RENESAS
瑞 萨

瑞萨电子

车身控制

瑞萨电子(中国)
www.cn.renesas.com

2013.06

More functions, less consumption

F Series

Save power, don't compromise

RENESAS RL78

> **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 130-nm Technology**
Thanks to the new 130-nm Flash technology we've realized a power reduction by 50%.

RENESAS RH850

> **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**
The industry's first 32-bit 40-nm generation of Automotive MCUs with considerably lower power consumption than other currently available 90-nm devices

Feature line-up

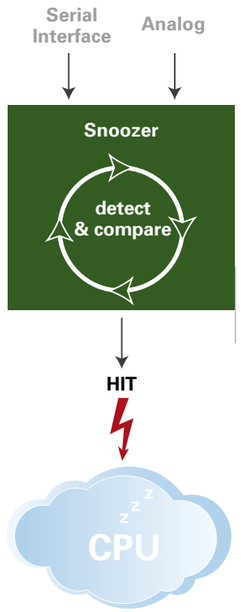
16-bit			32-bit		
RL78/F12	RL78/F13	RL78/F14	RH850/F1L	RH850/F1M	RH850/F1H
AUTOSAR					
					Ethernet
				FlexRay	FlexRay
	0 - 1 ch. CAN	1 ch. CAN	1 - 6 ch. CAN	6 ch. CAN	7 ch. CAN
1 ch. LIN	1 ch. LIN	1 - 2 ch. LIN	3-6 ch. LIN	7 - 16 ch. LIN	16 - 18 ch. LIN
2 - 4 ch. UART	1 - 2 ch. UART	2 ch UART	1 - 6 ch. UART	4 - 6 ch. UART	6 ch. UART
2 - 7 ch. CSI	2 - 4 ch. CSI	3 - 4 ch. CSI	2 - 6 ch. CSI	5 - 7 ch. CSI	8 ch. CSI
1 - 7 ch. I²C	2 - 5 ch. I²C	3 - 5 ch. I²C	1 ch. I²C	1 ch. I²C	1 ch. I²C
4 – 12 ch. 10-bit ADC	4 – 20 ch. 10-bit ADC	12 – 31 ch. 10-bit ADC	12 – 60 ch. 10/12 -bit ADC	32 – 60 ch. 10/12 -bit ADC	60 – 72 ch. 10/12 -bit ADC
4 - 7 ch. PWM	7 - 16 ch. PWM	11 - 20 ch. PWM	13 - 72 ch. PWM	40 - 80 ch. PWM	72 - 96 ch. PWM
8 ch. 16 - bit timer	7 - 21 ch. 16 - bit timer	21 - 25 ch. 16 - bit timer	0 - 8 ch. 16 - bit timer	16 - 32 ch. 16 - bit timer	32 ch. 16 - bit timer
			4 - 8 ch. 32 - bit timer	8 ch. 32 - bit timer	8 ch. 32 - bit timer
4 kB Dataflash	4 kB Dataflash	4 or 8 kB Dataflash	32 kB Dataflash	64 kB Dataflash	64 - 128 kB Dataflash
up to 32MHz	up to 32MHz	up to 32MHz	up to 80MHz	up to 120MHz	up to 120MHz
2.7 - 5.5V	2.7 - 5.5V	2.7 - 5.5V	3.0 - 5.5V	3.0 - 5.5V	3.0 - 5.5V
up to 125 °C	up to 150 °C	up to 150 °C	up to 125 °C	up to 125 °C	up to 125 °C

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.

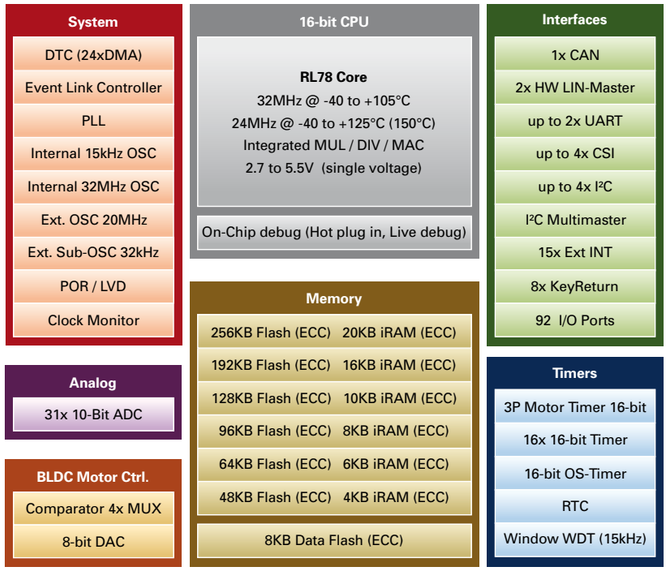
Highlights

- 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

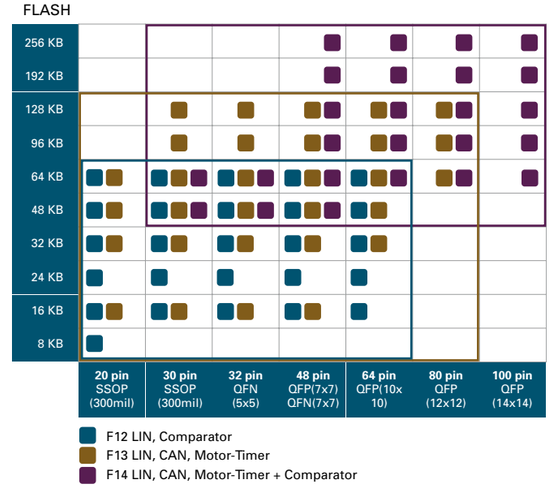


RL78/F14 Features

- **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, 100k w/e 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 extended 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

