

# RL78 MICROCONTROLLERS

The True Low Power Microcontroller Platform



BIG IDEAS  
FOR EVERY SPACE

# RL78 THE TRUE LOW POWER MICROCONTROLLER PLATFORM

RL78 from Renesas Electronics is an advanced family of general purpose and application specific microcontrollers (MCU's) combining true low power and high performance operation. RL78's innovative Snooze mode allows serial communication and ADC operation in standby, which makes it best in class for battery powered designs.

## Why RL78?

- World's best in class performance for an equivalent MCU family
- Scalability of physical size including smart pin layout
- System cost saving features
- Wide voltage operation
- Wide temperature operation
- On board security features
- An extensive ecosystem and more details of RL78 can be found at [www.renesas.eu/RL78](http://www.renesas.eu/RL78)

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### Extensive Ecosystem

- Comprehensive development tools
- 3<sup>rd</sup> party support
- Free E2 Studio GNU IDE
- Free Applilet peripheral driver

### True Low Power

- 46  $\mu$ A/MHz Operation<sup>1</sup>
- 0.57  $\mu$ A (RTC + LVD)
- Unique “Snooze” mode

### Broad Scalability

- 10 to 128 pins
- 1 KB to 512 KB Flash
- Compatibility

### High Quality & Safety

- Flash memory with ECC
- IEC 60730 Safety functions
- High temperature support
- -40 to 105 °C, -40 to 125 °C

### System Cost Reduction

- 64/32 MHz +/- 1% Internal Oscillator
- Data Flash with BGO 1 Million erase cycles<sup>2</sup>
- Onboard temperature sensor & LVD

### High Performance

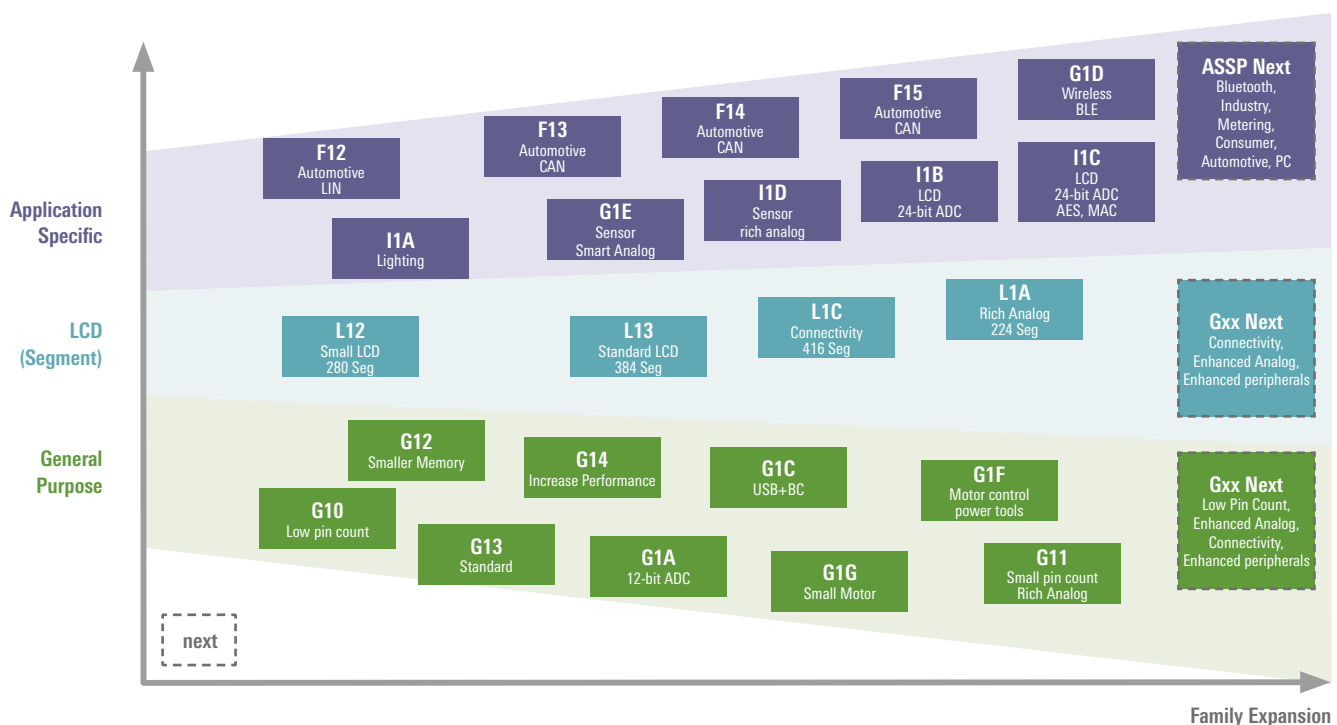
- Up to 1.6 DMIPS / MHz
- Up to 32 MHz operation
- 1.6 V to 5.5 V operation
- DMA or DTC<sup>3</sup>
- Event Link Controller
- Direct Transfer Controller

<sup>1</sup> 66  $\mu$ A at 32 MHz (NOP instruction)

<sup>2</sup> Typical value

<sup>3</sup> DTC: Direct Transfer Control

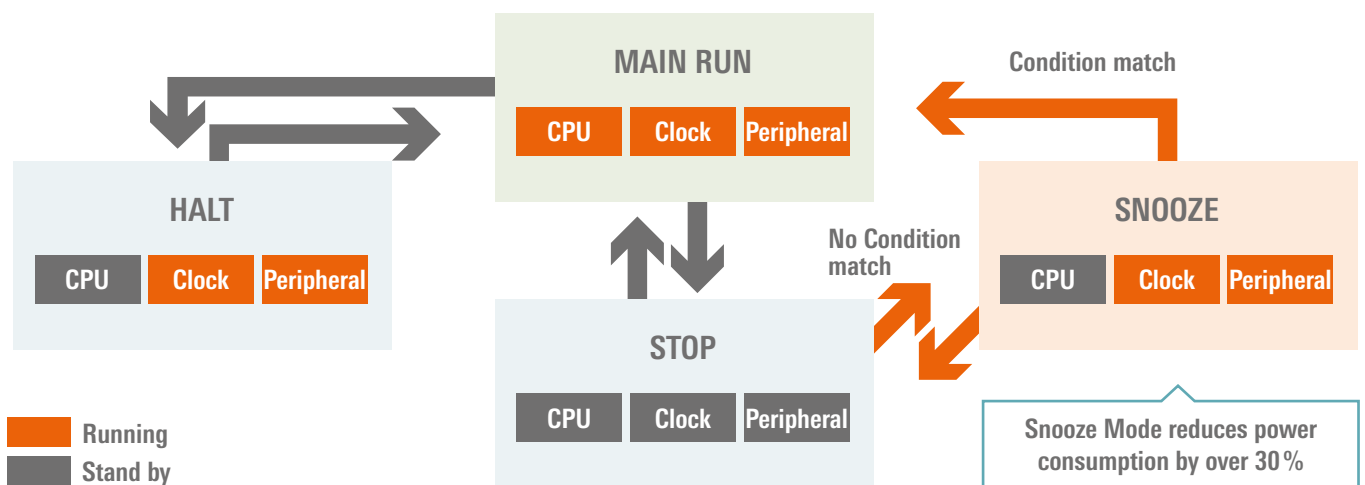
### RL78 Roadmap – A growing family



# RL78 LOW POWER MODES

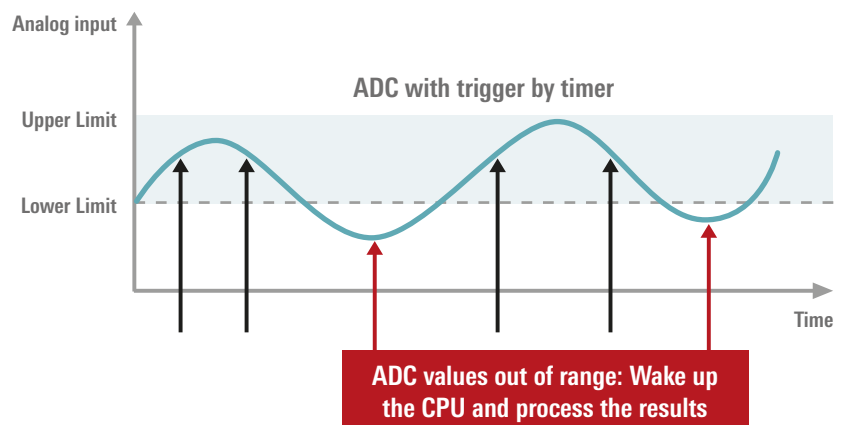
## RL78 offers multiple power saving modes

- RL78's three low power modes maximise battery life, by offering flexible low power states to minimise CPU run time



## Snooze Mode

- No need to wake up CPU for receiving data
- The unique Snooze Mode allows some peripherals ie. ADC and UART operation whilst in standby modes
- Achieve 1/10th of the power consumption; Snooze mode uses 0.5 mA vs. 5 mA in Run mode (ADC)

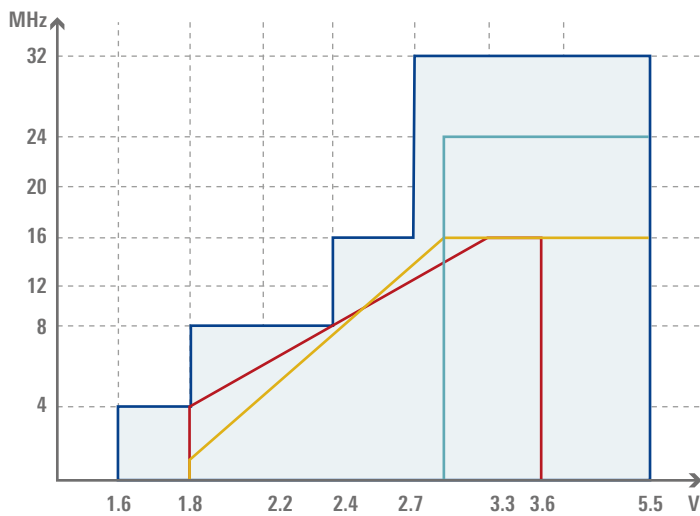


Snooze Mode ADC conversion example

## Standby Modes

- Halt mode disables CPU operation saving as much as 80% of total MCU current, whilst allowing fast CPU enable time
- STOP mode achieves lowest power consumption by disabling more CPU functions

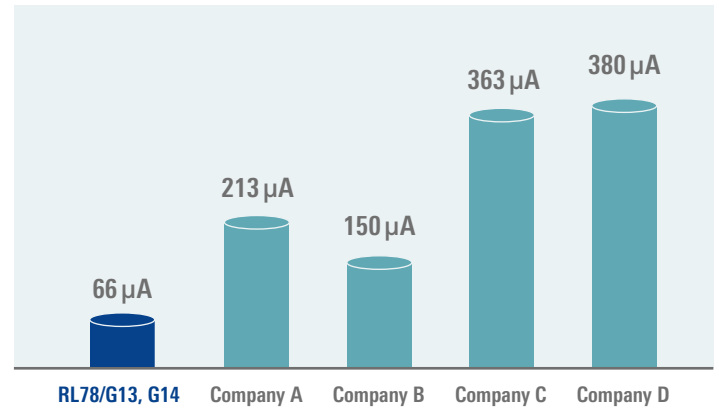
## RL78 Wide Operating Voltage



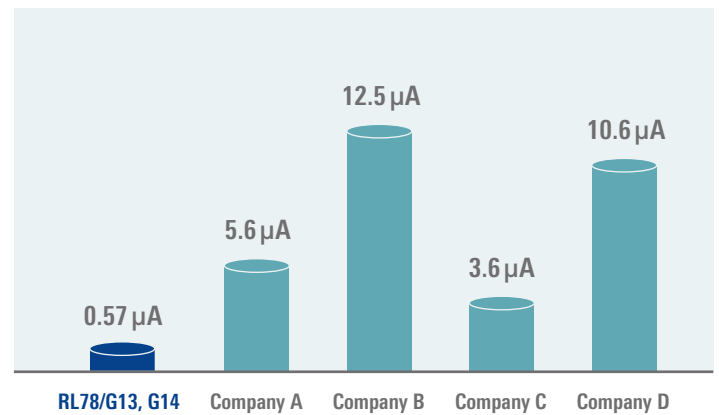
- **RL78/G13, G14**
- Company A
- Company B
- Company C

## Power Consumption Values

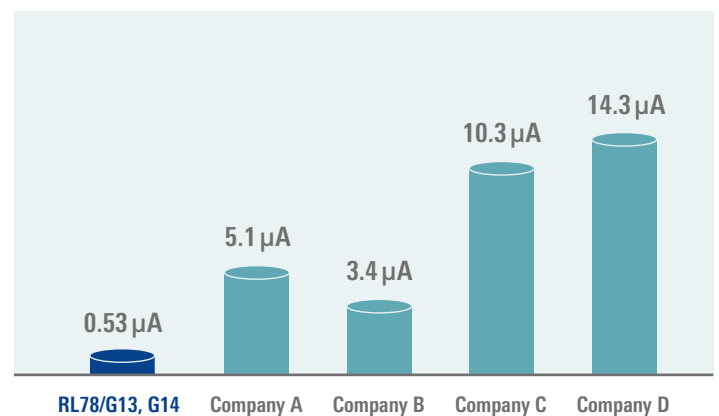
Current consumed in Main Run mode ( $\mu\text{A}/\text{MHz}$ )



Current consumed in Halt mode (32.768 kHz, RTC + LVD)



Current consumed in Stop mode (WDT + LVD)



