating temperature
- T_j = -40°C to +110°C

■ RZ/N1D block diagram



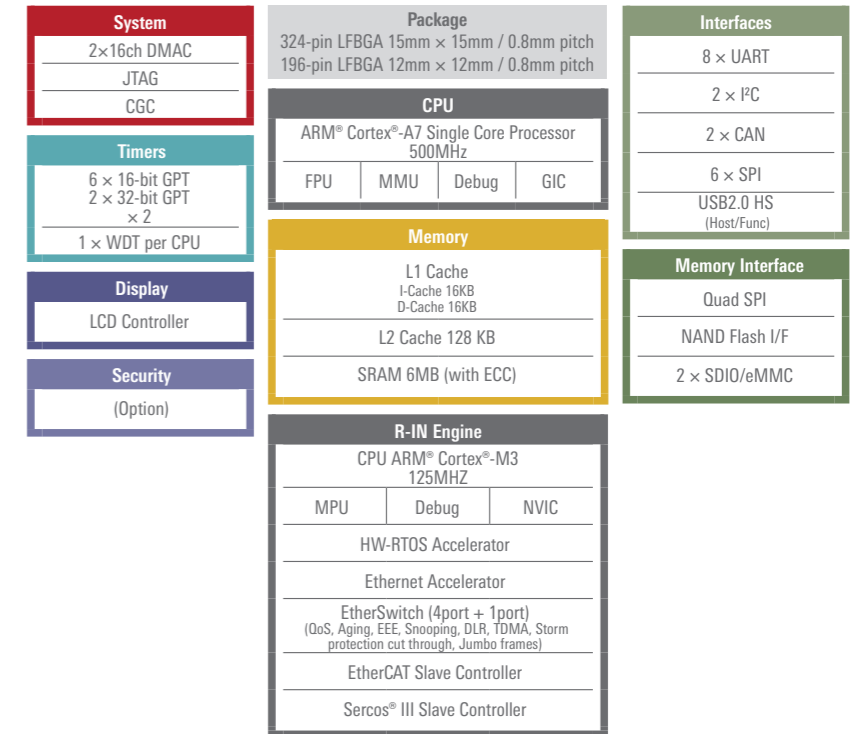
■ Application example: Programmable logic controller Block diagram



