瑞萨电子

瑞萨电子(中国)
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**More functions, less consumption**

**RL78/F1X**
- More than 100 derivatives
- New Snooze Power Save Mode
  - The new mode supports special power-down concepts for cyclic wake up applications. It allows monitoring of serial interfaces and analog input pins from few up to no CPU activities.
- More CPU performance
  - Less power consumption
- New 40-nm Technology
  - Thanks to the new 130-nm Flash technology we’ve realized a power reduction by 50%.

**RH850/F1X**
- More than 50 derivatives
- New Low Power Sampling (LPS)
  - The new LPS supports special power-down concepts for cyclic wake up applications. IO-Ports, analogue input pins, LIN- and CAN-Interface and external sensor supply are regarded by the LPS by hardware without any CPU activities.
- More CPU performance
  - Less power consumption
- New 40-nm Technology
  - Thanks to the new 130-nm Flash technology we’ve realized a power reduction by 50%.

**Save power, don’t compromise**

**Feature line-up**

<table>
<thead>
<tr>
<th></th>
<th>16-bit CAN</th>
<th>16-bit LIN</th>
<th>1-ch. CAN</th>
<th>16-bit LIN</th>
<th>1-ch. CAN</th>
<th>1-ch. CAN</th>
<th>1-ch. CAN</th>
<th>1-ch. CAN</th>
<th>1-ch. CAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>RL78/F14</td>
<td>2 - 4 ch.</td>
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<tr>
<td>RH850/F1L</td>
<td>1 ch.</td>
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<tr>
<td>RH850/F1M</td>
<td>1 - 6 ch.</td>
<td>1 - 6 ch.</td>
<td>1 - 6 ch.</td>
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<tr>
<td>RH850/F1H</td>
<td>6 ch.</td>
<td>6 ch.</td>
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<tr>
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<td>7 - 16 ch.</td>
<td>7 - 16 ch.</td>
<td>7 - 16 ch.</td>
<td>7 - 16 ch.</td>
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<tr>
<td>FlexRay</td>
<td>16 ch.</td>
<td>16 ch.</td>
<td>16 ch.</td>
<td>16 ch.</td>
<td>16 ch.</td>
<td>16 ch.</td>
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<tr>
<td>FlexRay</td>
<td>16 ch.</td>
<td>16 ch.</td>
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<tr>
<th></th>
<th>2 - 7 ch.</th>
<th>3 - 4 ch.</th>
<th>3 - 5 ch.</th>
<th>5 - 7 ch.</th>
<th>8 ch.</th>
<th>8 ch.</th>
<th>8 ch.</th>
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<th>8 ch.</th>
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<tbody>
<tr>
<td>RH850/F1L</td>
<td>1 ch.</td>
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<tr>
<td>RH850/F1H</td>
<td>2 - 5 ch.</td>
<td>2 - 5 ch.</td>
<td>2 - 5 ch.</td>
<td>2 - 5 ch.</td>
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|          | 4 - 12 ch. | 4 - 20 ch. | 12 - 31 ch.| 12 - 60 ch.| 32 - 60 ch.|| 60 - 72 ch.|
|----------|------------|------------|------------|------------|------------|------------|------------|------------|
|          | 10-bit ADC | 10-bit ADC | 10-bit ADC | 10-bit ADC | 10-bit ADC | 10-bit ADC | 10-bit ADC | 10-bit ADC |
|          | 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer|
|          | 4 - 7 ch.  | 7 - 16 ch. | 11 - 20 ch.| 13 - 72 ch.| 40 - 80 ch.|| 72 - 96 ch.|
|          | PWM        | PWM        | PWM        | PWM        | PWM        | PWM        | PWM        | PWM        |
|          | 8 ch.      | 7 - 21 ch. | 21 - 25 ch.| 0 - 8 ch.  | 16 - 32 ch.| 32 ch.     | 4 - 8 ch.  | 8 ch.      | 8 ch.      |
|          | 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 16-bit timer| 32-bit timer| 32-bit timer| 32-bit timer|