Source: data sheets and actual measurement

## RL78 LINE-UP

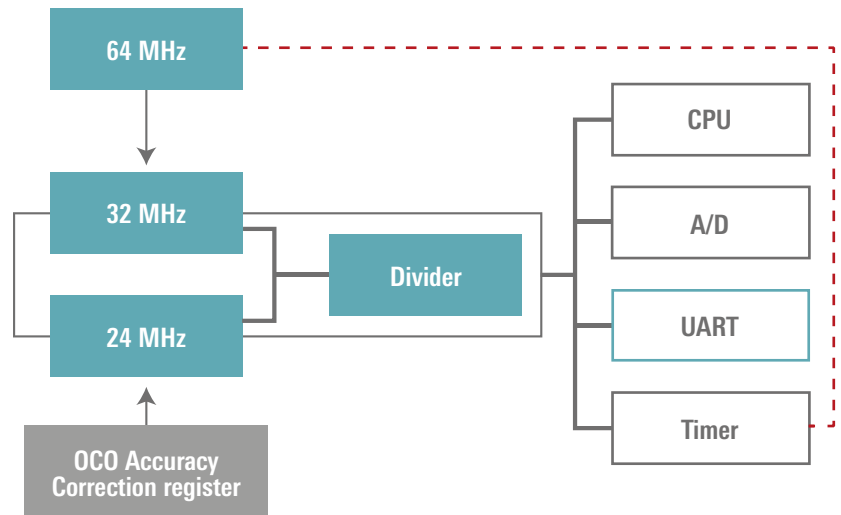
## Packages available down to 3 x 3 mm



# RL78 REDUCING SYSTEM COST

## High Accuracy On-Chip Oscillator

- High speed On-Chip Oscillator with + / -1% accuracy
  - over temperature and voltage
  - -20 to 85 °C and 1.8 V to 5.5 V
- Two selectable pre-set frequencies
  - 24 MHz and 32 MHz / 64 MHz (\*1)
  - 16 MHz, 12 MHz, 8 MHz, 4 MHz, 3 MHz, 2 MHz,
  - 1 MHz by using Divider
- 64 MHz (+ / -1%) available on RL78/G14 familiy
  - for high speed motor controller drive
- Improved accuracy with correction register



## Data Flash

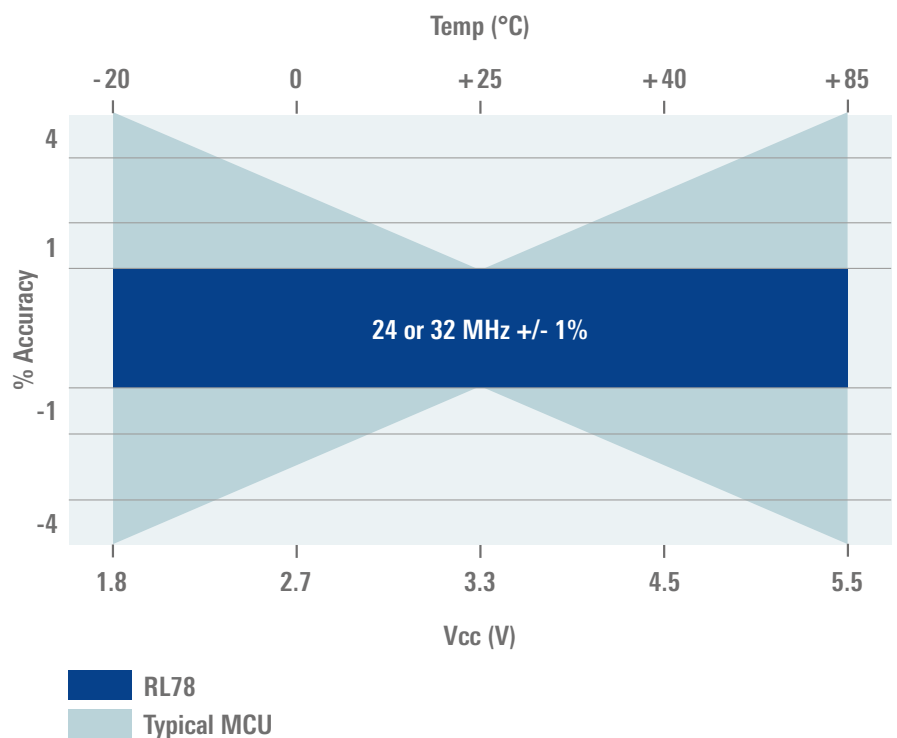
- Up to 8 KB

## Rich Analog Features

- High accuracy OpAmp
- Analog Comparator
- Configurable voltage Vref

## Integrated Temp Sensor

## Integrated low voltage detectors



# RL78 APPLICATIONS

RL78 offers System Designers key advantages for next generation designs, reducing system power, enhancing integration and providing a cost effective platform approach.

## Industrial Automation

- RL78 offers an extensive range of small packages
- RL78 has standard and extended temperature range devices from -40 to +105 °C
- Renesas has a proven track record in IA with complimentary ASIC and ASSP solutions



## Lighting

- RL78/I1A offers dedicated DALI and Power Factor control
- RL78's free windows based Applilet software make it easy for designers to turn around a lighting design with little design experience
- RL78/I1A integrates high resolution PWM timers



## Consumer

- RL78 MCU's offer a full calendar function
- RL78 has an integrated temperature sensor



## Home Automation

- For long battery life, RL78 offers class leading low power including the unique Snooze mode
- Battery operation down to 1.6 V



## White Goods

- RL78 offers integrated safety compliance for white goods (IEC 60730)
- RL78 offers high temperature support
- RL78's integrated peripherals make it the ideal choice for cost sensitive white goods



## Power Tools

- Renesas is renowned for high quality long life MCU's
- RL78 is available in multiple packages and scalable for the platform design approach



## Medical

- When a small package MCU with long product life is required, RL78 is your first choice
- Renesas provides solutions for Tier one Medical manufacturers and is part of the Continua alliance



## Motor Control

- RL78/G14 family is ideal for motor control applications with integrated MC timers
- RL78's on chip oscillators with 1% accuracy provide an integrated low cost solution for timing critical applications



## Metering

- RL78's low power modes make the MCU ideal to meet industry power consumption requirements
- RL78 is analog rich, ideal for smart metering applications
- Renesas has three decades experience of providing high quality and long product life MCU's within metering



## Detectors and Sensors

- RL78/I1D offers high integration features in order to fit with detector and sensor applications
- Fast wake up, rich Analog integration, smart intelligence like DTC, ELC, DOC with lowest power on chip oscillator at 34  $\mu$ A
- Ideal device for battery powered products





# RL78 GENERAL PURPOSE LINE-UP

|                                                                                                                                                               |                                                                                                                                                                |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Upward compatibility ↑                                                                                                                                        | RL78/G14                                                                                                                                                       |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                               | RL78/G13                                                                                                                                                       |                                                                                                                                                                                    | Easy for upgrade<br>add more & compatible peripheral                                                                                                                                                                                                                                                                   |
|                                                                                                                                                               | RL78/G12                                                                                                                                                       |                                                                                                                                                                                    | Add Peripheral                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                               |                                                                                                                                                                |                                                                                                                                                                                    | Add Peripheral & Memory & Flexibility                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                               | <b>Package:</b> 20-pin to 30-pin<br><b>Flash:</b> 2 K to 16 K<br><b>RAM:</b> 256 b to 1.5 Kbyte<br><b>Dataflash:</b> 2 x 1 Kbyte                               | <b>Package:</b> 20-pin to 128-pin<br><b>Flash:</b> 16 K to 512 K<br><b>RAM:</b> 2 K to 32 Kbyte<br><b>Dataflash:</b> 8 x 1 Kbyte                                                   | <b>Package:</b> 30-pin to 100-pin<br><b>Flash:</b> 16 K to 512 K<br><b>RAM:</b> 2.5 K to 48 Kbyte<br><b>Dataflash:</b> 8 x 1 Kbyte                                                                                                                                                                                     |
|                                                                                                                                                               | 24 MHz internal HS OCO +/-1 %<br><b>Vcc: 1.8 V to 5.5 V</b>                                                                                                    | 32 MHz internal HS OCO +/-1 %<br><b>Vcc: 1.6 V to 5.5 V</b>                                                                                                                        | 64 MHz internal HS OCO +/-1 %<br><b>Vcc: 1.6 V to 5.5 V</b>                                                                                                                                                                                                                                                            |
|                                                                                                                                                               | <b>24 MHz HOCO</b>                                                                                                                                             | <b>32 MHz HOCO</b>                                                                                                                                                                 | <b>64 MHz HOCO</b>                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                               | <b>2 ch – DMA</b><br>up to 8 x 16-bit Timer (7 x PWM)<br>1 x Interval Timer<br>3 x USART<br>3 x I <sup>2</sup> C/SPI<br>1 x I <sup>2</sup> C<br>up to 11 x ADC | <b>2 ch – DMA</b><br>up to 16 x 16-bit Timer (14 x PWM)<br>1 x Interval Timer<br>up to 4 x USART<br>up to 8 x I <sup>2</sup> C/SPI<br>up to 2 x I <sup>2</sup> C<br>up to 26 x ADC | <b>no DMA but up 39 ch DTC</b><br>Compatible to RL78/G13 up to 20 ADC<br>add performance features:<br>Timer RD (3ph Motor control)<br>Timer RG (encoder function)Timer RJ<br>(counter, Pulse out<br>add Comparator (*1)<br>add D/A converter (*1)<br>add DTC (Direct Transfer Control)<br>add ELC (Event Link Control) |
| <b>Safety function:</b> Flash & SFR protection, RAM parity/write protection<br>Trap instruction, CRC, clock stop detection, I/O pin read back, ADC, others... |                                                                                                                                                                |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                        |
| More high performance peripherals →                                                                                                                           |                                                                                                                                                                |                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                        |

## Choose RL78 for your Application

### Low Power

- Battery operation down to 1,6V
- Active: down to 46uA@1MHz
- HALT: down to 300nA
- Stop: down 230 nA
- SNOOZE function: ADC and UART operation while standby
- RAM data retention in STOP mode

### High Quality and Safety

- Flash memory with ECC
- IEC 60730 Safety functions
- CRC calculation
- RAM/SFR write protection
- Support +105°C and +125°C

### Intelligent Peripherals

- Direct Transfer Controller (DTC)
- Direct Memory Access (DMA)
- Direct Operation Controller (DOC)  
combined with DTC/DMAC enables useful operations without CPU
- Event Link Controller (ELC)

### Scalability

- Compatible Line-up
- +1000 devices
- Wide package range: 10pin to 128pin
- Broad memory: 1kB to 512kB

### Special Features

- +/-1% 64/32/24MHz OCO (over temp and voltage range)
- 3ph Motor control at 64Mhz
- 24-bit  $\Sigma\Delta$  ADC
- LCD Driver
- USB, CAN

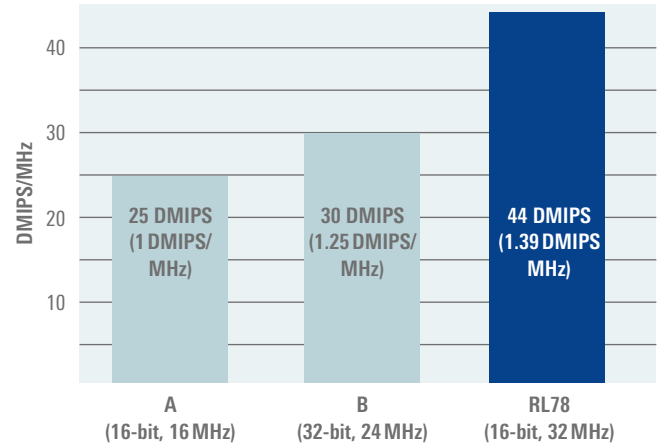
### Extensive Ecosystem

- Comprehensive development tools
- 3rd party support
- Free E2 Studio GNU IDE
- Quick implementation with free Applilet peripheral driver

# HIGH EFFICIENCY

## Up to 44 DMIPS performance at 32 MHz

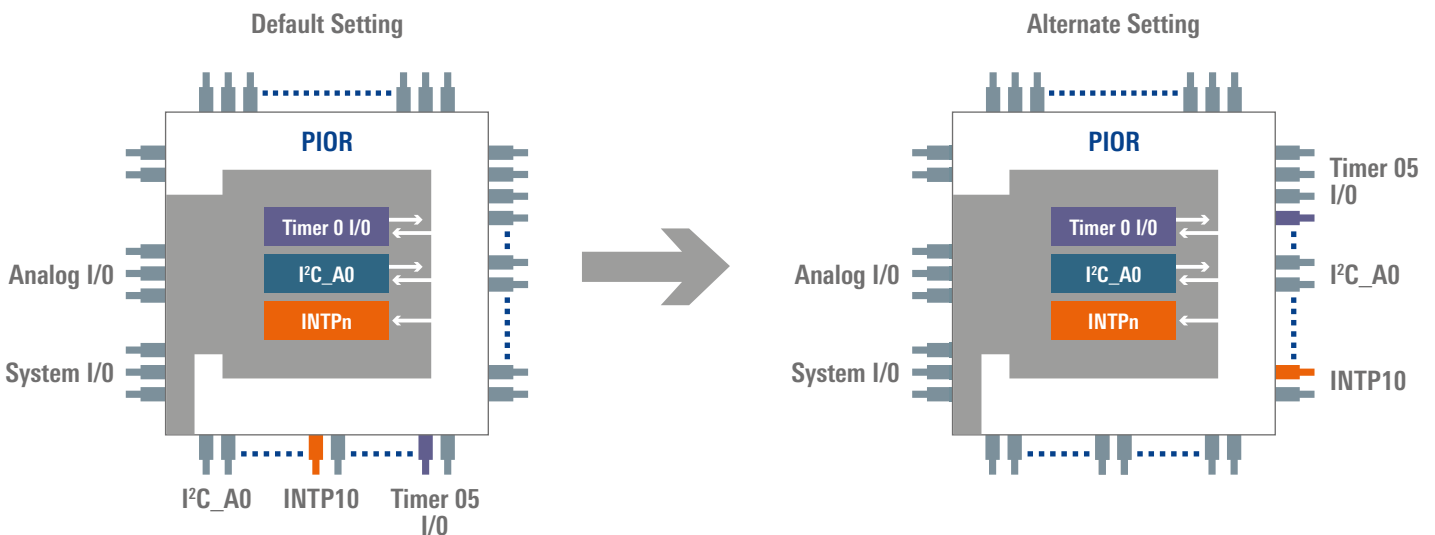
- Unrivalled power consumption / performance ratio (1/3 that of competitors)
- Higher DMIPS rating and lower power consumption than a popular 32-bit competitor technology
- RL78 offers widest operating voltage in its class from 1.6 V to 5.5 V
- 86% instructions executed in 1-2 cycles



# FLEXIBILITY

## Peripheral I/O Re-direction (PIOR) capability remaps functions to alternate ports

- Due to layout or peripheral pin sharing constraint, there may be conflicts for existing peripheral I/O pin assignments
- Optimise peripheral pin functionality by easing function bottlenecks on a pin
- PIOR capability can help ease a bottleneck, as shown in this example by remapping to alternate pins



# SAFETY FEATURES

## Hardware for IEC/UL 60730 compliance

### CRC

#### Two types of CRC hardware

- High-speed CRC (on flash memory)
- CRC peripheral (for application usage)

