

# RL78/I1D

The Smart choice for detector & sensor

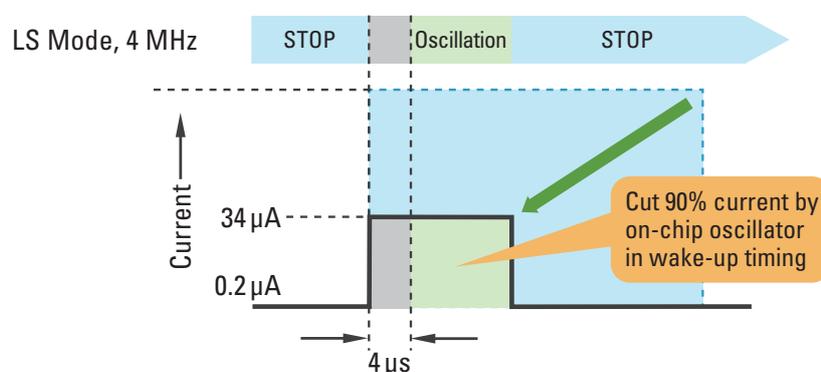


## RL78/I1D – The Smart choice for detector & sensor

Detectors and sensors are surely one of the fast growing market as part of the change happening with the development of the Internet of Things. More and more detectors & sensors are used, especially in building automation systems, like access control system & security system or fire protection system. The latest microcontroller of the RL78 platform RL78/I1D is specifically designed for such type of applications.

### RL78/I1D Benefits and Key Features

- Single chip solution ideal for all types of detectors & sensors applications
- High integration of analog features needed for analog processing: 12-bit ADC, up to 4 units of Operational Amplifiers, 2 window comparators, internal reference voltage and temperature sensor
  - All components available on-chip for sensor processing
- Less external components thanks to internal peripherals: LVD, POR, Data Flash
  - Reduce BOM list with more integration for cost effective solution
- Lowest power consumption value with highly optimised peripherals and modes
  - Achieve extended battery life
- Wake up from lowest power mode in 4  $\mu$ s
  - Fast wake up helps to reduce the power consumption even more, and also to react more quickly to event for accurate and real time control
- 4 channels of new 8-bit interval timer, and still 12-bit interval timer for longer interval timer
  - Best timer for stop mode because of power consumption < 100 nA, and ideal to achieve even longer wake up time in order to increase even more the lifetime of the battery
- Enhanced functionality with intelligent peripherals connection
  - Data Transfer Controller (DTC), Data Operation Circuit (DOC), Event Link Controller (ELC) will help to reduce the workload and the program code and also helps to reduce the overall current consumption, as these are available in stop mode
- Easiest development thanks to 'Detect it!' solution kit and code generation with Applilet tool



Middle speed on-chip oscillator current image (RL78/I1D)

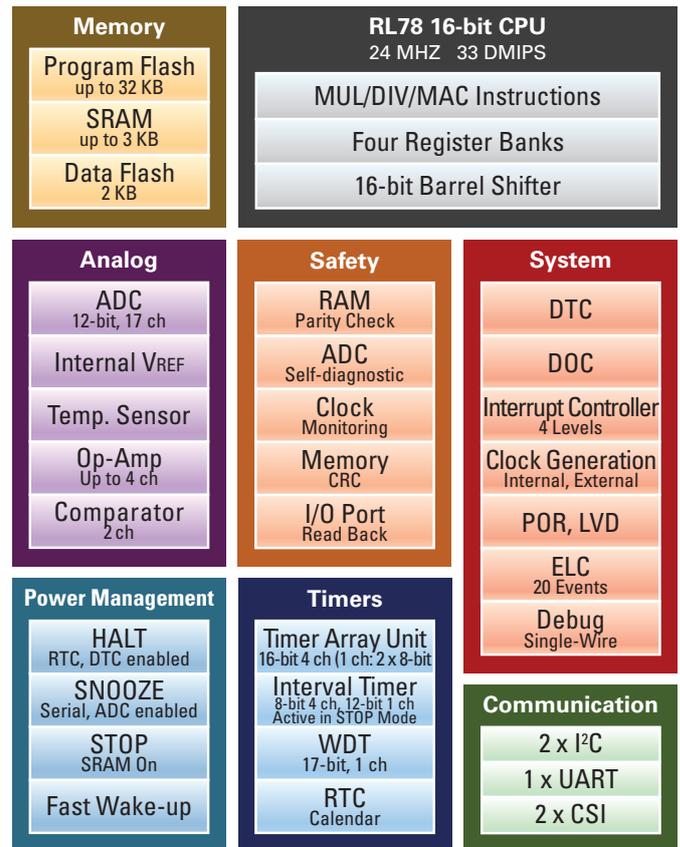
### RL78/I1D Applications

- Detectors for security & access control applications: glass break detector, open/close detector, motion or presence detector, ...
- Detectors for fire protection: smoke detector, CO detector, ...
- Industrial sensors: flow, temperature, pressure, ...
- Electrical components: circuit breakers, remote control, ...



