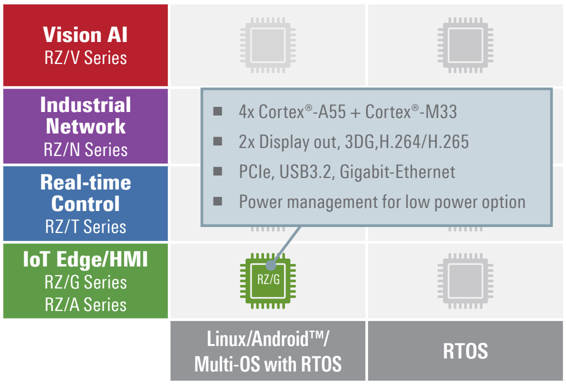
64bit MPU Delivering 1.8GHz for HMI and Edge Computing

RENESAS RZ/G3E GROUP

Quad Arm® Cortex®-A55 and Ethos™ -U55 NPU based Microprocessor (MPU)

RZ/G3E is Renesas' first MPU integrated Quad CPU and NPU in one chip, improving power efficiency, reliability and security for HMI applications. The RZ/G3E offers rich HMI functions including Graphics Engine (GPU), Video Codec, and multi-screen of Full-HD output, and Neural Processing Unit (NPU) for Edge Computing functions. In addition to the Cortex-A55 quad core delivering a powerful 1.8 GHz to run both HMI and edge computing functions, RZ/G3E also features a Cortex-M33 core to enable low power operation. The combination of two different cores enables users to build products with both high performance and low power consumption.



- 4x Cortex®-A55 + Cortex®-M33
- 2x Display out, 3DG,H.264/H.265
- PCIe, USB3.2, Gigabit-Ethernet
- Power management for low power option

Key Features

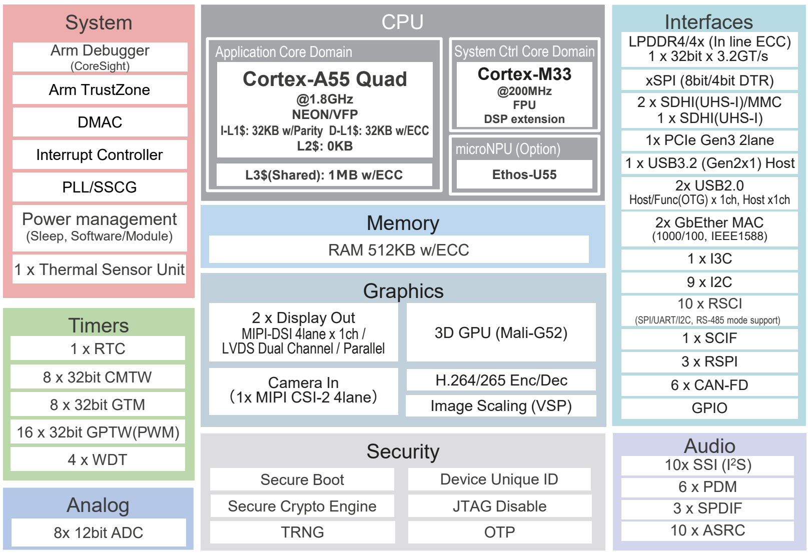
- 4x Cortex®-A55 1.8GHz
- 1x Cortex®-M33 200MHz
- 1x Ethos™-U55 NPU
- 1x Mali™-G52
- 1x H.264/H.265 Codec
- 2x Display out: MIPI DSI, LVDS, Parallel-IF
- 1x Camera In: MIPI CSI-2
- LPDDR4/LPDDR4X Memory Interface
- 2x Giga-bit Ethernet
- PCIe® Interface (Gen3)
- 6x CAN-FD
- 12bit ADC 8ch
- Low Power standby mode
- Package : 15x15mm, 21x21mm

Target Applications

- Industrial HMI, Industrial PC
- Multi-function printer for office
- Medical HMI, Smart Retail
- Home Security, Smart Doorbell, Smart Thermostat
- EV Charger HMI

Block Diagram

RZ/G3E Block Diagram



System
- Arm Debugger (CoreSight)
- Arm TrustZone
- DMAC
- Interrupt Controller
- PLL/SSCG
- Power management (Sleep, Software/Module)
- 1 x Thermal Sensor Unit

Timers
- 1 x RTC
- 8 x 32bit CMTW
- 8 x 32bit GTM
- 16 x 32bit GPTW(PWM)
- 4 x WDT