### RAM

#### Parity/Write Protection

- Parity: Internal reset when parity error generated on Read or Write
- Write Protection:  
Select from: ~128 B/~256 B/~512 B

### SFR

#### Write Protection

- Write protection for: Port setting, interrupt setting, clock setting, LVI setting
- RAM Parity setting

### CPU

#### Illegal memory access detection

- Illegal memory access: generates “internal reset”
- Trap instruction “FF” instruction generates “internal reset”

### Clock

#### Stop Detection/Frequency Check

- Stop detection: possible to detect by WWDT
- Frequency check: possible to check by timer function

### ADC

#### Multiple Input Signal selectable

- ADC measurement sources:
  - External ADC input pins
  - External/Internal AVref sources
  - Internal Vref (1.4 V typ.)
  - Temperature sensor

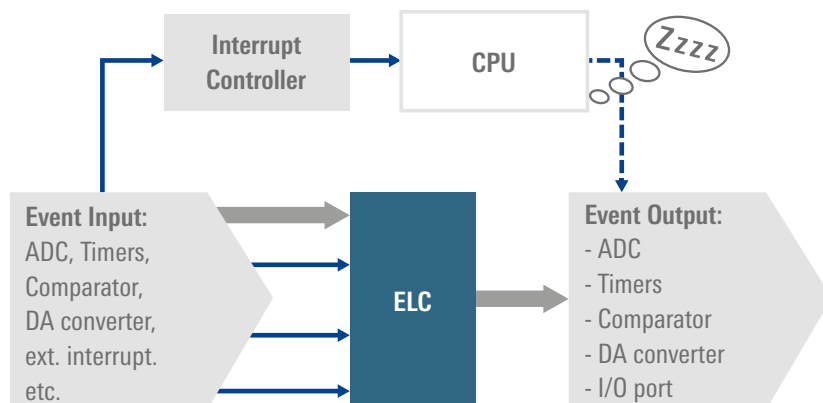
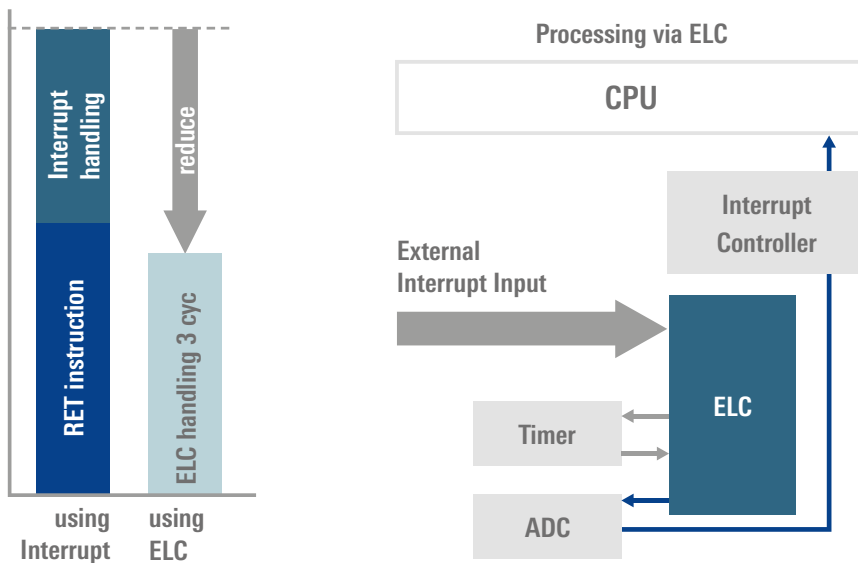
## Event Link Controller (ELC)

The ELC is an innovative way to reduce CPU load by direct routing interrupt event signals from one peripheral or module to the others.

- ELC improves real time function by using less interrupts
- Reduces program size
- ELC achieves lower average power consumption

Depending on the RL78 family up to 26 different events are selectable.

- Automatically triggers other peripheral by bypassing the CPU and can be combined with the DTC
- Direct links between the hardware, e.g direct control of I/O and event timers
- Active in low power mode

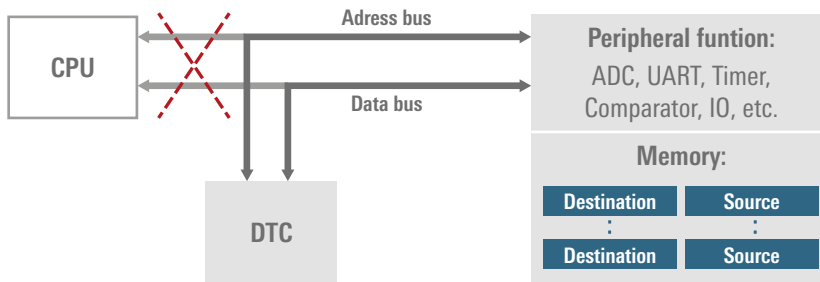


Example

## Direct Transfer Controller (DTC) (\*1)

The DTC is an excellent feature to reduce the CPU workload and can transfer data between memory and register without CPU intervention.

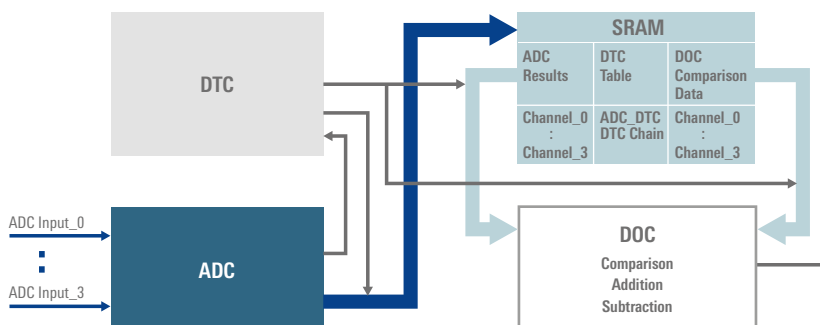
- Configurable in RAM and not limited by hardware.
- Possible to transfer in Normal, Repeat and Block transfer mode, with selectable block sizes up to 512 bytes and automatic address incrementation
- Flexible selection of up to 39 sources – with priority setting from high to low.



## Data Operation Circuit (DOC)

The DOC is another intelligent feature and provides the ability to generate an interrupt from the result of a simple arithmetic operation between two pieces of data:

- automatic 16-bit addition,
- subtraction or
- comparison can be made



By combining this with DTC/DMAC it allows a wide variety of operations to be managed without CPU intervention. For examples:

- March X function
- SCI address match
- ADC level comparison alarm
- automatic 16-bit addition,
- subtraction or
- comparison can be made

Samples 4 input channels, move with DTC and control with DOC to check for alarm condition without any CPU intervention. No software development is required apart from initialisation routine and ISR.

- transfer automatically the ADC result via DTC to SRAM for alarm condition store the threshold level in SRAM
- automatic compare/add/subtraction via DOC to check the alarm condition

# RL78 WITH ADVANCED PERIPHERALS

## RL78 Series

For applications that require increased performance the best-selling RL78/G13, G1A (12-bit ADC) and G14 series offer the same uncompromised low power RL78 solution but are also peripheral rich. The series offer 16 K to 512 K of on-board Flash, have variants with high precision 12-bit ADC, multiple smart timers and integrated safety functions.

### Power Management

- Operating: as low as 66  $\mu$ A/MHz, (64 MHz, 32 MHz, 24 MHz)
- Halt: 0.57 mA (RTC + LVD)
- Stop: 220 nA (RAM retained)
- Snooze: 580  $\mu$ A (UART), 780  $\mu$ A (ADC)

### System

- +/- 1% Internal Oscillator (64 MHz, 32 MHz, 24 MHz)
- 16 x 16 Multiplier, 32/32 Divider, Multiply-Accumulate

### Timers

- Interval Timer (40 nA)
- Multi-function 16-bit Timer Array Unit (TAU)
- 3ph Motor control Timer RD
- Encoder Timer RJ

### Enhanced Analog

- 10-bit ADC conversion time
- 12-bit ADC up to 28 channels
- 2 channel Comparator

### Intelligent Features

- Direct Transfer Controller (DTC)
- Event Link Controller (ELC)

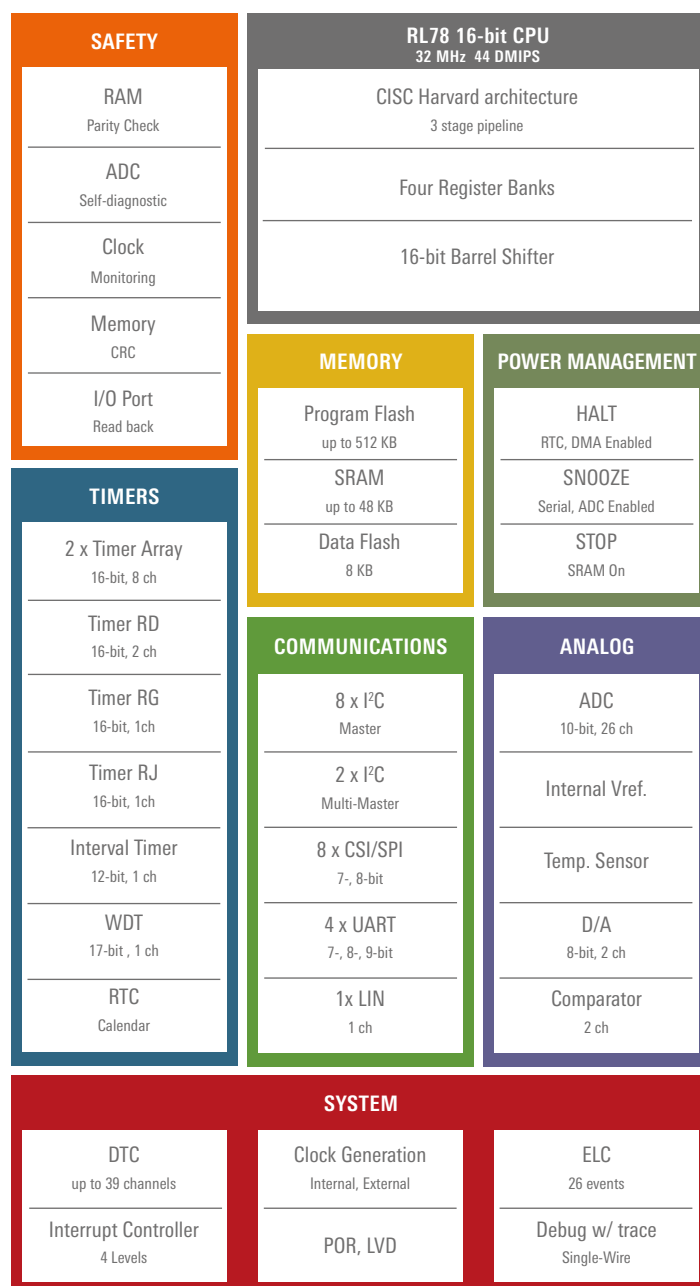
### Safety

- IEC/UL 60730 Support
- Others: Illegal memory access, guard

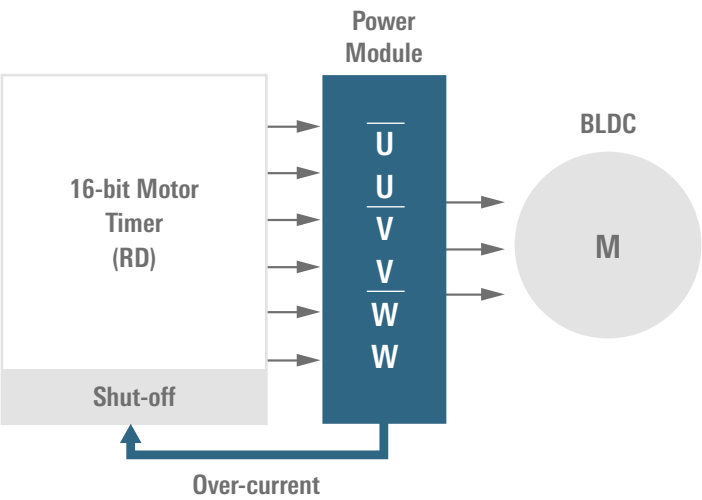
### Temperature range

- -40 to 105 °C

## RL78/G14 block diagram



RL78/G14 Motor Control timer RD



RL78/G1A Line-up (12-bit ADC)

| Pin No.           |      | 20-36        | 40           | 44-48                        | 64                            |
|-------------------|------|--------------|--------------|------------------------------|-------------------------------|
| Flash Size (Byte) | 64 K | 4 K          | 4 K          | 4 K                          | 4 K                           |
|                   | 48 K | 3 K          | 3 K          | 3 K                          | 3 K                           |
|                   | 32 K | 2 K          | 2 K          | 2 K                          | 2 K                           |
|                   | 16 K | 2 K          | 2 K          | 2 K                          |                               |
| PKG               |      | LGA:<br>3 mm | QFN:<br>5 mm | QFP:<br>7 mm<br>QFN:<br>7 mm | QFP:<br>10 mm<br>BGA:<br>4 mm |

RL78/G14

| Pin No.           |       | 20-36                     | 40    | 44-48            | 64       | 80-100 |     |
|-------------------|-------|---------------------------|-------|------------------|----------|--------|-----|
| Flash Size (Byte) | 512 K |                           |       | 48 K             | 48 K     | 48 K   | RAM |
|                   | 384 K |                           |       | 32 K             | 32 K     | 32 K   |     |
|                   | 256 K |                           |       | 24 K             | 24 K     | 24 K   |     |
|                   | 192 K |                           | 20 K  | :                | :        | :      |     |
|                   | 128 K | 16 K                      | 16 K  | 16 K             | 16 K     | 16 K   |     |
|                   | :     | :                         | :     | :                | 4 K      |        |     |
|                   | 16 K  | 2.5 K                     | 2.5 K | 2.5 K            |          |        |     |
| PKG               |       | SSOP,<br>QFP, QFN,<br>LGA | QFN   | QFP, QFN,<br>LGA | QFP, LGA | QFP    |     |

# RL78 WITH LCD DRIVE

## RL78/LCD Series

The latest devices from the RL78 platform offer integrated LCD drive. The first member in the family with integrated LCD drive to be released is the RL78/L12.

