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 ΔΣ 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
RX21A – The Power Analyzer and Electric Energy Meter MCU

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 µA/MHz Operation, all peripherals active
- 0.9 µA Deep standby with RTC running
- 0.45 µA 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, 2x 2ch 8-bit TMR
- Watchdog Timers
  » 1 channel 14-bit, 1 channel 8-bit
- Communications
  » 5 x SCI (simple SPI, simple I2C), 2 x RSPI interfaces with CS, 1 x IrDA, 2 x Multi-Master I2C bus interface, GPIO
- Analog functions
  » 2.7 to 3.6 V operation
  » Up to seven 24-bit ∆Σ 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

<table>
<thead>
<tr>
<th>Pin Count</th>
<th>Flash ROM</th>
<th>Data Flash</th>
<th>RAM</th>
<th>Package</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-pin</td>
<td>512 K</td>
<td>8 K</td>
<td>64 K</td>
<td>PLQP0100KB-A (14 x 14 mm, 0.5 mm pitch)</td>
<td>R5F521A8BGFP</td>
</tr>
<tr>
<td>80-pin</td>
<td>512 K</td>
<td>8 K</td>
<td>64 K</td>
<td>PLQP0080KB-A (14 x 14 mm, 0.5 mm pitch)</td>
<td>R5F521A8BGFN</td>
</tr>
<tr>
<td>64-pin</td>
<td>512 K</td>
<td>8 K</td>
<td>64 K</td>
<td>PLQP0064KB-A (14 x 14 mm, 0.5 mm pitch)</td>
<td>R5F521A8BGFM</td>
</tr>
<tr>
<td>100-pin</td>
<td>384 K</td>
<td>8 K</td>
<td>64 K</td>
<td>PLQP0100KB-A (14 x 14 mm, 0.5 mm pitch)</td>
<td>R5F521A7BGFP</td>
</tr>
<tr>
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<td>384 K</td>
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<td>R5F521A7BGFM</td>
</tr>
</tbody>
</table>

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

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Document No. R01PF0055ED0300