

# RX21A

## The Power Analyzer and Electric Energy Meter MCU



Renesas Electronics' RX21A microcontroller family is the ideal solution for compact electricity meters, offering compatible and optimized devices for 3-phase and single-phase electricity meter applications. The RX21A offers 50 MHz MONOS Flash performance, full 1.8 – 3.6 V Flash operation, DSP functions, seven separate 24-bit ADC modules, RTC, memory protection, AES hardware encryption, temperature sensor, up to 9 serial communications interfaces, and includes up to 512 Kbytes of Flash memory, 8 kbytes of data Flash and 64 kbytes of on chip SRAM in 64- to 100-pin packages.

In combination with dedicated metrology firmware this all enables the design of compact electricity meters at lowest investment. The RX21A is supported by a complete suite of tools including software, debugger, and a meter evaluation platform that allows IEC type tests to be performed.

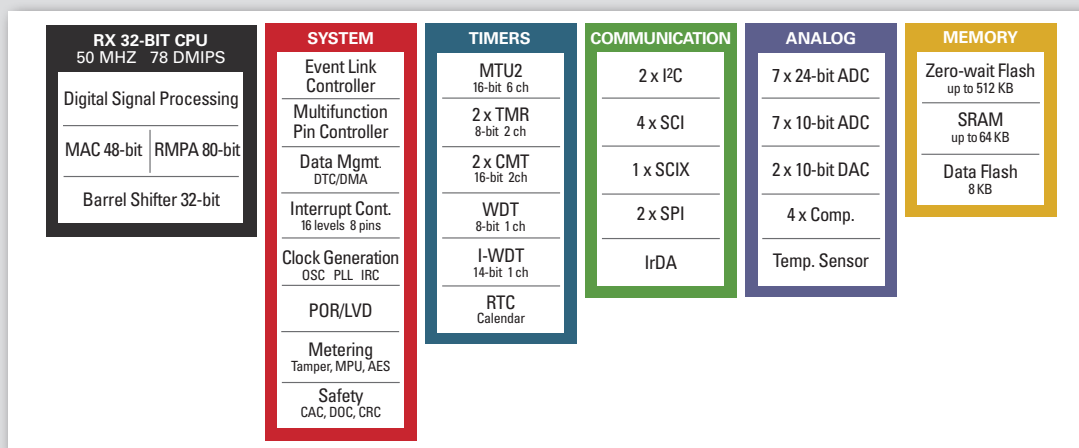
### Applications

- High accuracy electric energy meters
- Power Analyzer

### Key Benefits

- Full single-chip concept providing flexible software-defined metrology architecture, and application MCU
- True RX family concept that saves software investment thus future-proof
- Integration of dedicated meter features to reduce system cost and to make the design ultra-compact
- Same platform for both single-phase and 3-phase meters to ensure cost effective meter design
- Up to seven separate 24-bit  $\Delta\Sigma$  ADC modules with PGA to realize featured 3-ph meter
- Factory calibrated variant (G specification) available that allows for super-high < 0.1 % accuracy over a greater than 6600 : 1 dynamic range, plus a 10 ppm/°C bandgap temperature coefficient
- Full RTC with alarm, calibration, binary count mode, and anti-tamper function
- Calibrated temperature sensor to ease adjustments
- Various communication interfaces that allow easy connection of various modems
- Complete metrology firmware provided, enabling the design of precision single and multi-phase e-meters featuring true single-point calibration, active and reactive power calculation, harmonic content calculation, and energy pulse output generation. Extended dynamic range and higher accuracy automatically achieved through detection of G specification devices

### RX21A Block Diagram



## Key Features

### 32-bit RX CPU core

- Enhanced Harvard Architecture
- 50 MHz operating frequency (max.) ~ 165 DMIPS (1.8 – 3.6 V)
- DSP functions (MAC, RMPA, Barrel shifter)
- Memory protection unit (MPU)

### Memory Line-up

- 256 kbytes to 512 kbytes zero wait-state Flash
- 8 kbytes data Flash with background operation (BGO) function
- 32 kbytes to 64 kbytes SRAM

### Low-power design and architecture

- 1.62 to 5.5 V operation (program and erase)
- 200  $\mu$ A/MHz Operation, all peripherals active
- 0.9  $\mu$ A Deep standby with RTC running
- 0.45  $\mu$ A Standby mode

### Optimized System & Peripherals

- System
  - » 4 channel DMA, Data Transfer Controller (DTC)
  - » Interrupt Controller
  - » Power On Reset (POR), Low Voltage Detection (LVD)
  - » AES Hardware encryption
  - » 50 MHz High speed oscillator, 125 kHz low speed oscillator, 32 kHz sub-system oscillator
  - » Event Link Controller (ELC)
  - » Safety functions (CAC, DOC, CRC)

- Real-time clock
  - » Full calendar with leap year; Alarm, calibration, binary count mode; 3 Time stamps for anti-tamper
- General Purpose Timers
  - » 6 channel 16-bit MTU2, 2x 2ch 16-bit CMT, 2 x 2ch 8-bit TMR
- Watchdog Timers
  - » 1 channel 14-bit, 1 channel 8-bit
- Communications
  - » 5 x SCI (simple SPI, simple I<sup>2</sup>C), 2 x RSPI interfaces with CS, 1 x IrDA, 2 x Multi-Master I<sup>2</sup>C bus interface, GPIO
- Analog functions
  - » 2.7 to 3.6 V operation
  - » Up to seven 24-bit  $\Delta\Sigma$  ADC channels with PGA
  - » Up to 85 dB SINAD
  - » Bandgap with guaranteed 30 ppm/°C temp co. (typ. 10 ppm/°C for G specification)
  - » Up to seven channels 10-bit ADC
  - » 4 channel comparator
  - » Temperature sensor for measuring temperature within the chip

### Operating temperature range

- -40°C to +105°C (G specification)
- -40°C to +85°C (D specification)

### Package line-up

- 64-pin to 100-pin

## Ordering Information

| Pin Count | Flash ROM | Data Flash | RAM  | Package                                 | Part Number  |
|-----------|-----------|------------|------|-----------------------------------------|--------------|
| 100-pin   | 512 K     | 8 K        | 64 K | PLQP0100KB-A (14 x 14 mm, 0.5 mm pitch) | R5F521A8BGFP |
| 80-pin    | 512 K     | 8 K        | 64 K | PLQP0080KB-A (14 x 14mm, 0.5 mm pitch)  | R5F521A8BGFN |
| 64-pin    | 512 K     | 8 K        | 64 K | PLQP0064KB-A (14 x 14mm, 0.5 mm pitch)  | R5F521A8BGFM |
| 100-pin   | 384 K     | 8 K        | 64 K | PLQP0100KB-A (14 x 14 mm, 0.5 mm pitch) | R5F521A7BGFP |
| 80-pin    | 384 K     | 8 K        | 64 K | PLQP0080KB-A (14 x 14mm, 0.5 mm pitch)  | R5F521A7BGFN |
| 64-pin    | 384 K     | 8 K        | 64 K | PLQP0064KB-A (14 x 14mm, 0.5 mm pitch)  | R5F521A7BGFM |

Note: The number of available 24-bit ADC modules depends on package (100-pin: 7 modules, 80-pin: 4, 64-pin: 3)

Note: G-specified versions listed here. For less demanding applications a D-specified version including a 256 K Flash/32 K RAM option is available

Before purchasing or using any Renesas Electronics products listed herein, please refer to the latest product manual and/or data sheet in advance.