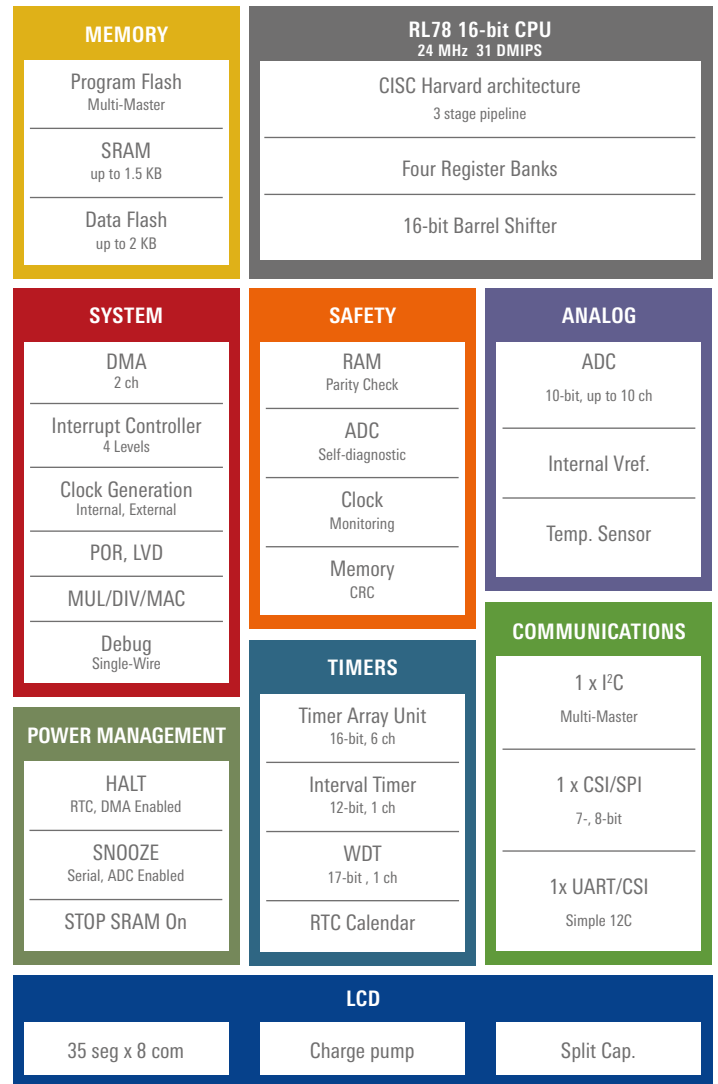
- More segment drive for a smaller package:
- RL78/L12 can drive 35 seg x 8 com or 39 seg x 4 com
- RL78/L13 can drive 47 seg x 8 com or 48 seg x 4 com
- RL78/L1A can drive 41 seg x 8 com or 45 seg x 4 com
- Low power LCD drive, only 0.6  $\mu$ A @ 3 V with capacitor split method
- Flexible control method: Split capacitors, capacitive charge pump or external split resistor
- Selectable functions (Seg or I/O) for every segment pin
  - ; Drive for both A waveform glass and B waveform panel

The RL78/L12 and RL78/L13 are both basic LCD devices with 10bit ADC convert, while the RL78/L1A family has enhanced and rich Analog peripherals such as:

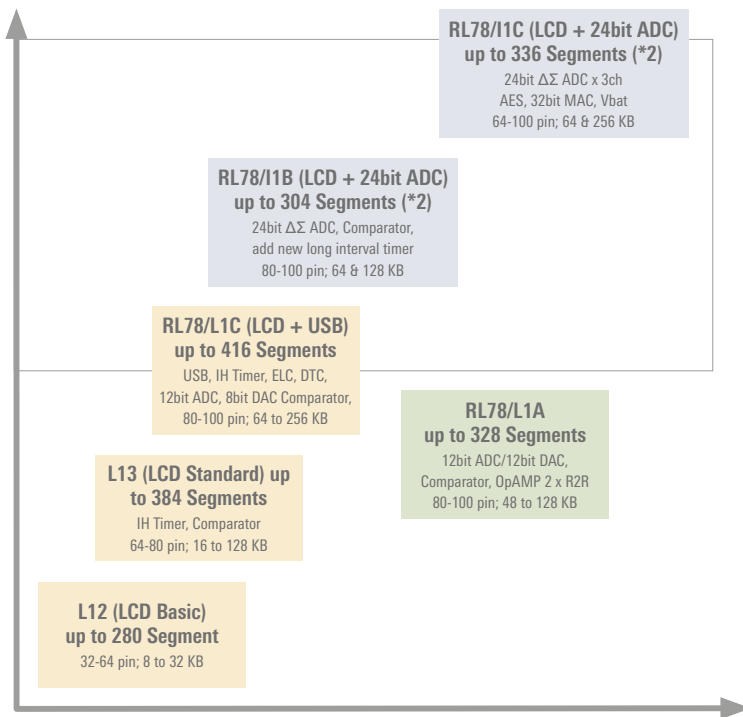
- 12bit A/D converters, 12bit D/A converters, Comparators,
- high accurate rail to rail OPAMPs with switch fabrics

Using in addition the smart features like DTC and ELC a lot of peripherals can be connected internally to reduce CPU workload and can save overall power consumption.

## RL78/L12 Block Diagram



## RL78/L1x Line-up



## RL78/L1x Applications

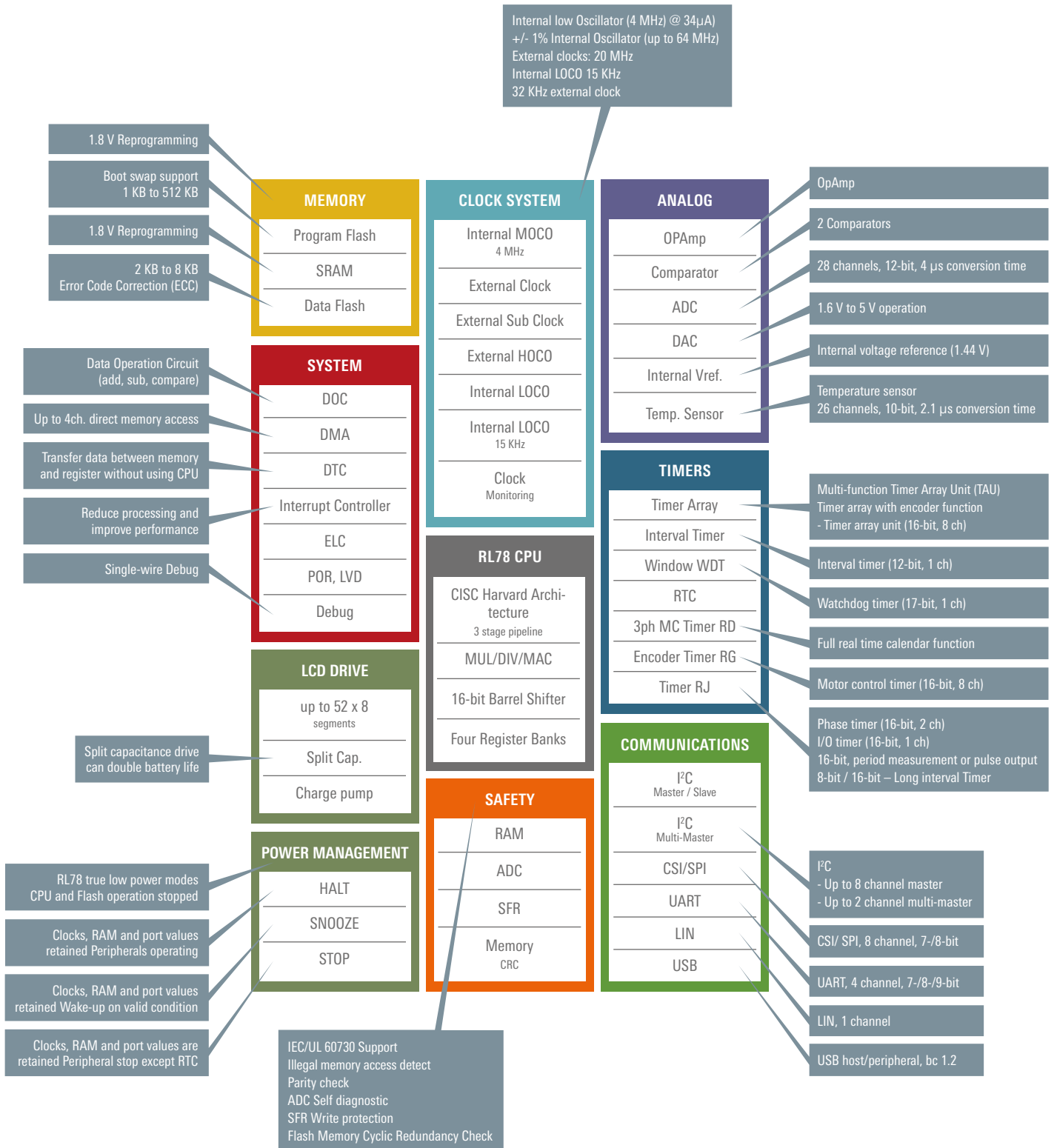
- **Home Automation:** For long battery life and operation down to 1.6V RL78 is the first choice
- **Metering:** RL78 is analogue rich, ideal for smart metering applications. Renesas has three decades of metering experience
- **Medical:** RL78 offers true low power consumption and rich features, ideal for portable healthcare devices and Renesas Electronics is an active member of Continua alliance



## RL78 FAMILY OVERVIEW

[illegible]

# RL78 FAMILY PERIPHERALS



Please refer to RL78 series datasheet for device functionality

# RL78 WITH USB

## RL78/G1C and RL78/L1C Series

As the RL78 family expands another series of devices, the RL78/G1C and RL78L1C adds USB connectivity. Renesas is one of the pioneers of USB bringing the first USB 2.0 and USB 3.0 ASSP's to market. RL78/G1C family integrates USB 2.0 host and peripheral full speed functionality, while the RL78L1C supports LCD with peripheral function.

### USB Compatibility

- Supports USB standard class driver (Host/Peripheral)
- Support class: CDC / HID / MSC / PHD / etc.

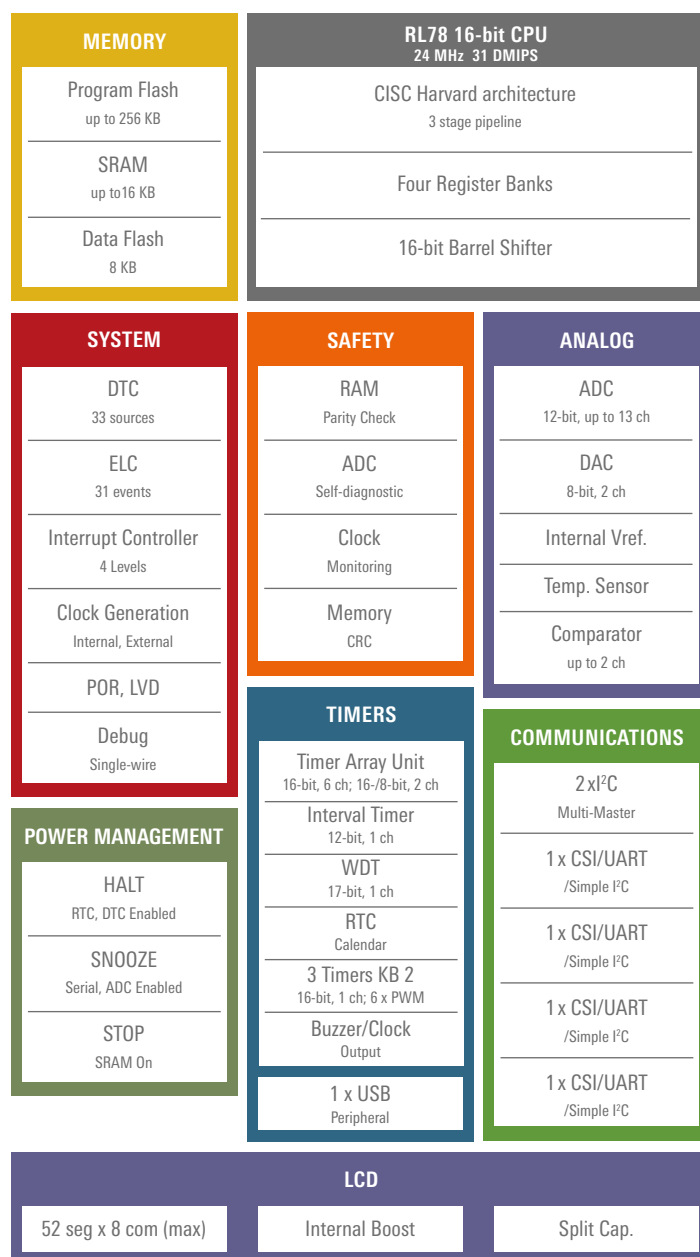
### USB BC1.2 Compliance

- Allows currents up to 1.5 A to be used during charging

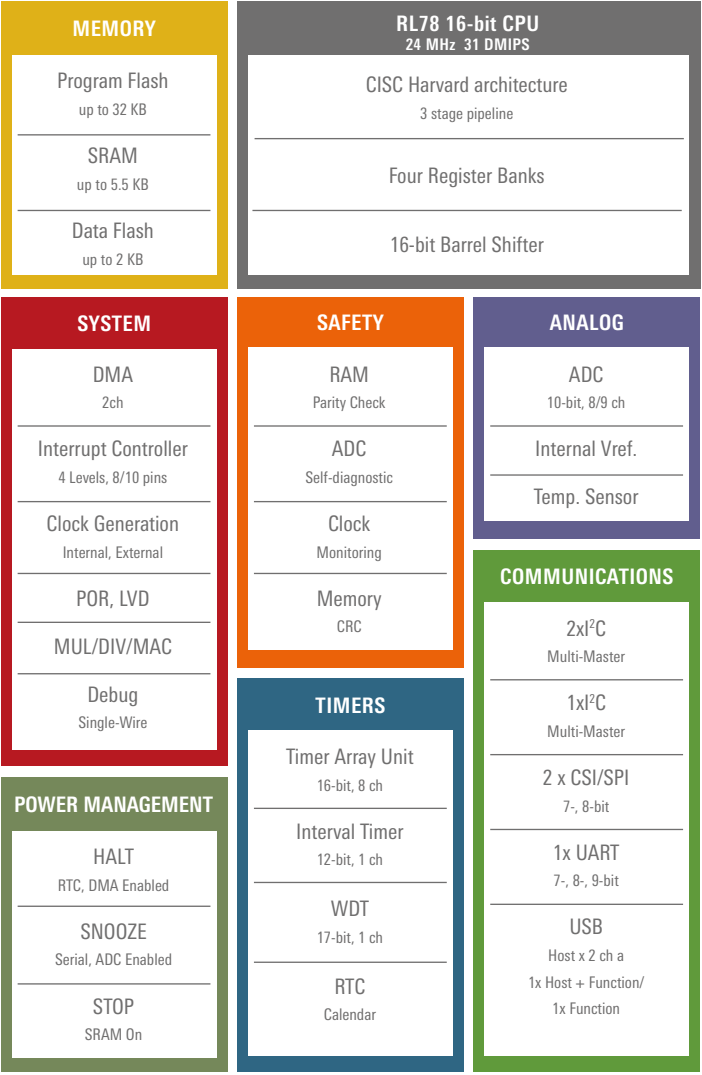
### Compact & small & LCD

- Small general purpose or with LCD drive
- 32-pin to 48-pin & 80 to 100-pin

## RL78/L1C Block Diagram with LCD & USB



RL78/G1C Block Diagram with USB

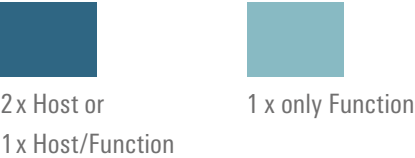


RL78/L1C with LCD & USB

| Pin No.               | 80          | 100         |
|-----------------------|-------------|-------------|
| Flash Memory/RAM (KB) | 256 KB      | 16 K        |
|                       | 192 KB      | 16 K        |
|                       | 128 KB      | 12 K        |
|                       | 96 KB       | 10 K        |
|                       | 64 KB       | 8 K         |
| PKG                   | QFP 12 x 12 | QFP 14 x 14 |

RL78/G1C – with USB

| Pin No. | 32                     | 48                     |
|---------|------------------------|------------------------|
| 256 KB  | 5.5 K                  | 5.5 K                  |
| PKG     | QFP 7 x 7<br>QFN 5 x 5 | QFP 7 x 7<br>QFN 7 x 7 |



All devices have 2 x 1 K Dataflash

# RL78 LOW PIN COUNT

## RL78/G10 Series

RL78 family expands its lineup to offer a highly-integrated small, low-pin count 10- and 16-pin SSOP packaged MCUs, optimized for space-constrained, low-cost applications in consumer, industrial, and medical markets. Development is quick and easy due to cost-effective, professional development tools and on-chip debugging capabilities.