## RL78/I1D Block Diagram

- **RL78 CPU Core**
  - 16-bit CISC CPU, 33 DMIPS @ 24 MHz
- **Flash Memory**
  - 1.8 V Reprogramming
  - ROM: up to 32 KB
  - SRAM: up to 3 KB
  - Data Flash: 2 KB
  - Error Code Correction (ECC)
- **System**
  - ± 1% Internal High-Speed Oscillator (24 MHz)
  - Low Power Internal Medium-Speed Oscillator (4 MHz): 34 µA
  - ± 15% Internal Low-Speed Low Power oscillator (15 kHz)
  - 16 x 16 Multiplier, 32/32 Divider, Multiply-Instruction
  - 1.6 to 3.6 V operation, External Clock (20 MHz max.)
- **Power Management**
  - Operating: < 150 µA @ 1 MHz
  - STOP: 0.2 µA (RAM retained)
  - MOCO frequency stabilization time: < 4 µs
- **Safety Features**
  - IEC/UL 60730 Support, Illegal Memory Access,
- **Timers**
  - Multi-function Timer Array Unit (TAU0)
  - Watchdog (window function)
  - 12-bit Interval Timer: 1 ch
  - 8-bit Interval Timers: 4 ch
  - Real Time Clock
- **Analog**
  - ADC: Up to 17 channels 12-bit
  - Op-Amp: Up to 4 ch
  - Comparators: 2 ch
  - 1.6 V (Vcc) operation,
  - Internal Voltage Reference (1.45 V)



- **Temperature range**
  - -40 to +105° C operation
- **High-end peripherals**
  - Data Transfer Controller (DTC)
  - Event Link Controller (ELC)
  - Data Operation Circuit (DOC)
  - POR, LVD
- **Communication**
  - CSI, UART, I<sup>2</sup>C
- **Packages: 20-pin to 48-pin**

## RL78/I1D Line-up

RL78/I1D line-up is optimised in terms of memory/package for detector & sensor applications:

- Small memory for good fit with applications
- Cost effective and compact packages

Flash Size	32 KB			3 K*	3 K*	3 K*	3 K*	RAM
	16 KB	2 K	2 K	2 K	2 K	2 K	2 K	
	8 KB	0.7 K	0.7 K	0.7 K	*Only 2 KB when self programming function and data flash are used			
	20-pin SSOP	24-pin QFN	30-pin SSOP	32-pin QFN	32-pin QFP	48-pin QFP		
	0.8mm thickness 7.62mm 0.65mm pitch	0.8mm thickness 4 x 4mm 0.5mm pitch	1.4mm thickness 7.62mm 0.65mm pitch	0.9mm thickness 5 x 5mm 0.5mm pitch	1.7mm thickness 7 x 7mm 0.8mm pitch	1.7mm thickness 7 x 7mm 0.5mm pitch		

## RL78/I1D Development Tools

Explore → Evaluate → Develop → Manufacture



Target Board



Solution Kit "Detect it!"



E1 Debugger & Programmer



Programmer PG-FP5



### Compiler

IAR Embedded Workbench (EWRL78), full C and C++ support, MISRA C compliance checker



### Renesas e² studio

IAR & GNU build phase plug-in support, E1/IECUBE debug phase plug-in support



### Code Generator

"Applilet" royalty-free Windows based code generator



µC/OS-II and µC/OS-III



RTX

RTOS



embOS



www.segger.com

## RL78/I1D Tool Ordering Information

Hardware Tool	Part Number
RL78/I1D Target Board	RTE5117GC0TGB00000R
RL78/I1D Solution kit "Detect It!"	YDETECT-IT-RL78
E1 Debugger & Programmer	YR0E000010KCE00-EE
PG-FP5 Flash Programmer	Y-PG-FP5-EE
IAR Systems IDE & Compiler (free up to 16 kB Flash)	Y-IAR-EWRL78-FULL

## RL78/I1D Devices Ordering Information

Pin Count	Package	Memory [KB]	RAM [KB]	Data Flash [KB]	16-bit Timers	12-bit int. Timer	8-bit int. Timers	Watchdog	RTC	CPU Frequency	ADC	Operational Amplifier	Comparator	CSI	UART	Simplified I²C	GPIO Ports	Part Number
20	20-pin plastic LSSOP (4,4 x 6,5 mm)	8	0.7						1 (No output)		6	2		1		1	14	R5F11768GSP
		16	2															R5F1176AGSP
24	24-pin plastic HWQFN (4 x 4 mm)	8	0.7											2		2	18	R5F1178GNA
		16	2															R5F1177AGNA
30	30-pin plastic LSSOP (7,62 mm (300))	8	0.7	2	4	1	4	1		24			2	1	1		24	R5F117A8GSP
		16	2															R5F117AAGSP
		32	3*															R5F117ACGSP
32	32-pin plastic HVQFN (5 x 5 mm)	16	2						1 with output		12	4		2		2	26	R5F117BAGNA
		32	3*															R5F117BCGNA
	32-pin plastic LQFP (7 x 7 mm)	16	2															R5F117BAGFP
		32	3*															R5F117BCGFP
48	48-pin plastic LFQFP (7 x 7 mm)	16	2							17							42	R5F117GAGFB
		32	3*															R5F117GCGFB

\*Only 2 KB when self-programming function and data flash are used.

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

