RL78
The Ultimate Low Power Microcontroller Platform
Welcome to the RL78, a new platform family of world’s lowest-power microcontrollers from Renesas Electronics. RL78 embeds ultimate intelligence with a perfect combination of lowest power consumption, best in class CPU performance and the highest integration of world leading peripherals.

**RL78 – The ultimate embedded intelligence in your system!**

A complete platform line-up is on offer with ultimate flexibility of choice in terms of performance, memory, packages, peripherals as well as the world’s lowest power consumption in the embedded arena. The general purpose range of RL78 family offers multiple flavours to suit every need:

- **RL78/G12**: 24Mhz Low-pin count family from ranging from 20-30pin wide variety of packages
- **RL78/G13**: 32Mhz General purpose family ranging from 20-128pins in a wide variety of packages

RL78 offers the best platform of choice for Industrial, Consumer and Automotive applications. The Industrial & Consumer portfolio of RL78 family includes widest range of general purpose devices (RL78 G Series) as well as a full roadmap for many application specific lines such as LCD, Lighting, USB, Metering and motor control.

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**RL78 G Series Portfolio – A Device For Every Need!**

<table>
<thead>
<tr>
<th>ROM</th>
<th>64KB</th>
<th>128KB</th>
<th>256KB</th>
<th>384KB</th>
<th>512KB</th>
<th>1MB</th>
<th>2MB</th>
<th>4MB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pins</td>
<td>20</td>
<td>24</td>
<td>25</td>
<td>30</td>
<td>32</td>
<td>36</td>
<td>40</td>
<td>48</td>
</tr>
<tr>
<td>Package</td>
<td>SSOP (300 mil)</td>
<td>QFN (4x4)</td>
<td>LGA (3x3)</td>
<td>SSOP (300 mil)</td>
<td>QFN (5x5)</td>
<td>LGA (4x4)</td>
<td>QFN (6x6)</td>
<td>SSOP (300 mil)</td>
</tr>
</tbody>
</table>

**RL78 Roadmap For Your Success**

<table>
<thead>
<tr>
<th>Product Category</th>
<th>CY 2011</th>
<th>CY 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RL78/G11</strong> (Low pin count 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RL78/I1x</strong> (Lighting)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RL78/G1x</strong> (High Function 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RL78/G1x</strong> (USB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RL78/G1x</strong> (Auto Body)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RL78/G1x</strong> (Auto Dashboard)</td>
<td></td>
<td></td>
</tr>
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</tbody>
</table>

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www.renesas.eu
Add Value To Your Application With RL78…

RL78 offers the ideal solution for multiple applications across Industrial, Automotive, Communication and Consumer segments.

### Features & Benefits

<table>
<thead>
<tr>
<th>High Performance</th>
<th>Ultimate Low Power</th>
<th>Widest Scalability</th>
<th>System Cost Reduction</th>
<th>Highest Quality &amp; Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 1.27DMIPS/MHz</td>
<td>• 70μA @ 32KHz operation</td>
<td>• 20 to 128pin packages</td>
<td>• Back ground operation data Flash</td>
<td>• Highest quality Flash</td>
</tr>
<tr>
<td>• Max 32MHz operation</td>
<td>• 0.7μA@ 32KHz HALT with RTC</td>
<td>• Up to 512KB Flash</td>
<td>• 32MHz +/- 1% OCO</td>
<td>• IEC 60730 safety function</td>
</tr>
<tr>
<td>• H/W Mul/Div/MAC</td>
<td>• “Snooze” mode</td>
<td>• Up to 32KB RAM</td>
<td>• Analog integration</td>
<td>• High EMS robustness</td>
</tr>
<tr>
<td>• 1.6V to 5.5V operation</td>
<td></td>
<td>• ASSP expansion</td>
<td></td>
<td>• High temperature support</td>
</tr>
</tbody>
</table>

### Ideal choice for any application

<table>
<thead>
<tr>
<th>Home Appliances</th>
<th>Small Appliances</th>
<th>Industrial Control</th>
<th>Metering</th>
<th>Medical</th>
<th>Lighting</th>
<th>Others</th>
</tr>
</thead>
</table>

Ideal choice for any application
Lowest Power Consumption @ Highest Performance – No Compromise!

The RL78 family delivers an impressive operating current of 70 μA/MHz (while running at 32 MHz) and a super low standby current of 0.7 μA (in sub-halt mode, with the RTC and LVD operating).

All of this is still possible while running the CPU @ 32Mhz delivering a mega 40.6 DMIPS (1.27DMIPS/Mhz) performance without any compromise!

Choose the leader in low power...

Thanks to the latest 130nm process technology, improved internal oscillator configuration and highly optimized internal logic, RL78 stands as an undisputed leader in the competitive landscape.

Current consumed during normal operation (μ/Mhz)

![Graph showing current consumption during normal operation for different companies and RL78/G13]

Current consumed during RTC operation (32.768 kHz, RTC + LVD)

![Graph showing current consumption during RTC operation for different companies and RL78/G13]

Achieve the ultimate power saving with ‘Snooze Mode’

On top the RL78 family offers a very unique power-saving ‘snooze mode’ in which A/D conversion and serial communication can continue while the the CPU is in standby. So no need to wake up the CPU for receiving data. This mode is excellent for battery-powered systems as it greatly increases the battery life.