### Power Management

- Run: 46  $\mu$ A/MHz
- Stop: 0,5  $\mu$ A (RAM retained) w/SPOR

### Low-Pin count in small

- 10-pin 4.4 x 3.6 mm SSOP
- 16-pin 3.4 x 5.0 mm SSOP

### Small Flash memory size

- Flash: 1 to 4 KB SRAM: up to 512 B

### System intergration & cost reduction

- 20 MHz On-Chip Oscillator +/- 2%
- 15 kHz Low Speed On-Chip Oscillator
- ext. Cer./Crystal OSC up to 20 MHz

### Timers

- Multi-function Timer Array Unit (TAU), up to 3 x PWM output
- 12-bit Interval Timer
- Watchdog

### Analog

- 8 x channels, 10-bit
- Comparator 1 ch
- Internal Voltage reference

### Serial Communication

- CSI/SPI, UART, I<sup>2</sup>C

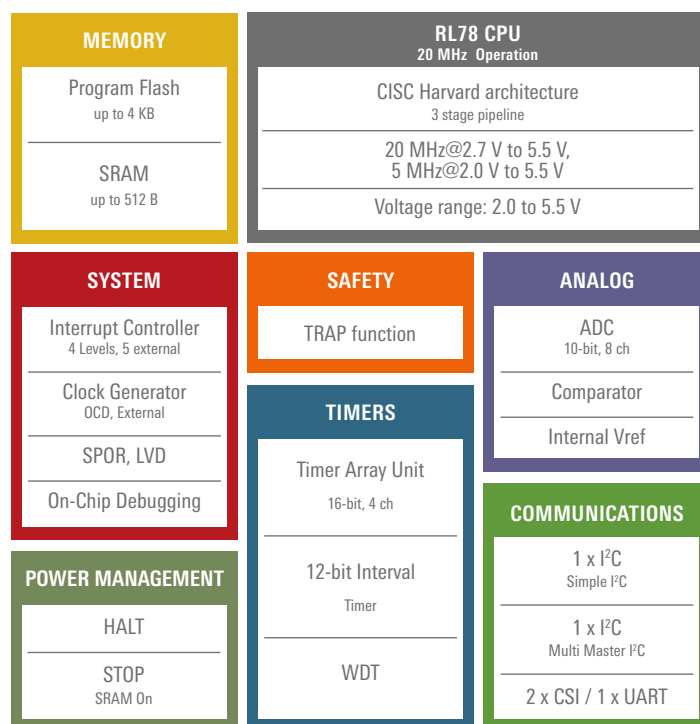
## RL78/G10 Line-up

| Pin No.           |      | 10                | 16                |
|-------------------|------|-------------------|-------------------|
| Flash Memory (KB) | 4 KB | 512               | 512               |
|                   | 2 KB | 256               | 256               |
|                   | 1 KB | 128               | 128               |
|                   |      | SSOP<br>4.4 x 3.6 | SSOP<br>4.4 x 5.0 |

RAM size  
(Byte)



## RL78/G10 Block Diagram



## RL78/G11 Series

The RL78/G11 microcontroller line-up concept is based on small packages, in small 16KB flash memory and rich analog peripherals such as A/D converters, D/A converters, comparators and PGA and these are configurable as PGA+ADC+V<sub>BGR</sub>, PGA+COMP, COMP+DAC/V<sub>BGR</sub> or PGA+COMP+DAC/V<sub>BGR</sub>. Using the smart features like DTC and ELC a lot of peripherals can be connected internally to reduce CPU workload and can save overall power consumption. It also supports very low power operation (100 uA @ 1 MHz) and a high speed 4µs wake up.

### Power Management

- 1.4 mA @ 24MHz, 5V RUN
- 100 µA @ 1MHz (LP mode)
- 0.65 µA @ HALT mode SUB+LVD:ON
- 0.25 µA @ STOP mode (RAM retention)R

### System integration & cost reduction

- 24 MHz (HOCO) High Speed On-Chip Oscillator +/-1 %
- 4 MHz (MOCO) Middle Speed On-Chip Oscillator@34 µA

### Intelligent features for smart connection

- Direct Transfer control (DTC), Event Link Controller (ELC), Data Operation Circuit (DOC)

### Key Features

- Rich analogue 10bit ADC, Comparator, DAC & PGA
- Timer KB output with 1ph bridge drive (e.g. LED)
- Fast wake up < 4us - Low 16bit interval Timer
- Long interval timer
- Small packages

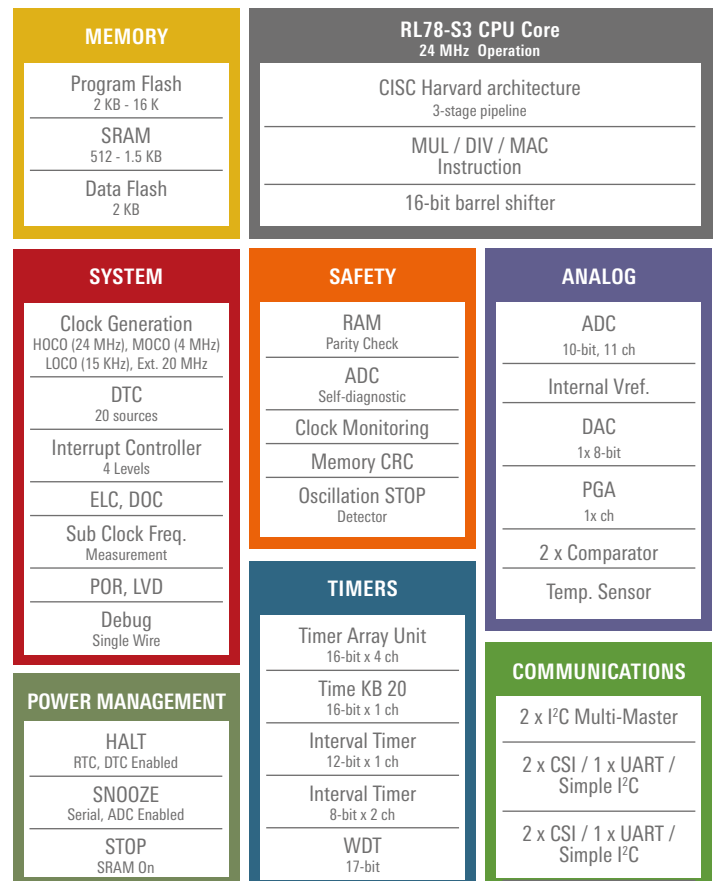
### Temperature & Quality Grade

- Temperature: -40°C to 85°C/105°C
- Consumer & industry application

## RL78/G11 Line-up

| Pin No.           | 10                | 16                | 20                | 24           | 25           |                 |
|-------------------|-------------------|-------------------|-------------------|--------------|--------------|-----------------|
| Flash Memory (KB) | 32 KB             |                   |                   |              |              |                 |
|                   | 16 KB             |                   | 1.5 K             | 1.5 K        | 1.5 K        |                 |
|                   | 8 KB              |                   |                   |              |              |                 |
| PKG [mm2]         | SSOP<br>4.4 x 4.6 | SSOP<br>4.4 x 5.0 | SSOP<br>4.4 x 6.5 | QFN<br>4 x 4 | LGA<br>3 x 3 | RAM size (Byte) |

## RL78/G11 Block Diagram



# RL78/G1G – MOTOR CONTROL

## RL78/G1G Series

In complement to the well know RL78/G14 family, this new RL78/G1G Family has been created to offer a solution for the low end Motor Control (MC) arena. Both families RL78/G14 and RL78/G1G have implemented the same 3ph Motor control Timer RD. Customers can utilize the same Software on all products. While RL78/G14 is suitable for the higher end MC area and can drive Brushless AC, DC and Induction AC (sensored) motors, the RL78/G1G is targeting application which needs small package, small memory at a more cost sensitive level.

### Motor control System

- 16-bit CPU core @ 24 MHz with MAC
- 3ph Motor Timer RD with 48 MHz clock
- Quick comparator (70 ns) with PGA (4, 8, 16, 32) to detect over current with forced cutoff
- Small package

### Safety IEC60730–1

- ECC, RAM parity Error detection CRC, WDT, ADC self diagnosis
- I/O consistency check
- Register write protection

### Analog

- 12 channels x 10-bit ADC

### Intelligent Features

- Event Link Controller (ELC)

### Power Management

- Vcc: 2.7 to 5.5 V

### Temperature range

- -40 to 85 °C

## RL78/G1G Line-up

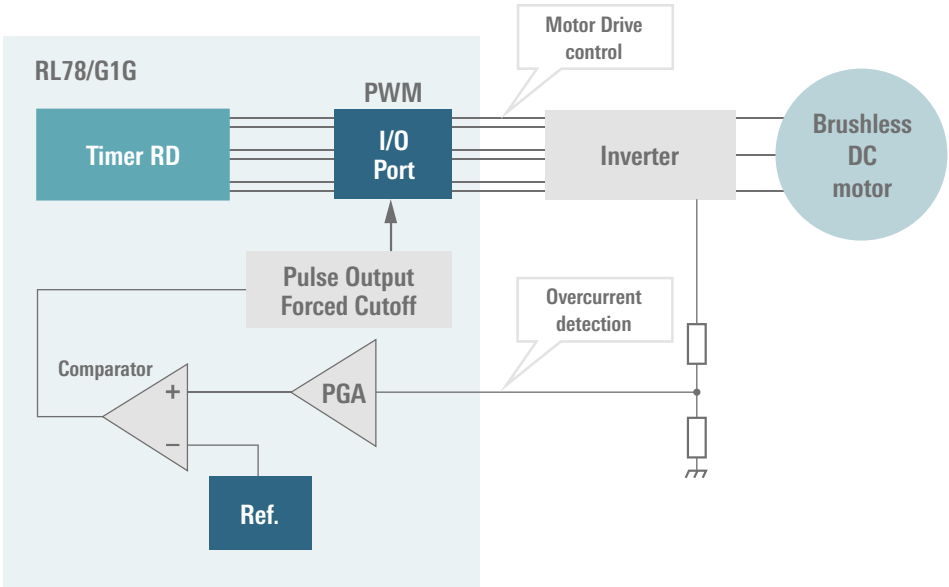
| Pin No.           |    | 30                | 32                                 | 44                                  |
|-------------------|----|-------------------|------------------------------------|-------------------------------------|
| Flash Memory (KB) | 16 | 1.5 K             | 1.5 K                              | 1.5 K                               |
|                   | 8  | 1.5 K             | 1.5 K                              | 1.5 K                               |
| PKG               |    | SSOP<br>(300 mil) | SSOP<br>(7 x 7)<br>0.8 mm<br>pitch | QFP<br>(10 x 10)<br>0.8 mm<br>pitch |

## Application

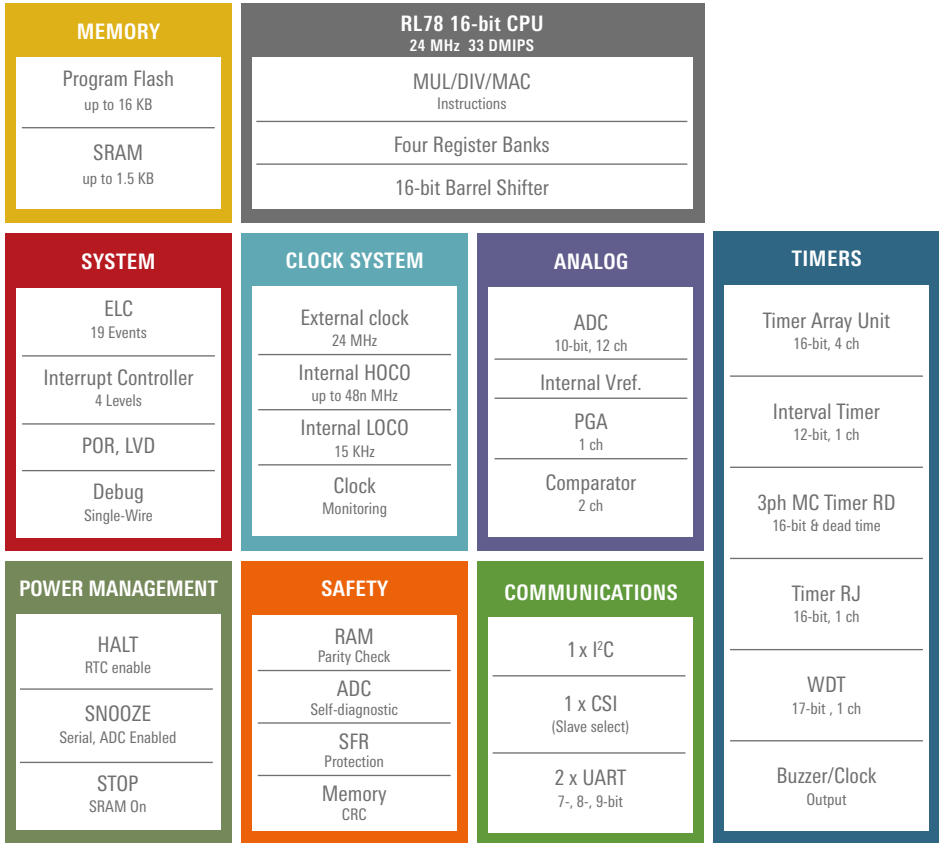
### Brushless DC – block commutation

- Sensorless – Back EMF
- Sensored – Hall, encoder

Specific embedded peripheral  
for small motor control system



RL78/G10 Block Diagram



# RL78 SMART CHOICE FOR DETECTOR & SENSOR

## RL78/I1D

The Building automation arena is on of the fast growing market. These are including for example fire or smoke detectors, alarm system, sensor as part of access control and security system. The RL78/I1D family has specially been designed for such kind of application where lowest power function, enhanced analog features and quick wake up time in small packages are required.