LAUTERBACH DEVELOPMENT TOOLS

I SYSTEM

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

E1
On-Chip Debugger and Flasher

PG-FP5
Flash programmer

RL78/F1x software development tools

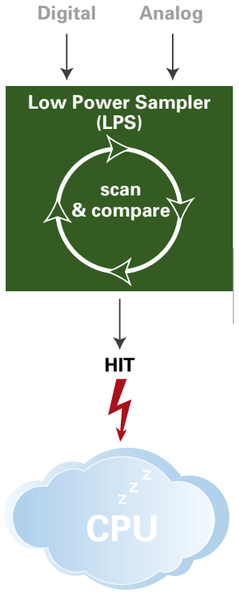
Software	Type	Supplier
C/C++ compiler, Debugger, Editor	IAR, EWRL78 Workbench	Renesas, IAR
MCAL 4.0.3 (Microcontroller Abstraction Layer)	Peripheral driver software	Renesas (under development)
Applilet (device driver generation tool)	Peripheral driver generator software	Renesas
Flash Library (flash self programming, EEPROM emulation)	Flash driver software	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 appliations. The F Series products, designed for body applications, provide high scalability, extreme low power consumption and a broad range of networking IPs.

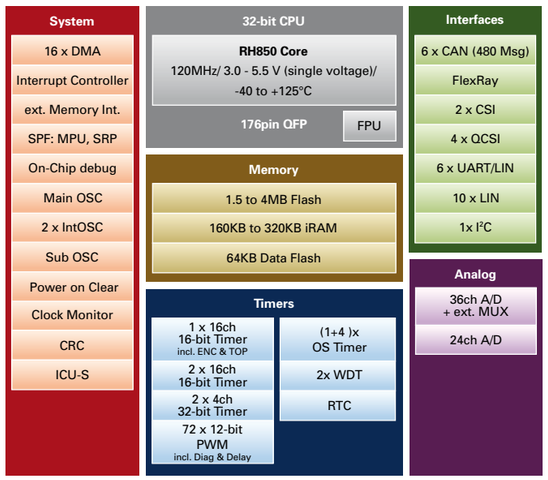
Highlights

- **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

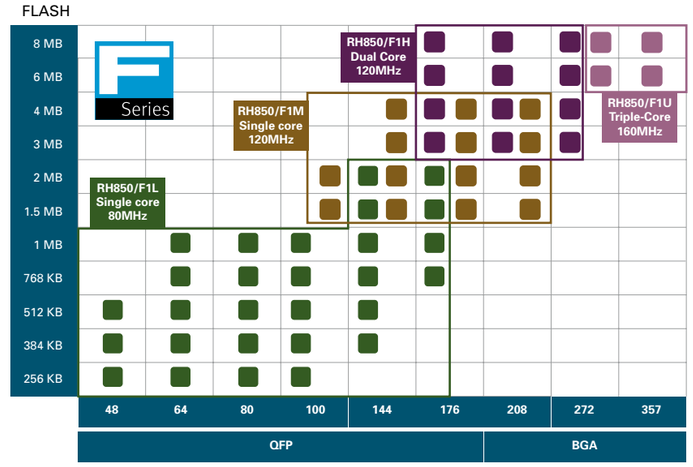


Features

- **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 I/F
- **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

Debugger System

LAUTERBACH DEVELOPMENT TOOLS

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

i SYSTEM

PG-FP5
Flash programmer

RH850/F1x software development tools

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

瑞萨电子车身控制应用目录
Renesas Electronics Body Control Application Catalog

Renesas Electronics Corporation

Notes:
1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
   "Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.
(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

RENESAS
瑞 萨

瑞萨电子中国销售・技术支持网点： http://www.cn.renesas.com

瑞萨电子（中国）有限公司

北京市海淀区知春路27号量子芯座17层	邮编：100191	电话：+86 10 8235 1155	传真：+86 10 8235 7679
长春分公司 吉林省长春市朝阳区西安大路727号中银大厦A座1609室	邮编：130061	电话：+86 431 8859 7533	传真：+86 431 8680 2944
大连分公司 辽宁省大连市中山区中山路88号天安国际大厦21楼2103室	邮编：116001	电话：+86 411 3980 5858	传真：+86 411 3980 5877
青岛分公司 山东省青岛市市南区香港中路10号颐和国际大厦A栋23A楼07室	邮编：100191	电话：+86 532 6677 7600	传真：+86 532 6677 7608
上海分公司 上海市浦东新区陆家嘴环路1233号汇亚大厦205室	邮编：200120	电话：+86 21 5877 1818	传真：+86 21 6887 7858
成都分公司 四川省成都市二环路南三段15号天华大厦608室	邮编：610041	电话：+86 28 8512 5224	传真：+86 28 8512 5334
深圳分公司 广东省深圳市福田中心区益田路4068号卓越时代广场18楼1807-1809室	邮编：518048	电话：+86 755 8283 5080	传真：+86 755 2399 5080

瑞萨电子管理（上海）有限公司

上海市浦东新区陆家嘴环路1233号汇亚大厦205室	邮编：200120	电话：+86 21 5877 1818	传真：+86 21 6887 7858

瑞萨电子香港有限公司

香港九龙旺角太子道西193号新世纪广场第2座16楼1601-1603室	电话：+852 2265 6688	传真：+86 2886 9022

瑞萨电子大中国地区（包括香港地区）代理商及分销商的联系方式：http://cn.renesas.com/buy

© 2013 Renesas Electronics (China) Co., Ltd. All rights reserved.
Printed in China.

R01CA0001CC0200