Analog
- 8x 12bit ADC

CPU
- Application Core Domain
  - **Cortex-A55 Quad** @1.8GHz NEON/VFP I-L1$: 32KB w/Parity D-L1$: 32KB w/ECC L2$: 0KB
  - L3$(Shared): 1MB w/ECC
- System Ctrl Core Domain
  - **Cortex-M33** @200MHz FPU DSP extension
- microNPU (Option)
  - Ethos-U55

Memory
- RAM 512KB w/ECC

Graphics
- 2 x Display Out MIPI-DSI 4lane x 1ch / LVDS Dual Channel / Parallel
- 3D GPU (Mali-G52)
- Camera In (1x MIPI CSI-2 4lane)
- H.264/265 Enc/Dec
- Image Scaling (VSP)

Security
- Secure Boot
- Device Unique ID
- Secure Crypto Engine
- JTAG Disable
- TRNG
- OTP

Interfaces
- LPDDR4/4x (In line ECC) 1 x 32bit x 3.2GT/s
- xSPI (8bit/4bit DTR)
- 2 x SDHI(UHS-I)/MMC 1 x SDHI(UHS-I)
- 1x PCIe Gen3 2lane
- 1 x USB3.2 (Gen2x1) Host
- 2x USB2.0 Host/Func(OTG) x 1ch, Host x1ch
- 2x GbEther MAC (1000/100, IEEE1588)
- 1 x I3C
- 9 x I2C
- 10 x RSCI (SPI/UART/I2C, RS-485 mode support)
- 1 x SCIF
- 3 x RSPI
- 6 x CAN-FD
- GPIO

Audio
- 10x SSI (I²S)
- 6 x PDM
- 3 x SPDIF
- 10 x ASRC

15x15mm 529pin 0.5mm pin-pitch
21x21mm 625pin 0.8mm pin-pitch

Renesas Electronics

www.renesas.com

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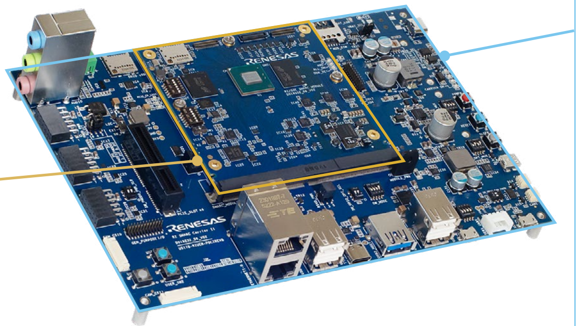
Evaluation Board Kit - RTK9947E57S01000BE

The RZ/G3E SMARC Evaluation Board Kit (EVK) consists of a combination of a CPU module board and a carrier board that are compliant with the SMARC v2.1 standard.

- CPU Module Board
  - RZ/G3E R9A09G047E57GBG x1
  - LPDDR4X SDRAM: 4GB × 1
  - QSPI flash memory: 16MB × 1
  - eMMC memory: 64GB × 1
  - PMIC power supply RAA215300#HA8 implemented
  - microSD card x2
  - JTAG connector
  - ADC x8 channels



- Carrier Board
  - Gigabit Ethernet x2
  - USB2.0 Micro B OTG
  - USB2.0 Type-A x2
  - USB3.2 Type-A, USB3.2 Type-C
  - MIPI CSI-2 Camera interface x2
  - Micro HDMI, MIPI-DSI/LVDS interface x2
  - uSD interface
  - Mono speaker interface, Stereo headphone, Mic. and Aux. interfaces
  - CAN interface x2
  - PCIe Gen3 4-lane Slot
  - M.2 Key E interface
  - Module supply current monitor
  - USB-Type C power input

Software Package

Select your ideal Linux package from the following three types.

	Linux BSP Plus	Verified Linux Package	HMI SDK
Target Users	Expert	Expert	Beginner
Kernel Support Term	2 years	10 years	10 years
Kernel Update	Every year	Every 2 years	Every 2 years
Yocto Update	Every 2 years	No	No
Verification Level	Low	High	High
Maintenance Term	none	6 month	6 month

Ordering References

Product Group	RZ/G3E							
Part Number	R9A09G047E57GBG	R9A09G047E47GBG	R9A09G047E37GBG	R9A09G047E27GBG	R9A09G047E58GBG	R9A09G047E48GBG	R9A09G047E38GBG	R9A09G047E28GBG
Arm® Cortex®-A55	4		2		4		2	
Arm® Ethos-U55	Yes	No	Yes	No	Yes	No	Yes	No
Security	Yes							
Package	FCBGA							
Pin Count	529Pin				625Pin			
Package Information	15x15mm, 0.5mm pitch				21x21mm, 0.8mm pitch			

For more details, please visit: **renesas.com/rzg3e**

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