### System integration & cost reduction

- 24 MHz (HOCO) High Speed On-Chip Oscillator +/- 1 %
- 4 MHz (MOCO) Middle Speed On-Chip Oscillator@34  $\mu$ A
- 15 KHz (LOCO) Low Speed On-Chip Oscillator

### Low power Timers

- 12-bit Interval Timer (40 nA)
- 16-bit / 2 x 8-bit Interval Timer (100 nA) with prescaler (fIL / 128) to achieve long wake up timings

### Enhanced Analog

- 12-bit ADC up to 17 channels
- Op-Amp: up to 4 channels
- Comparator: 2 channels

### Intelligent Features

- Direct Transfer Controller (DTC)
- Event Link Controller (ELC)
- Data Operation Circuit (DOC)

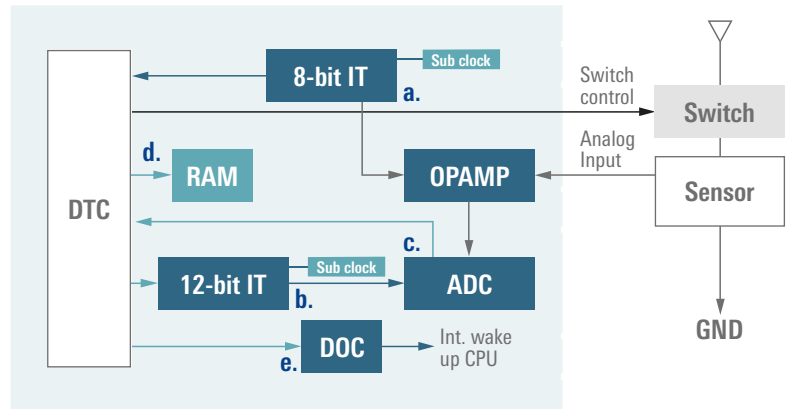
### Power Management

- Operation: < 150  $\mu$ A / MHz
- Stop: 0.2  $\mu$ A (RAM retrained)
- Wake up time: < 4  $\mu$ s (via MOCO)
- Vcc: 1.6 to 3.6 V

### Temperature range

- -40 to 105  $^{\circ}$ C

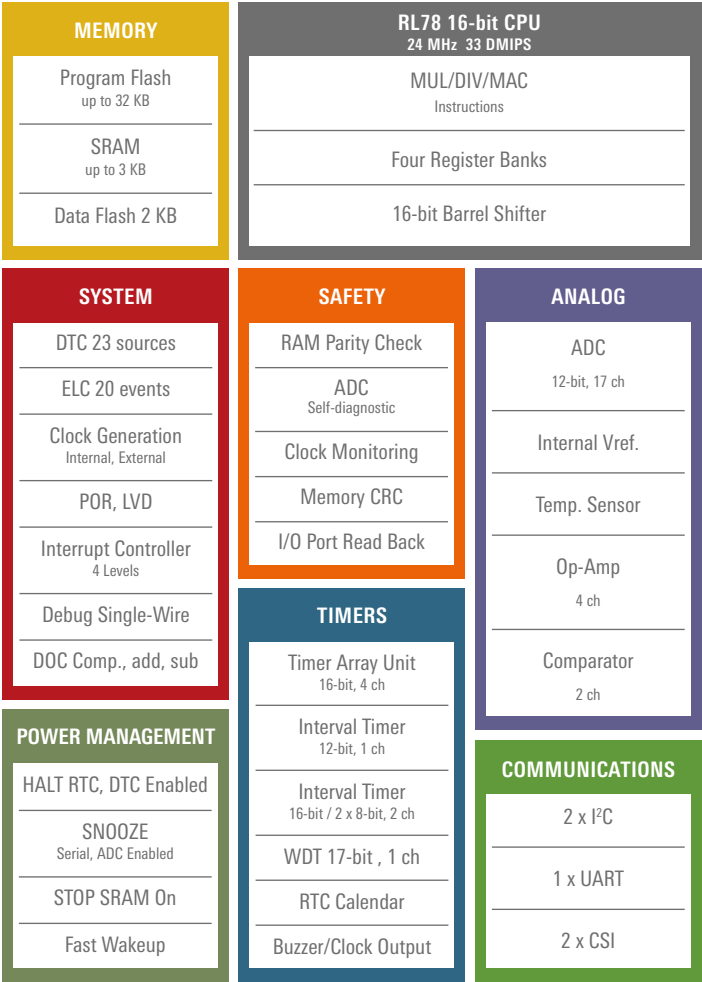
## Example: RL78/I1D intelligent features usage



- a. Switch on Sensor in low power mode
- b. Delay ADC conversation
- c./d. Move automatically ADC result via DTC to RAM
- e. Automatic DOC judgement to wake up RL78/I1D



# RL78/I1D Block Diagram



# RL78/I1D Line-up

| Pin No.           |    | 20             | 24                           | 30              | 32                                                                | 32                           | 48                           |     |
|-------------------|----|----------------|------------------------------|-----------------|-------------------------------------------------------------------|------------------------------|------------------------------|-----|
| Flash Memory (KB) | 32 |                |                              | 3 K*            | 3 K*                                                              | 3 K*                         | 3 K*                         | RAM |
|                   | 16 | 2 K            | 2 K                          | 2 K             | 2 K                                                               | 2 K                          | 2 K                          |     |
|                   | 8  | 0.7 K          | 0.7 K                        | 0.7 K           | *Only 2 KB when self programming function and data flash are used |                              |                              |     |
| PKG               |    | SSOP<br>6.5 mm | QFN<br>4 x 4 mm <sup>2</sup> | SSOP<br>7.62 mm | QFN<br>5 x 5 mm <sup>2</sup>                                      | QFN<br>7 x 7 mm <sup>2</sup> | QFN<br>7 x 7 mm <sup>2</sup> |     |

# PACKAGE LINE-UP



10  
Pins

10-SSOP (4.4 x 3.6 mm)

|            |              |
|------------|--------------|
| Pin count  | 20-pin       |
| Type       | SSOP         |
| Size       | 4.4 x 3.6 mm |
| Pitch      | 0.65 mm      |
| Thickness* | 1.40 mm      |
| Used by    | RL78/G10     |



20  
Pins

20-SSOP (7.62 mm)

|            |               |
|------------|---------------|
| Pin count  | 20-pin        |
| Type       | SSOP          |
| Size       | 7.62 mm       |
| Pitch      | 0.65 mm       |
| Thickness* | 1.40 mm       |
| Used by    | RL78/G13, F12 |



20  
Pins

20-LSSOP (4.4 x 6.5 mm)

|            |                    |
|------------|--------------------|
| Pin count  | 20-pin             |
| Type       | LSSOP              |
| Size       | 4.4 x 6.5 mm       |
| Pitch      | 0.65 mm            |
| Thickness* | 1.45 mm            |
| Used by    | RL78/G12, I1A, I1D |



24  
Pins

24-WQFN (4 x 4 mm)

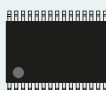
|            |                    |
|------------|--------------------|
| Pin count  | 24-pin             |
| Type       | WQFN               |
| Size       | 4 x 4 mm           |
| Pitch      | 0.50 mm            |
| Thickness* | 0.80 mm            |
| Used by    | RL78/G12, G13, I1D |



25  
Pins

25-FLGA (3 x 3 mm)

|            |               |
|------------|---------------|
| Pin count  | 25-pin        |
| Type       | FLGA          |
| Size       | 3 x 3 mm      |
| Pitch      | 0.50 mm       |
| Thickness* | 0.76 mm       |
| Used by    | RL78/G13, G1A |



30  
Pins

30-SSOP (7.62 mm)

|            |                              |
|------------|------------------------------|
| Pin count  | 30-pin                       |
| Type       | SSOP                         |
| Size       | 7.62 mm                      |
| Pitch      | 0.65 mm                      |
| Thickness* | 1.40 mm                      |
| Used by    | RL78/G12, G13, G14, I1A, I1D |



32  
Pins

32-LQFP (7 x 7 mm)

|            |               |
|------------|---------------|
| Pin count  | 32-pin        |
| Type       | LQFP          |
| Size       | 7 x 7 mm      |
| Pitch      | 0.80 mm       |
| Thickness* | 1.70 mm       |
| Used by    | RL78/G14, I1D |



32  
Pins

32-VQFN (5 x 6 mm)

|            |          |
|------------|----------|
| Pin count  | 32-pin   |
| Type       | VQFN     |
| Size       | 5 x 6 mm |
| Pitch      | 0.5 mm   |
| Thickness* | 0.95 mm  |
| Used by    | RL78/I1A |



32  
Pins

32-WQFN (5 x 5 mm)

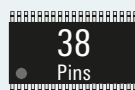
|            |                              |
|------------|------------------------------|
| Pin count  | 32-pin                       |
| Type       | WQFN                         |
| Size       | 5 x 5 mm                     |
| Pitch      | 0.50 mm                      |
| Thickness* | 0.80 mm                      |
| Used by    | RL78/G13, G14, G1A, F12, I1D |



36  
Pins

36-FPLGA (4 x 4 mm)

|            |               |
|------------|---------------|
| Pin count  | 36-pin        |
| Type       | FPLGA         |
| Size       | 4 x 4 mm      |
| Pitch      | 0.50 mm       |
| Thickness* | 0.76 mm       |
| Used by    | RL78/G13, G14 |



38  
Pins

38-SSOP (7.62 mm)

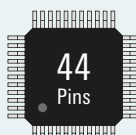
|            |          |
|------------|----------|
| Pin count  | 38-pin   |
| Type       | SSOP     |
| Size       | 7.62 mm  |
| Pitch      | 0.65 mm  |
| Thickness* | 2.00 mm  |
| Used by    | RL78/I1A |



40  
Pins

40-WQFN (6 x 6 mm)

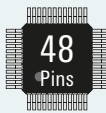
|            |               |
|------------|---------------|
| Pin count  | 40-pin        |
| Type       | WQFN          |
| Size       | 6 x 6 mm      |
| Pitch      | 0.50 mm       |
| Thickness* | 0.80 mm       |
| Used by    | RL78/G13, G14 |



44  
Pins

44-LQFP (10 x 10 mm)

|            |                    |
|------------|--------------------|
| Pin count  | 44-pin             |
| Type       | LQFP               |
| Size       | 10 x 10 mm         |
| Pitch      | 0.80 mm            |
| Thickness* | 1.60 mm            |
| Used by    | RL78/G13, G14, L12 |



48  
Pins

48-LQFP (7 x 7 mm)

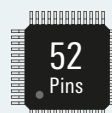
|            |                                   |
|------------|-----------------------------------|
| Pin count  | 48-pin                            |
| Type       | LQFP                              |
| Size       | 7 x 7 mm                          |
| Pitch      | 0.50 mm                           |
| Thickness* | 1.60 mm                           |
| Used by    | RL78/G13, G14, G1A, F12, L12, I1D |



48  
Pins

48-WQFN (7 x 7 mm)

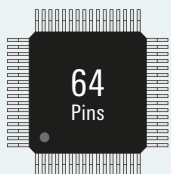
|            |                         |
|------------|-------------------------|
| Pin count  | 48-pin                  |
| Type       | WQFN                    |
| Size       | 7 x 7 mm                |
| Pitch      | 0.50 mm                 |
| Thickness* | 0.80 mm                 |
| Used by    | RL78/G13, G14, G1A, F12 |



52  
Pins

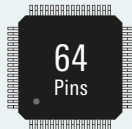
52-LQFP (10 x 10 mm)

|            |                    |
|------------|--------------------|
| Pin count  | 52-pin             |
| Type       | LQFP               |
| Size       | 10 x 10 mm         |
| Pitch      | 0.65 mm            |
| Thickness* | 1.70 mm            |
| Used by    | RL78/G13, G14, L12 |



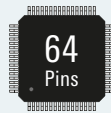
64-LQFP (14 x 14 mm)

|            |            |
|------------|------------|
| Pin count  | 64-pin     |
| Type       | LQFP       |
| Size       | 14 x 14 mm |
| Pitch      | 0.80 mm    |
| Thickness* | 1.70 mm    |
| Used by    | RL78/G14   |



64-LQFP (12 x 12 mm)

|            |                    |
|------------|--------------------|
| Pin count  | 64-pin             |
| Type       | LQFP               |
| Size       | 12 x 12 mm         |
| Pitch      | 0.65 mm            |
| Thickness* | 1.60 mm            |
| Used by    | RL78/G13, G14, L12 |



64-LQFP (10 x 10 mm)

|            |                              |
|------------|------------------------------|
| Pin count  | 64-pin                       |
| Type       | LQFP                         |
| Size       | 10 x 10 mm                   |
| Pitch      | 0.50 mm                      |
| Thickness* | 1.60 mm                      |
| Used by    | RL78/G13, G14, G1A, F12, L12 |



64  
Pins

64-FPBGA (4 x 4 mm)

|            |               |
|------------|---------------|
| Pin count  | 64-pin        |
| Type       | FPBGA         |
| Size       | 4 x 4 mm      |
| Pitch      | 0.40 mm       |
| Thickness* | 0.99 mm       |
| Used by    | RL78/G13, G1A |