Current consumed in STOP mode (WDT + LVD)

![Graph showing current consumption in STOP mode for different companies and RL78/G13]

Achieve the ultimate power saving with ‘Snooze Mode’

Source: Comparison made on datasheets

* operation with nop instruction

140μA (all instruction execution)
**RL78 – A Feature Rich Microcontroller**

With a complete lineup of products with memory sizes selectable from 2 KB to 512 KB and packages sizes ranging from 20 to 128 pins, RL78 offers the best in class features for any application.

Thanks to all products having been developed using the same platform, it provides ideal compatibility and scalability within and across different families. You can also re-use your existing software assets due to common peripherals coming from the 78K0 and R8C families. To benefit we invite you to select an RL78 family product with the confidence that you can use it for many years to come.

**Timers**

A complete timer unit is included which, provides choice of 16-bit counter and capture/compare registers for each timer channel. Timers can be operated individually as well as in interlocking units to enable a range of other features such as one-shot pulse & PWM signal outputs.

**Serial Interfaces**

A single-channel 3-wire serial interface and FC interface is also included, each of which is provided with a shift register and buffer register. Two full-duplex UART channels are also available.

**A/D Converter**

The A/D converter can operate from a voltage as low as 1.6 V. The conversion resolution can be selected from 8 or 10 bits. A wide range of conversion modes are available, including scan mode, one-shot conversion mode, and successive conversion mode.

**DMAC**

Data can be transferred directly between peripheral hardware SFRs and the internal RAM based on interrupts from timers, serial interfaces, or the A/D converter, or based on a software trigger, without going via the CPU.

**WDT**

The watchdog timer detects a hung program. Three possible WDT window settings are available and can be selected to suit your system.

**LVD**

The LVD monitors the voltage and generates a reset or interrupt signal depending on the current mode. Thanks to a new interrupt and reset mode, the LVD can also initiate data-save processing by generating an interrupt before issuing the reset signal.

**RTC**

The RTC includes a full calendar feature that enables the clock to be updated automatically up to the year 2099. No need to be awake the CPU from standby mode because it continues operating, helping to reduce power consumption.
Looking For System Cost Reduction?

Then look no further… Feature rich RL78 family offers the ultimate solution to save overall system cost by integrating the key peripherals inside this all-in-one MCU.

These peripherals include components such as a high precision internal oscillator with an accuracy of 1%. Data Flash memory that can be overwritten 1 million times and that can operate in the background, a temperature sensor, and high current tolerant ports for interfacing with different power supplies. Furthermore a full range of small packages are available to help you reduce the PCB size.

Developed using a new 130nm process, the RL78 family not only reduces system cost, but also helps to reduce the size of your system.

The Ultimate Security Features

RL78 family is one of the first to offer key critical safety features in hardware to ensure compliance with Europe’s International Electrotechnical Commission standards (IEC 60730) as well as help to comply with other internal safety standards for many Consumer and Industrial applications.

The safety Hardware in the RL78 family offers a robust solution for detecting or preventing failures.

Flash memory CRC operations

Flash memory data can be checked through CRC operations, which can be selected according to the usage conditions.

RAM parity error detection

The parity can be automatically checked during RAM access.

Invalid memory error detection

Invalid memory access e.g. access-prohibited areas easily detected.

RAM guarding

Specified RAM areas can be prevented from being overwritten.

SFR guarding

Specific SFRs can be prevented from being overwritten.

Frequency detection

The low-speed internal oscillator (15 kHz) can be used to measure the frequency of the main clock to ensure normal operation.

A/D converter testing

The A/D converter can perform a self-check.

Achieve the highest level of functionality at no extra cost

Full Background Operation Data Flash

- Data access unit 1 byte
- Data Flash size 4 KB (deletion unit: 1 KB)
- Number of overwrites 1 million (Typ.)
- Overwrites/reads 1 million (Typ.)
- Dedicated library further simplifies operation

Conventional Process delete

Simultaneous execution possible

Greatly reduced writing time
Full Tool Chain For Every Development Stage

RL78 offers the most flexible tool chain for every step of any development. This includes easy to use starter kits for in-depth product evaluation, full IDE, library of middleware software and a range of hardware to help you design easier and faster with RL78. All of this is further supported by a large 3rd party network.

Learning & Evaluation

A USB stick starter kit to quickly learn about RL78 key features, complete with GUI based control, software examples and development environment.

A fully featured evaluation platform to enable in-depth testing of RL78 microcontroller. Also enables quick and easy start of your design with RL78. Comes complete with GUI, software examples, application notes and development environment.

Development Environment

IAR Embedded Workbench

- E1 On-Chip Debugging Emulator - This emulator enables on-chip debugging and flash programming.
- Fully functional in-circuit emulator IECUBE® - enables detailed debugging possible through microcontroller-equivalent emulation and the use of functions such as tracing and time measurement.

Programming

- E1 On-Chip Debugging Emulator also offering flash programming functionality.
- PG-FP5 tool is used to delete, write, and verify programs on a target system or via a program adapter.
The Renesas Eco System

Dedicated Website
www.renesas.eu/pr/mcu/rl78

Personalised Content
www.renesas.eu/myrenesas

Engineering Community
www.renesasrulz.com

3rd Party Network
www.renesas.eu/alliance

Online Training
www.renesasinteractive.com

Latest News
www.twitter.com/renesas_europe

Facebook Group
www.facebook.com/renesaseurope

Video Channel
www.youtube.com/renesasresents

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