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<tr>
<th></th>
<th>4 kB</th>
<th>4 kB</th>
<th>4 or 8 kB</th>
<th>32 kB</th>
<th>64 kB</th>
<th>64 - 128 kB</th>
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<tr>
<td></td>
<td>Dataflash</td>
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<td>Dataflash</td>
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<tr>
<td></td>
<td>up to 32MHz</td>
<td>up to 32MHz</td>
<td>up to 32MHz</td>
<td>up to 80MHz</td>
<td>up to 120MHz</td>
<td>up to 120MHz</td>
</tr>
<tr>
<td></td>
<td>2.7 - 5.5V</td>
<td>2.7 - 5.5V</td>
<td>2.7 - 5.5V</td>
<td>3.0 - 5.5V</td>
<td>3.0 - 5.5V</td>
<td>3.0 - 5.5V</td>
</tr>
<tr>
<td></td>
<td>up to 125°C</td>
<td>up to 150°C</td>
<td>up to 150°C</td>
<td>up to 125°C</td>
<td>up to 125°C</td>
<td>up to 125°C</td>
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</tbody>
</table>

More CPU performance
- Less power consumption

New 130-nm Technology
- Thanks to the new 130-nm Flash technology we’ve realized a power reduction by 50%.
16-Bit MCU: RL78/F1x

The RL78 Family is Renesas Electronics next-generation microcontroller family combining advanced features from both the 78K and R8C families to deliver low power consumption and high performance.

Highlights
- CPU performance: up to 51 DMIPS (Dhrystone V2.1) at 32MHz
- Low power consumption: 200uA/MHz @ Operation, 0.32uA @ STOP mode with LVD
- SNOOZE mode for efficient cyclic wake up applications
- Functional safety concept supported by many safety features
- High temperature: Ta up to 150°C

RL78/F14 Features
- RL78 Core 32MHz
  - 16-bit CISC CPU with MUL/DIV/MAC
- Flash technology
  - Wide voltage range: 2.7 – 5.5V
  - Data flash: simultaneous operation for EEPROM emulation, 10k write cycles
- Clock generator circuit
  - On chip High-speed (64/32MHz) and Low-speed (15kHz) oscillator
  - PLL (bypass for CAN IP)
  - External sub-clock (32kHz) connection
- System Peripherals
  - Data Transfer Controller (DTC): equivalent to 24-channel DMA
  - Event Link Controller (ELC): combines peripherals occasions
- Analogue Peripherals
  - 8-bit D/A converter
  - Analogue Comparator with adjustable hysteresis and 4 channel multiplexer
- Timer
  - 16-bit Motor Control Timer for 3-phase motor
- Serial Interfaces
  - CAN: 20 mailboxes
  - LIN: protocol controller with adjustable hardware support and master/slave mode
- Functional Safety
  - ECC on Flash and RAM
  - Stack pointer monitor
  - Invalid memory access detection
  - Window watchdog timer with exclusive on chip oscillator
  - HW-CRC
  - Clock Monitor
  - I/O port output signal level detection
  - Automotive self-test software available

RL78/F1x Portfolio

RL78/F1x hardware development tools

IECUBE2
Full functional In-Circuit Emulator

Debugger System
PG-FP5
Flash programmer

Target Board
Device specific MCU board with on-chip debug connector

E1
On-Chip Debugger and Flasher

RL78/F1x software development tools

Software
C/C++ compiler, Debugger, Editor
IAR, EWRL78 Workbench
Renesas, IAR
MICAL 4.0.3
(Microcontroller Abstraction Layer)
Peripheral driver software
Renesas (under development)
Applieret
(device driver generation tool)
Peripheral driver generator software
Renesas
Flash Library
Flash driver software
Renesas
Flash (flash self programming, EEPROM emulation)
Renesas
LIN driver
LIN Communication software
Vector Informatik
CAN driver
CAN Communication software
Vector Informatik, Elektrobit
OSEK
Operating System
Vector Informatik, Elektrobit
Flash Programmer Software
Programmer suitable for PG-FP5 and E1
Renesas
32-Bit MCU: RH850/F1x

The RH850 Family represents the next generation 32-bit RISC Microcontroller to endorse future automotive applications. The F Series products, designed for body applications, provide high scalability, extreme low power consumption and a broad range of networking IPs.