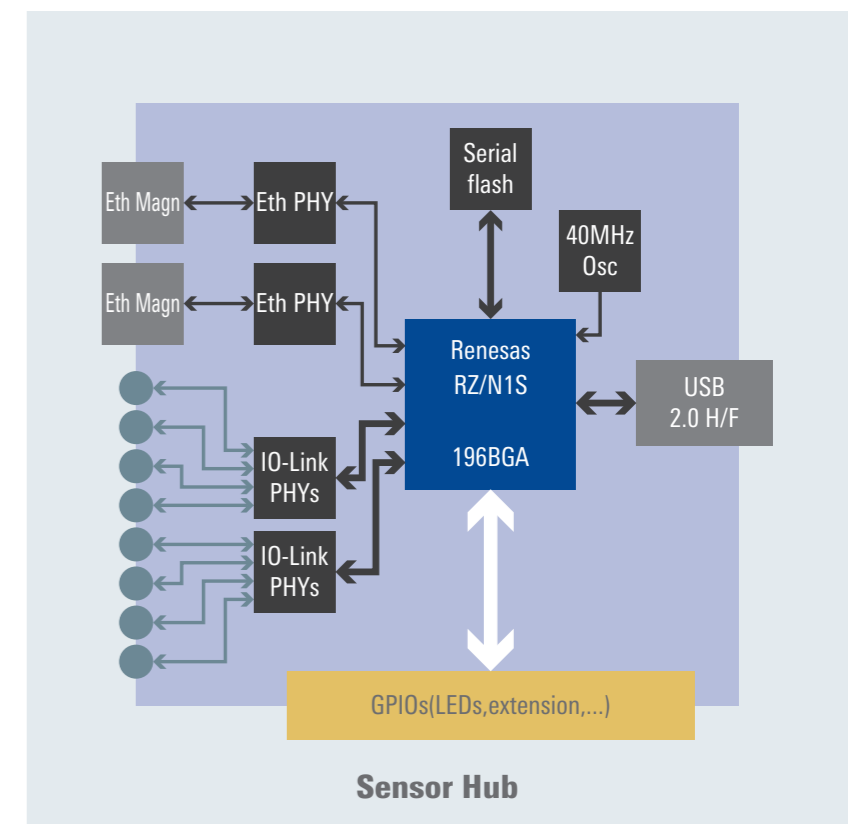
RZ/N1S Group

- 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
- T_j = -40°C to +110°C

■ RZ/N1S block diagram



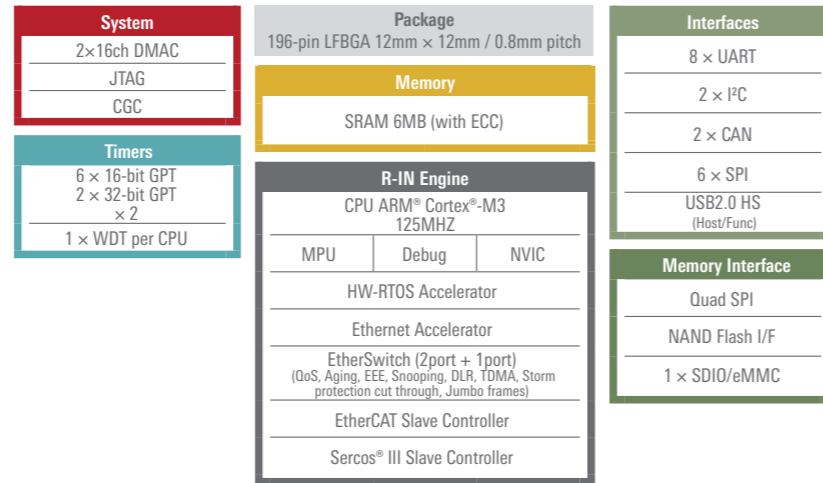
■ Application example: Sensor Hub block diagram



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
- T_j = -40°C to +110°C

RZ/N1L block diagram



RZ/N Series: Solutions from Renesas Partners

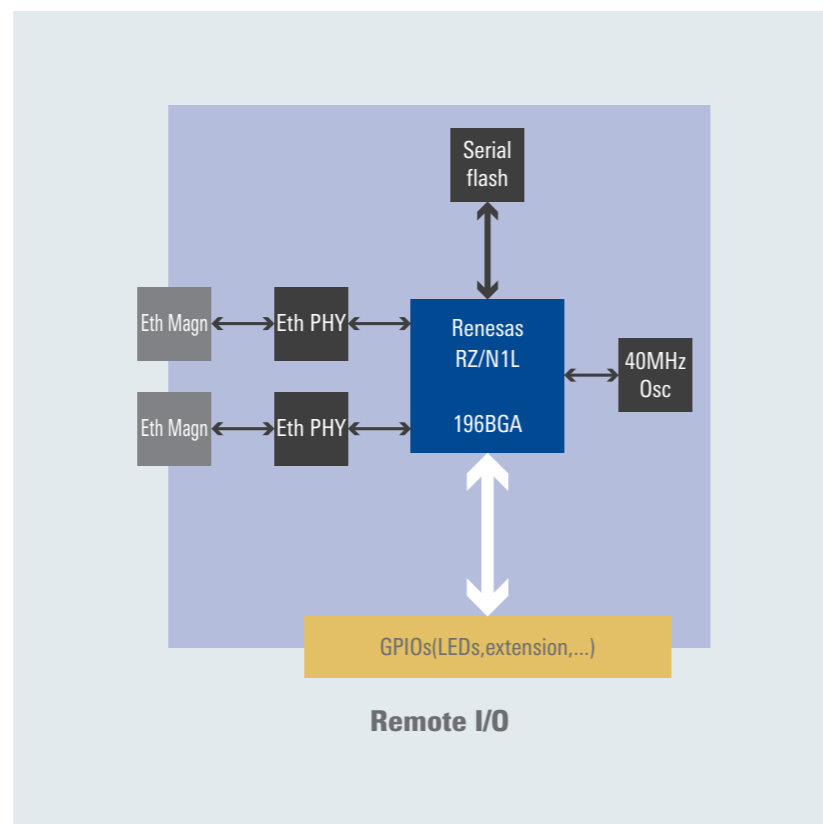
A variety of software solutions are available from vendors with deep expertise in industrial networks.

Protocol Vendor	
Port.GmbH	Industrial network stack PROFINET (Slave) EtherNet/IP (Slave) Powerlink (Slave)
TMG (TMG Technologie und Engineering GmbH)	Industrial network stack PROFINET (Slave) EtherNet/IP (Slave)
Cannon Automata	Industrial network stack Sercos® III (Slave)
NetModule	Redundant protocol HSR/PRP

RZ/N Series: Development Environments

CPU Core	• Cortex®-A7 • Cortex®-M3	• Cortex®-A7 (for VxWorks)	• Cortex®-A7 (for Linux)
Debugger	• Embedded • Workbench	• Eclipse	• GDB
Compiler	• IAR • C/C++ Compiler	• GCC • DIAB	• GCC
ICEs	• I-jet™	• JTAG debugger (LAUTERBACH)	• J-Link (SEGGER)

Application example: Remote I/O



RZ Specifications

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

Group name	RZ/A1M				
	256-pin			324-pin	
Pin count					
Product 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				
I ² C (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 = LVDSPLLCC = USBVAVCC = USBVAVCC = 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				
	256-pin			324-pin	
Pin count					
Product 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				
I ² C (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 = LVDSPLLCC = USBVAVCC = USBVAVCC = 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 208-pin)