64  
Pins

64-FLGA (5 x 5 mm)

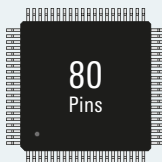
|            |          |
|------------|----------|
| Pin count  | 64-pin   |
| Type       | FLGA     |
| Size       | 5 x 5 mm |
| Pitch      | 0.50 mm  |
| Thickness* | 0.76 mm  |
| Used by    | RL78/G14 |



64  
Pins

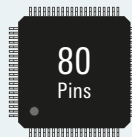
64-WQFN (8 x 8 mm)

|            |          |
|------------|----------|
| Pin count  | 64-pin   |
| Type       | WQFN     |
| Size       | 8 x 8 mm |
| Pitch      | 0.40 mm  |
| Thickness* | 0.80 mm  |
| Used by    | RL78/L12 |



80-LQFP (14 x 14 mm)

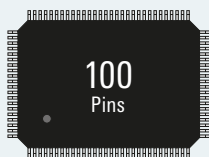
|            |               |
|------------|---------------|
| Pin count  | 80-pin        |
| Type       | LQFP          |
| Size       | 14 x 14 mm    |
| Pitch      | 0.65 mm       |
| Thickness* | 1.70 mm       |
| Used by    | RL78/G13, G14 |



80  
Pins

80-LQFP (12 x 12 mm)

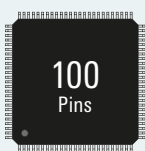
|            |               |
|------------|---------------|
| Pin count  | 80-pin        |
| Type       | LQFP          |
| Size       | 12 x 12 mm    |
| Pitch      | 0.50 mm       |
| Thickness* | 1.60 mm       |
| Used by    | RL78/G13, G14 |



100  
Pins

100-LQFP (14 x 20 mm)

|            |               |
|------------|---------------|
| Pin count  | 100-pin       |
| Type       | LQFP          |
| Size       | 14 x 20 mm    |
| Pitch      | 0.65 mm       |
| Thickness* | 1.60 mm       |
| Used by    | RL78/G13, G14 |



100  
Pins

100-LQFP (14 x 14 mm)

|            |               |
|------------|---------------|
| Pin count  | 100-pin       |
| Type       | LQFP          |
| Size       | 14 x 14 mm    |
| Pitch      | 0.50 mm       |
| Thickness* | 1.60 mm       |
| Used by    | RL78/G13, G14 |



128  
Pins

128-LQFP (14 x 20 mm)

|            |            |
|------------|------------|
| Pin count  | 128-pin    |
| Type       | LQFP       |
| Size       | 14 x 20 mm |
| Pitch      | 0.50 mm    |
| Thickness* | 1.60 mm    |
| Used by    | RL78/G13   |

\* Indicates maximum thickness.

# RL78 FOR MOTOR CONTROL

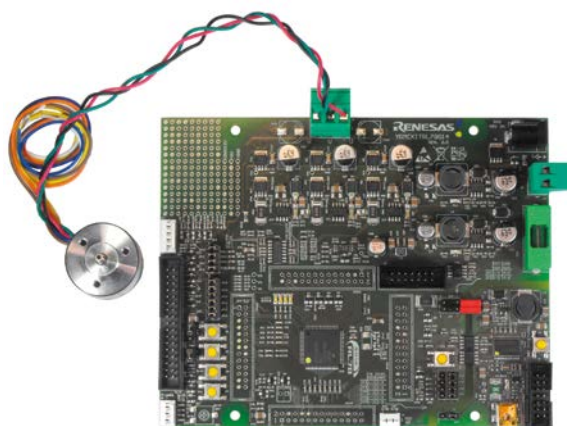
## RL78/G1F, G1G and G14 Group

- RL78/G1F, G1G and G14 MCUs integrate the Timer RD motor-control timer, as well as ADC, TAU, SAU, ELC functions
- The devices can drive 5V parts without level shifters
- Compatibility is maintained for common peripherals on RL78/G1F, G1G and G14 MCUs

|                              | G1F                                                                                    | G1G                                                                             | G14                                                                                 |
|------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>CPU frequency (max.)</b>  | 32 MHz                                                                                 | 24 MHz                                                                          | 32 MHz                                                                              |
| <b>HOCO</b>                  | +/-1%                                                                                  | +/-2%                                                                           | +/-1%                                                                               |
| <b>VDD</b>                   | 1.6V - 5.5V                                                                            | 2.7V - 5.5V                                                                     | 1.6V - 5.5V                                                                         |
| <b>Motor timer</b>           | Timer RD (64 MHz)                                                                      | Timer RD (48 MHz)                                                               | Timer RD (64 MHz)                                                                   |
| <b>Rotor feedback timer</b>  | Timer RX (64 MHz)                                                                      | —                                                                               | —                                                                                   |
| <b>Comparator mask timer</b> | TAU (1 shot)                                                                           | —                                                                               | —                                                                                   |
| <b>2-phase encoder timer</b> | Timer RG                                                                               | —                                                                               | Timer RG                                                                            |
| <b>DTC</b>                   | Yes                                                                                    | —                                                                               | Yes                                                                                 |
| <b>Comparator</b>            | 2ch<br>150 ns max.<br>(8-bit DAC and 1.45V reference)                                  | 2ch<br>150 ns max.<br>(8-bit DAC reference)                                     | 2ch <sup>1</sup><br>1.2 us max.<br>(0.76VDD, 0.24VDD, 1.45V reference)              |
| <b>PGA</b>                   | 1 ch                                                                                   | 1 ch                                                                            | —                                                                                   |
| <b>DAC</b>                   | 2 ch (8-bit)                                                                           | —                                                                               | 2ch (8-bit) <sup>1</sup>                                                            |
| <b>Pin count</b>             | 24-64-pin                                                                              | 30-44-pin                                                                       | 30-100-pin                                                                          |
| <b>Data Flash</b>            | 4 KB                                                                                   | —                                                                               | 4 KB                                                                                |
| <b>Application examples</b>  | <ul style="list-style-type: none"> <li>■ Power tools</li> <li>■ White goods</li> </ul> | <ul style="list-style-type: none"> <li>■ Fans</li> <li>■ Power tools</li> </ul> | <ul style="list-style-type: none"> <li>■ White goods</li> <li>■ RC motor</li> </ul> |

## RL78/G14 motor control kit

- The kit allows evaluations of motor control techniques
- Renesas offers royalty-free motor control software
- The MCUs enable field-oriented sensorless vector control
- These kits implement the 3-shunt detection approach
- RL78/G1x can greatly reduce design time and effort to meet IEC60730 compliance requirements



P/N: YRMCKITRL78G14

- [illegible]

## Application notes for motor control

| Type          | Description                                                                             | Document No.    |
|---------------|-----------------------------------------------------------------------------------------|-----------------|
| Motor Control | V/f Control of Induction Motor (RL78/G14)                                               | R01AN2196EJ0100 |
|               | Vector control of permanent magnetic synchronous motor using encoder                    | R01AN1664EJ0100 |
|               | Sensorless vector control of permanent magnetic synchronous motor                       | R01AN1661EJ0100 |
|               | 120 degrees conducting control of permanent magnetic synchronous motor with hall sensor | R01AN1659EJ0100 |
|               | Sensorless 120 degrees conducting control of permanent magnetic synchronous motor       | R01AN1660EJ0100 |
|               | Inverter control of the single phase induction motor                                    | R01AN1658EJ0100 |
|               | Sensorless 120 degrees conducting control of permanent magnetic synchronous motor       | R01AN1387EJ0100 |
| DSP           | RL78 Digital Signal Controller Library – Fixed Point and Motor                          | R01AN1216ES0101 |
|               | RL78 Digital Signal Controller Library – Filter                                         | R01AN1665ES0100 |

# RL78/G1D INTELLIGENT BLUETOOTH® SMART MCUS

Low Power RL78 Microcontroller and Bluetooth Low Energy wireless technology increases battery life and accelerates Bluetooth connected device development.



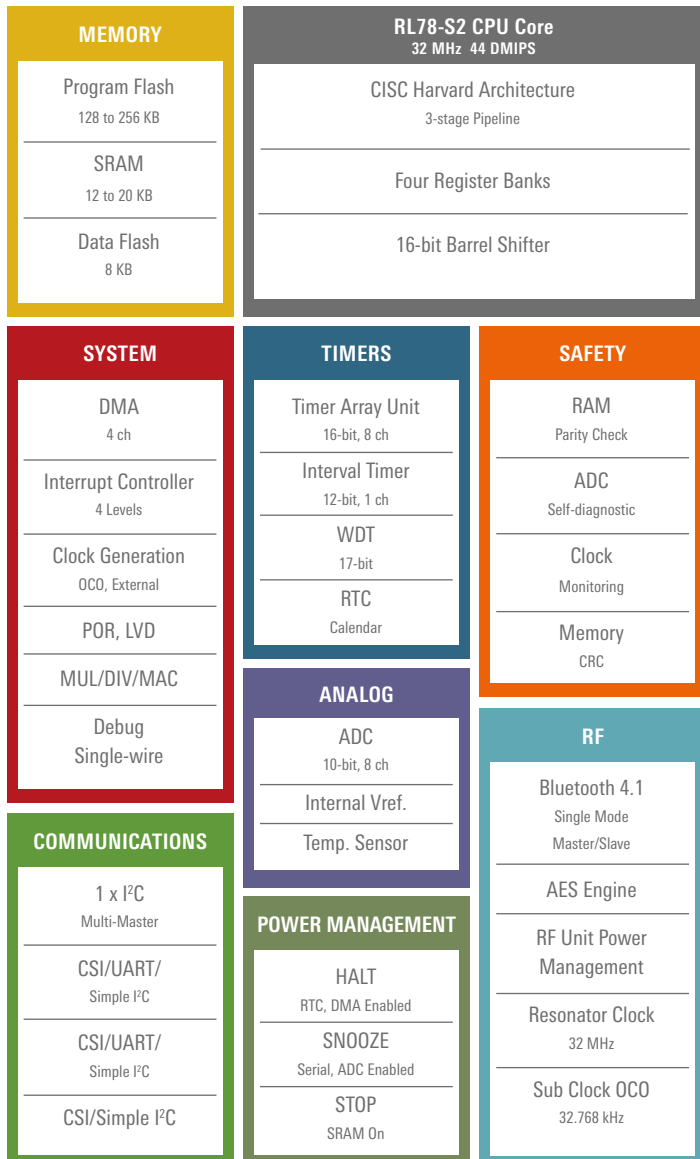
44 DMIPS,  
True Low Power



Offering low power consumption and robust system development support, Renesas RL78/G1D chips deliver reliable connectivity for 'Internet of Things (IoT)' products.

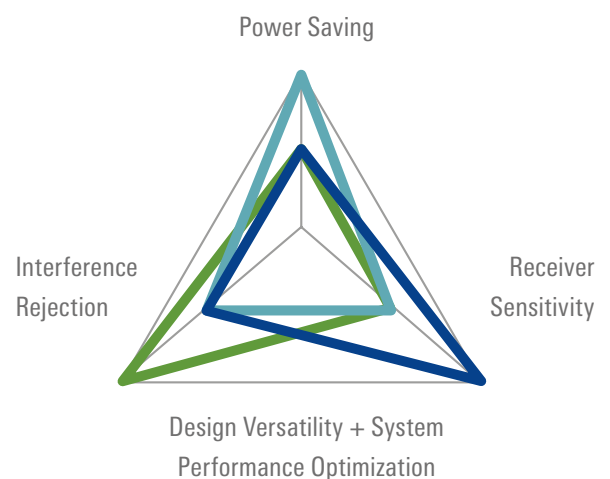
## RL78/G1D Block Diagram

VDD = 1.6 to 3.6V  
Ta = -40 to +85°C



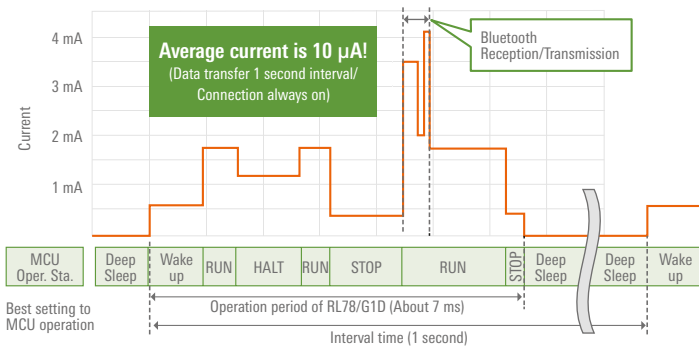
## Key Features

- Bluetooth Smart v4.1 connectivity supported in embedded and modem modes
- Peak Tx current of 4.3 mA and peak Rx current of 3.5 mA
- 'RF Adaptable Technology' automatically optimizes power consumption versus communication range
- High integration minimizes BOM cost; Balun, on-chip 32 KHz oscillator
- Industry-leading support tools shorten time to market
- BT SIG qualified stack plus documented test procedure facilitate radio certification
- Firmware-over-the-air (FOTA) capability enables convenient application upgrades in the field



## Efficient connection technology.

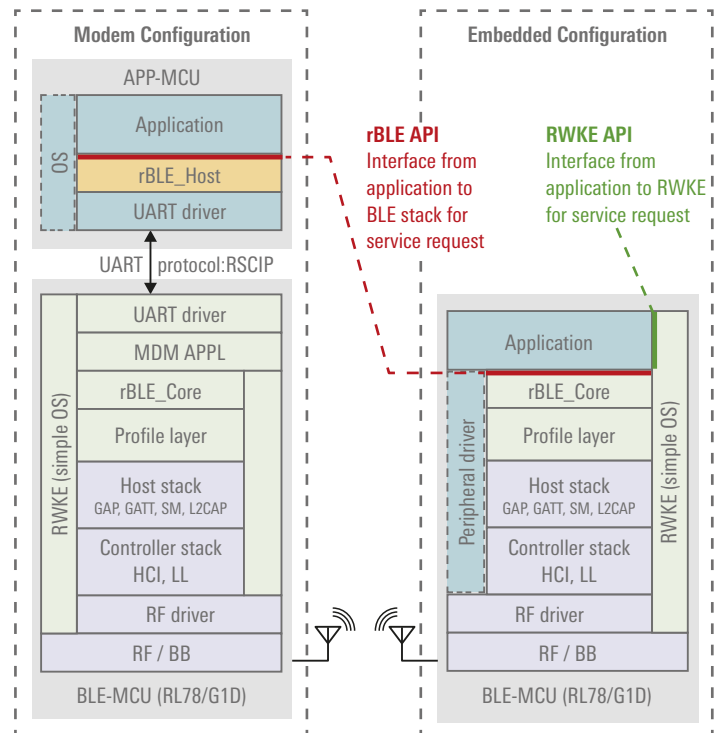
RL78/G1D MCUs prioritize current consumption at near distances or communication range at far distances.



