

RL78/G1A

Smart Industrial Sensor Reference Microcontroller

Use  **IO-Link**
Universal · Smart · Easy

The Renesas Electronics' RL78 is the microcontroller of choice for industrial sensor applications. It offers ultimate low power consumption ranked among the best in the industry. In addition to reduced current consumption down to 66 $\mu\text{A}/\text{MHz}$, the RL78/G1A offers multiple new features for IEC61131-9 IO-Link application support. These include ultra-small scale packages, up to 64 KB programmable flash memory with 1.8 V operating voltage, high accuracy 12-bit A/D converters, up to 32 MHz high speed on-chip oscillator with $\pm 1\%$ accuracy over temperature and voltage ranges. The RL78/G1A also features 4 KB on-chip Data Flash with background operation for IO-Link sensor data storage, numerous advanced safety features IEC or UL60730 compliant, an on-chip temperature sensor, 16-bit multi-function timers, and multiple high-speed serial communication channels for interfacing with sensor components. Two fully programmable DMA channels ensure high speed data transfer between peripherals without affecting the CPU load.

Fully tested RL78 smart IO-Link Device stack with independent board support package for various IO-Link transceiver ICs, is available from Renesas alliance partner. The stack is designed according to IO-Link specification V1.1, including data storage, and more.

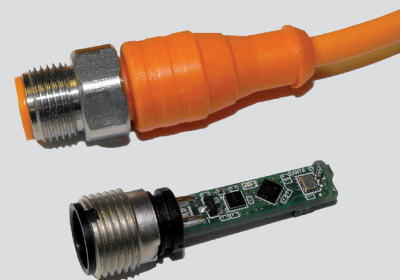
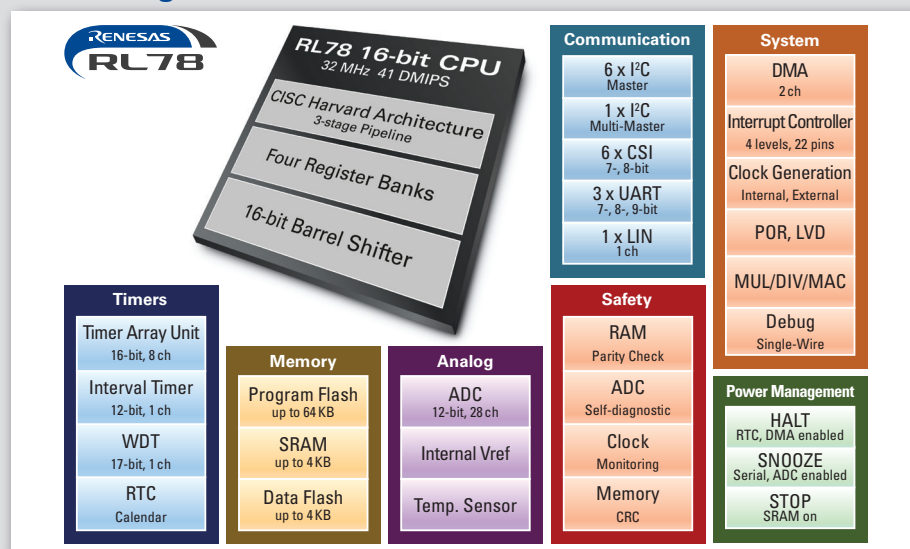
Applications

- Smart industrial sensors
- Miniature Smart IO-Link sensors

Key Benefits

- Rich analog functionality ideal for sensor applications and general cost reduction
- Temperature sensor for measuring temperature within the chip to ease adjustments
- Various communication interfaces that allow easy connection of various modems
- System cost effective features
- Wide temperature operation
- Renesas alliance partner support for smart IO-Link Device stack firmware integration

Block Diagram



Key Features

- 116-bit RL78 CPU Core
 - » 16-bit CISC, 41 DMIPS at 32 MHz
 - » CISC Architecture (Harvard) with 3-stage pipeline
 - » Multiply Signed & Unsigned: 16 x 16 to 32-bit result in 1 clock cycle
 - » MAC: 16 x 16 to 32-bit result in 2 clock cycles
 - » 16-bit barrel shifter for shift & rotate in 1 clock cycle
- Ultra-Low Power Technology
 - » 1.6 V to 3.6 V operation from a single supply
 - » Operating as low as 66 μ A/MHz
 - » Halt: 0.57 mA (RTC + LVD)
 - » Stop: 220 nA (RAM retained)
 - » Snooze: 580 μ A (UART), 780 μ A (ADC)
- Memory Line-up
 - » Flash: 16 Kbytes to 64 Kbytes
 - » RAM 2 Kbytes to 4 Kbytes 1.8 V Reprogramming, Boot swap support
 - » Data Flash: 4 Kbytes
 - » Error Code Correction (ECC)
- High-speed On-chip Oscillator
 - » 32 MHz with $\pm 1\%$ accuracy over voltage (1.8 V to 3.6 V) and temperature (-20°C to $+85^{\circ}\text{C}$)
 - » Pre-configured settings: 32 MHz, 24 MHz, 16 MHz, 12 MHz, 8 MHz, 6 MHz, 4 MHz, 3 MHz, 2 MHz, and 1 MHz
- General Purpose I/O
 - » 3.6 V tolerant, high-current (up to 20 mA per pin)
 - » Open-Drain, Internal Pull-up support
- Operating Ambient Temperature
 - » Extended: -40°C to $+105^{\circ}\text{C}$
- Safety Features
 - » IEC/UL 60730 Support
 - » Others: Illegal memory access, guard
- Timers
 - » Multi-function 16-bit Timer: up to 8 channels
 - » Watchdog (window function)
 - » Real Time Clock (full calendar and alarm function with watch correction function)
- Analog
 - » 12-bit ADC, up to 28 channels
 - » Support 1.6V (V_{CC}) operation
 - » Internal Voltage Reference (1.44 V)
 - » On-chip temperature sensor
- Data Memory Access (DMA) Controller
 - » Up to 2 fully programmable channels
- Communication Interfaces
 - » Up to 6 x I²C master
 - » Up to 1 x I²C multi-master
 - » Up to 6 x CSI/SPI (7-, 8-bit)
 - » Up to 3 x UART (7-, 8-, 9-bit)
 - » Up to 1 x LIN
- Package Type and Pin Line-up
 - » From 3 mm x 3 mm to 10 mm x 10 mm
 - » QFP: 48, 64; QFN: 32, 48; LGA: 25; BGA: 64
- Reset and Supply Management
 - » Power-on reset (POR) monitor/generator
 - » Low voltage detection (LVD) with 12 setting options (Interrupt and/or reset function)

Devices

Part Number	Flash ROM [kBytes]	RAM [kBytes]	Data Flash [kBytes]
R5F10E8E	64	4	4
R5F10E8D	48	4	3
R5F10E8C	32	4	2
R5F10E8A	16	4	2
Package = LGA (25-pin, 3 x 3 mm, 0.5 mm pitch)			

Development Kit

Order Number	Board Size
YRL78IOLINKMAX	IO-Link Device reference design = 25 x 6 mm

For further information on Renesas Electronics IO-Link solutions, visit our European website at www.renesas.eu/io-link

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