Group name	RZ/A1LU				
	176-pin			208-pin	
Pin count					
Product name	R7S721030VCBG	R7S721030VCFP	R7S721030VLFP	R7S721031VCFP	R7S721031VLFP
Quality level	Standard 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	-				
3-phase PWM output function	-				
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				
I ² C (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 = LVDSPLLCC = USBAPVCC = 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)		

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

Group name	RZ/A1L					RZ/A1LC
	176-pin			208-pin		176-pin
Pin count						
Product name	R7S721020VCBG	R7S721020VCFP	R7S721020VLFP	R7S721021VCFP	R7S721021VLFP	R7S721024VCBG
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	-					
3-phase PWM output function	-					
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					
I ² C (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 = LVDSPLLCC = USBAPVCC = 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
Product 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
I ² C (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_MLB=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, VDDQ_SATA0=0.98to1.08V, VDDA_SATA0, SATA1=1.7to1.9V, VDDQ_SATA1=0.98to1.08V, VDDA_SATA0, VDDA_SATA1=1.7to1.9V, VDDQ_SATA0, VDDQ_SATA1=0.98to1.08V, VDD_CPGPLL=1.7to1.9V, VDDQ_MODPLL, VDDQ_M1DPLL, VDDQ_M1MPLL, VDDQ_M0APLL, VDDQ_M1APLL=1.7to1.9V, DU/DUO_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, VDDQ_SATA0=0.98to1.08V, VDDA_SATA1=1.7to1.9V, VDDQ_SATA1=0.98to1.08V, VDDA_SATA0, VDDA_ SATA1=1.7to1.9V, VDDQ_SATA0, VDDQ_SATA1=0.98to1.08V, VDD_CPGPLL=1.7to1.9V, VDDQ_MODPLL, VDDQ_M1DPLL, VDDQ_M1MPLL, VDDQ_M0APLL, VDDQ_M1APLL=1.7to1.9V, DU/DUO_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, VDDQ_SATA0=0.98 to 1.08V, VDDA_SATA0=1.7 to 1.9V, VDDQ_SATA0=0.98 to 1.08V, VDDA_SATA0=1.7 to 1.9V, VDDQ_SATA0=0.98 to 1.08V, VDD_CPGPLL=1.7 to 1.9V, VDDQ_MODPLL, VDDQ_M0APLL=1.7 to 1.9V, DU/ DUO_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
Product 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	3
SPI (channels)	1	1
UART (channels)	18	18
I ² C (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=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	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					
Product 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 ² C (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							
Product 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 ² C (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
	400-pin	324-pin	324-pin	196-pin	196-pin
Pin count	400-pin	324-pin	324-pin	196-pin	196-pin
Product 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		YES		-
Floating-point unit	YES		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		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	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. 2 ports	Max. 1 port
EtherCAT Slave Controller	Max. 3 ports		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 ² C (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 or 2.5 V for I/O, 1.15V for CPU 1.5V for DDR3 or 1.8V for DDR2		3.3 V /2.5 V for I/O, 1.15 V for CPU		3.3 V or 2.5 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				

Package Lineup

▼ HLQFP

176-HLQFP (20 × 20mm)

Pitch	0.40mm
Thickness (max.)	1.70mm
Mounted product	RZ/T1

▼ LFQFP

176-LFQFP (24 × 24mm)

Pitch	0.50mm
Thickness (max.)	1.70mm
Mounted product	RZ/A1L, A1LU

208-LFQFP (28 × 28mm)

Pitch	0.50mm
Thickness (max.)	1.70mm
Mounted product	RZ/A1L, A1LU

256-LFQFP (28 × 28mm)

Pitch	0.40mm
Thickness (max.)	1.70mm
Mounted product	RZ/A1H, A1M

▼ FBGA

320-FBGA (17 × 17mm)

Pitch	0.80mm
Thickness (max.)	2.30mm
Mounted product	RZ/T1

324-FBGA (19 × 19mm)

Pitch	0.80mm
Thickness (max.)	2.10mm
Mounted product	RZ/A1H, A1M

501-FBGA (21 × 21mm)

Pitch	0.80mm
Thickness (max.)	2.40mm
Mounted product	RZ/G1E, G1C

831-FBGA (27 × 27mm)

Pitch	0.80mm
Thickness (max.)	2.40mm
Mounted product	RZ/G1H, G1M, G1C

▼ LFBGA

176-LFBGA (8 × 8mm)

Pitch	0.50mm
Thickness (max.)	1.40mm
Mounted product	RZ/A1L, A1LC, A1LU

196-LFBGA (12 × 12mm)

Pitch	0.80mm
Thickness (max.)	1.70mm
Mounted product	RZ/N1L, N1S

256-LFBGA (11 × 11mm)

Pitch	0.50mm
Thickness (max.)	1.40mm
Mounted product	RZ/A1H, A1M

324-LFBGA (15 × 15mm)

Pitch	0.80mm
Thickness (max.)	1.70mm
Mounted product	RZ/N1D, N1S

400-LFBGA (17 × 17mm)

Pitch	0.80mm
Thickness (max.)	1.70mm
Mounted product	RZ/N1D

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