### Outstanding Tx/Rx power efficiency.

State-of-the-art radio technology enables reliable communications with low current consumption.

## BLE Stack Configuration



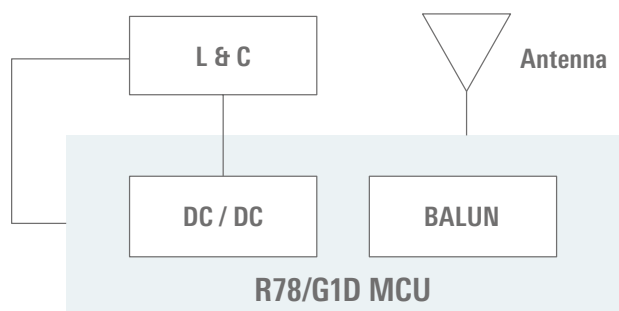
|  |                                         |
|--|-----------------------------------------|
|  | Customer developed software             |
|  | Renesas provided software (Source code) |
|  | Renesas provided software (Binary code) |
|  | Renesas provided software (Binary code) |

### ABBREVIATIONS

**RWKE** - Renesas Wireless Kernel Extension  
**RSCIP** - Renesas Serial Communication Protocol  
**API** - Application Program Interface

## Key Applications

- Home and Building Automation: Locks, gateway, security systems
- Industrial Systems: Asset tracking and management systems, remote displays, access control systems
- Retail Operations: Beacons, price tags, payment systems
- Healthcare and Fitness Centers: Blood glucose and pressure meters, weight- scales, activity monitors



### Simplified RF Design.

High level of integration simplifies RF design and reduces BOM count.

## The RL78/G1D Group

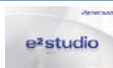
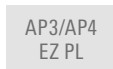
| Pin Count | Package                 | Fields of Application | Ordering Part Number | Code Flash Memory | Data Flash Memory | RAM   |
|-----------|-------------------------|-----------------------|----------------------|-------------------|-------------------|-------|
| 48 pins   | Plastic WQFN (6 x 6 mm) | Consumer              | R5F11AGGANB          | 128 KB            | 8 KB              | 12 KB |
|           |                         | Industrial            | R5F11AGGDNB          |                   |                   |       |
|           |                         | Consumer              | R5F11AGHANB          | 192 KB            | 8 KB              | 16 KB |
|           |                         | Industrial            | R5F11AGHDNB          |                   |                   |       |
|           |                         | Consumer              | R5F11AGJANB          | 256 KB            | 8 KB              | 20 KB |
|           |                         | Industrial            | R5F11AGJDNB          |                   |                   |       |

# RL78 DEVELOPMENT TOOLS AND KITS

## Extensive Renesas Development Ecosystem

Renesas Electronics and selected partners offer a comprehensive suite of hardware and software tools for the rapid evaluation and development of embedded systems built with RL78.

## Explore → Evaluate → Develop → Manufacture

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |
| Web Simulator                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | MCU Board                                                                         | Starter Kit                                                                       | Solution Starter Kit                                                              | E1/E2 Lite                                                                        | Debugger & Programmer                                                              | Programmer PG-FP5                                                                   |
| <div> <div>Compiler</div> <div>    </div> </div>                                                                                                                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
| <div> <div>IDE</div> <div>   </div> </div>                                                                                                                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
| <div> <div>Code Generator</div> <div>    </div> </div>                                                                                                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
| <div> <div>RTOS</div> <div>      </div> </div> |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |

## Software Development Tools

### e<sup>2</sup> Studio

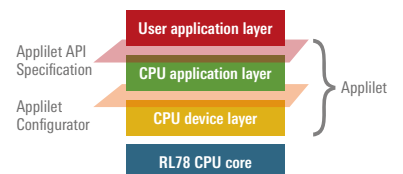
- Based on the popular Eclipse open source environment
- Complete IDE based on GNU or IAR compilers
- Powerful project management
- Download free at: [www.renesas.com/E2Studio](http://www.renesas.com/E2Studio)

### IAR Embedded Workbench

- Integrated development environment and optimised C++ compiler for RL78
- Project management tools and editor
- Configuration files for all RL78 devices
- Emulator Debugger Support
- Run-time libraries

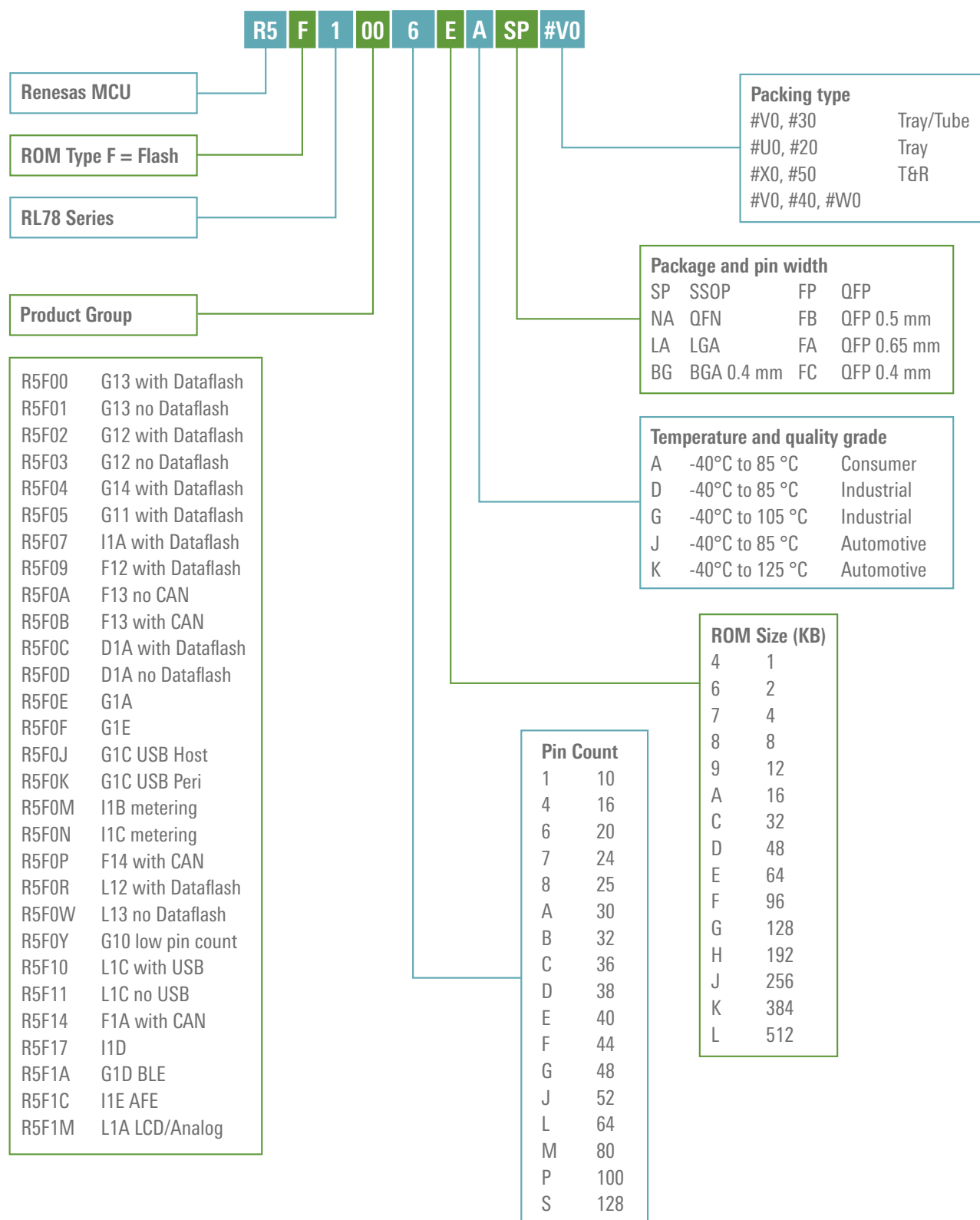
### Applilet

- Renesas software tool generates device driver code to initialize and use on-chip peripherals
- Full code generation for IAR EWRL78
- Integrated project wizard guides user to create a new project
- Download free at: [www.renesas.com/applilet](http://www.renesas.com/applilet)



| Series                  | Part Number              | Description                                                                        |
|-------------------------|--------------------------|------------------------------------------------------------------------------------|
| <b>RL78/G10</b>         | Y-RL78G10-KIT            | RL78/G10 kit with E1 debugger                                                      |
|                         | QB-R5F10Y16-TB           | RL78/G10 (10-pin) target board                                                     |
|                         | RTE510Y470TGB00000R      | RL78/G10 (16-pin) target board                                                     |
| <b>RL78/G11</b>         | YQB-R5F1057A-TB          | RL78/G11 (25-pin) target board                                                     |
| <b>RL78/G12</b>         | QB-R5F1026A-TB           | RL78/G12 target board                                                              |
| <b>RL78/G13</b>         | YRPBRL78G13              | Renesas Promotion Board RL78/G13                                                   |
|                         | R0K50100LC001BE          | RSK RL78/G13 CPU Board with LCD Display                                            |
|                         | YR0K50100LS000BE         | Renesas Starter Kit for RL78/G13 (E1 with IAR compiler)                            |
|                         | QB-R5F100LE-TB           | RL78/G13 (64K) target board                                                        |
|                         | QB-R5F100SL-TB           | RL78/G13 (512K) target board                                                       |
| <b>RL78/G14</b>         | YRPBRL78G14              | Renesas Promotion Board RL78/G14                                                   |
|                         | R0K50104PC001BE          | RSK RL78/G14 CPU Board with LCD Display                                            |
|                         | YR0K50104PS000BE         | Renesas Starter Kit for RL78/G14 (E1 with E <sup>2</sup> Studio)                   |
|                         | QB-R5F104LE-TB           | RL78/G14 (64K) target board                                                        |
|                         | QB-R5F104PJ-TB           | RL78/G14 (256K) target board                                                       |
| <b>RL78/G1C</b>         | QB-R5F10JGC-TB           | RL78/G1C target board                                                              |
|                         | YR0K5010JGS000BE         | Renesas Starter Kit for RL78/G1C (E1 with E <sup>2</sup> Studio)                   |
|                         | Y-QB-RL78G1C-ZZZ-EE      | ICE (IECUBE) In-Circuit Emulator for RL78/G1C                                      |
| <b>RL78/I1D</b>         | RTE5117GC0TGB00000R      | RL78/I1D Target board                                                              |
|                         | YDETECT-IT-RL78          | RL78/I1D Solution kit “Detect It!”                                                 |
| <b>RL78/L12</b>         | QB-R5F10RLC-TB           | RL78/L12 target board                                                              |
|                         | YRPBRL78L12              | Renesas Promotion Board RL78/L12                                                   |
|                         | YR0K5010RLS000BE         | Renesas Starter Kit for RL78/L12 inc. LCD APP2 (E1 with E <sup>2</sup> Studio)     |
| <b>RL78/L13</b>         | QB-R5F10WMG-TB           | RL78/L13 target board                                                              |
|                         | YR0K5010WMS000BE         | Renesas Starter Kit for RL78/L13 inc. LCD APP2 (E1 with E <sup>2</sup> Studio)     |
| <b>RL78/L1A</b>         | YQB-R5F11MPG-TB          | RL78/G11 (25-pin) target board                                                     |
|                         | YRPBRL78L1A              | Renesas Promotion Board RL78/L1A                                                   |
| <b>RL78/L1C</b>         | QB-R5F110PJ-TB           | RL78/L1C target board                                                              |
|                         | YR0K50110PC000BE         | Renesas Starter Kit for RL78/L1C inc. LCD APP2 (E1 with E <sup>2</sup> Studio)     |
| <b>RL78/G1G</b>         | YQB-R5F11EFA-TB          | RL78/G1G Target board                                                              |
|                         | R0K5011EFS000BE          | Renesas Starter Kit with RL78/G1G                                                  |
| <b>RL78/F12</b>         | QB-R5F109GE-TB           | RL78/F12 target board                                                              |
|                         | Y-ASK-RL78F12            | RL78/F12 Starter Kit (E1 Debugger included)                                        |
| <b>RL78/F13</b>         | QB-R5F10BMG-TB           | RL78/F13 target board                                                              |
| <b>RL78/F14</b>         | QB-R5F10PPJ-TB           | RL78/F14 target board                                                              |
| <b>Renesas Compiler</b> | CC-RL                    | RL78 Family C Compiler Package (without IDE) or C Compiler and IDE for RL78 Family |
| <b>IAR Compiler</b>     | Y-IAR-EWRL78-FULL        | IAR EWRL78 Compiler Stand-alone PC-locked License                                  |
|                         | Y-IAR-EWRL78-FULL-MOBILE | IAR EWRL78 Compiler Mobile License (incl. USB HW Dongle)                           |
| <b>Hardware tool</b>    | YR0E000010KCE0-EE        | E1 OCD Debugger & Programmer                                                       |
|                         | RTE0T0002LKCE00000R      | E2 Lite ON chip debugger (supporting RL and RX only)                               |
|                         | Y-PG-FP5-EE              | PG-FP5 Flash Programmer                                                            |

# RL78 PART NUMBER GUIDE



# GETTING STARTED WITH RL78 IS EASY!

Renesas Electronics has made embedded design with the RL78 microcontroller family as easy as possible. An extensive ecosystem for RL78 including training, free evaluation boards (Renesas Promotion Boards), low cost starter kits and multiple application notes aid the embedded system designer to develop the World's lowest power designs.

## www.renesas.eu/rl78

- Keep up to date with RL78 Family
- RL78 MCU search facility
- Full data & application notes
- Hardware and software guides and free downloads
- Sales and support information



## RL78 Promotion Board

- Learn about RL78 key features
- A complete GUI based control
- Software examples
- Development environment
- [www.renesas.eu/products/mpumcu/rl78/index.jsp](http://www.renesas.eu/products/mpumcu/rl78/index.jsp)



## The Renesas Eco System

Online technical community  
[www.renesasrulz.com](http://www.renesasrulz.com)

**RenesasRulz.com**  
*Think it. Build it. Post it.*

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

Renesas Electronics Europe

[www.renesas.com](http://www.renesas.com)

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