**Highlights**

- **Wide scalability**
  - 256K byte to 8M byte embedded Flash memory with ECC
  - 48 pin to 357 pin QFP and BGA packages
  - Single-, dual- and multicore architecture

- **High reliability**
  - Functional safety compliant (ASIL A to ASIL D)
  - Support of security standards (SHE/ICU-S, HSM/ICU-M)
  - Excellent high temperature performance (up to 170°C)

- **Best in class solution for cyclic activities**
  - Low Power Sampler (LPS) to scan and compare digital- and analog inputs CPUless
  - Cyclic RUN/STOP Mode to realize low power LIN/ CAN communication

**Features**

- **RH850 core**
  - 32bit RISC CPU with FPU (Option)
  - 80MHz to 160MHz Clock
  - Single-Voltage 3.0 to 5.5V
  - Operating temperature range -40 to +125°C

- **Flash technology**
  - 40nm MONOS (Metal-Oxide-Nitrid-Oxide-Silicon) Flash
  - Up to 8M byte code flash
  - Up to 320K byte RAM + 32K byte retention RAM
  - Up to 128K byte data flash

- **System Peripherals**
  - DMA Controller with minimum 16 channel
  - External memory IF

- **Analogue Peripherals**
  - 10-bit and 12-bit resolution multi channel ADC
  - Up to 6 Track & Hold circuits for synchronized conversion
  - Hardware support for external channel multiplexer
  - Self-diagnostic function

- **Timer**
  - Timer array unit with 16-bit and 32-bit resolution
  - PWM diagnostic function

- **Serial Interfaces**
  - CAN, LIN, FlexRay, Ethernet, USB, MLB
  - UART, CSI, QCSI

- **Functional Safety**
  - Software core selftest
  - Error Correction Coding (ECC)
  - Memory Protection Unit (MPU)
  - Redundant reset controller
  - Clock- and Core voltage monitor
  - Window watchdog
  - Error Correction Coding (ECC)
  - Core voltage monitor
  - Temperature sensor

**RH850/F1x Line-up**

**RH850/F1x Development Tools**

- **E1**
  - On-Chip Debugger and Flash programmer

- **RH850 Evaluation platform**
  - with Device/Packag3 specific MCU piggy-pack board adaptation

- **PG-FP5**
  - Flash programmer

**RH850/F1x software development tools**

<table>
<thead>
<tr>
<th>Software</th>
<th>Type</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/C++ compiler, Debugger, Editor</td>
<td>GHS MULTI Version 6</td>
<td>Renesas/Green Hills</td>
</tr>
<tr>
<td>C/C++ compiler, Debugger, Editor</td>
<td>IAR EWRH850</td>
<td>IAR (under development)</td>
</tr>
<tr>
<td>MCAL (Microcontroller Abstraction Layer)</td>
<td>Peripheral driver software</td>
<td>Renesas</td>
</tr>
<tr>
<td>Flash Library (flash self programming, EEPROM emulation)</td>
<td>Flash driver software</td>
<td>Renesas</td>
</tr>
<tr>
<td>LIN driver</td>
<td>LIN Communication software</td>
<td>Vector Informatik</td>
</tr>
<tr>
<td>CAN driver</td>
<td>CAN Communication software</td>
<td>Vector Informatik</td>
</tr>
<tr>
<td>OSEK Operating System</td>
<td>OSEK Operating System</td>
<td>Vector Informatik</td>
</tr>
<tr>
<td>Flash Programmer Software</td>
<td>RFP Programmer for E1</td>
<td>Renesas</td>
</tr>
</tbody>
</table>
Renesas Electronics Corporation

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