

# RE01 256KB

Implemented on Silicon on Thin Buried Oxide (SOTB)  
The World's Most Energy Efficient MCUs with Arm® Cortex® M Core



## 705 ULPMark™-CP score certified by EEMBC ULPMark™ benchmark

The RE01 256KB based on SOTB™ process technology realizes ultra-low current consumption in both active and standby mode and high-speed operation (64MHz) at low voltage (1.62V), which is impossible to achieve with conventional bulk silicon process. The RE01 has been certified the highest score of 705 for the ULPMark-CP by the EEMBC ULPMark™ benchmark. The RE01 256KB can significantly extend battery life and deliver high performance even in applications that use small batteries. In addition, its on-chip energy harvesting controller can extend the battery life further, or completely eliminate a battery to achieve a maintenance-free system.



### The world's most energy efficient

- Active current: 25µA/MHz / 12µA/MHz(Ex DCDC)
- Standby current: 400nA



### High-speed operation at low voltage

- High-speed operation 64MHz at low voltage 1.62V
- 32-bit CPU Arm® Cortex®-M0+



### Ultra-low power peripherals

- 14-bit ADC: 4µA, Flash programming: 0.6mA,
- RTC operation in Deep standby 380nA@1.8V
- Energy harvesting control circuit



### Strong security

- Trusted Secure IP (AES, Random number generation)
- Secure updating of flash memory, Secure boot

## Features

Part No. <sub>(1)</sub>	182CFP	082CFP	182CFM	082CFM	182DBR	082DBR	182DNG	082DNG	
Pin count	100		64		72		56		
Package	LQFP				WLPGA(CSP)		QFN		
Code flash memory / SRAM	256Kbytes/ 128Kbytes								
CPU operating frequency	Cortex®-M0+ up to 64MHz								
DMA/DTC	4ch/ Yes								
Energy harvesting control circuit	Yes								
Timers	GPT (PWM timer)		6ch						
	AGTW 32-bit timer		2ch						
	AGT 16-bit timer/ TMR 8-bit timer		2ch/ 2ch						
	RTC / CCC (1second event timer)		1ch/ 1ch						
	WDT/ IWDT		1ch/ 1ch						
	32-bit Wakeup timer		Yes						
Communication Function	SCI(UART/simple I2C/simple SPI)				7ch				
	IIC/ SPI/ QSPI		2ch/2ch/1ch		1ch/2ch/1ch		2ch/2ch/1ch		1ch/2ch/1ch
Analog	14-bit ADC		12ch		8ch		12ch		8ch
HMI	Parallel MIP-LCD IF				Yes				
Graphic	GDT (2DGraphic)				Yes				
Data processing	Data division circuit				Yes				
Security	TSIP-Lite <sub>(2)</sub>		Yes	No	Yes	No	Yes	No	

(\*1) The Part No. in the table is only the xxxxxx part of R7F0E01xxxxxx.

(\*2) TSIP: Trusted Secure IP

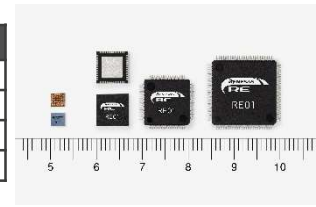
## Reduction of active current by External DCDC mode

Current consumption can be reduced to 12µA/MHz by using Renesas' ultra-low Iq ISL9123 as an external step-down regulator. External DCDC mode can be used for applications such as Always On sensing.

**Application Note:** How to reduce power consumption by using an external DC/DC converter ([R01AN5424](#))

Part No.

	100LQFP	64LQFP	72WLBGA	56QFN
w/ TSIP	R7F0E01182CFP	R7F0E01182CFM	R7F0E01182DBR	R7F0E01182DNG
w/o TSIP	R7F0E01082CFP	R7F0E01082CFM	R7F0E01082DBR	R7F0E01082DNG
Size	14mm x 14mm	10mm x 10mm	3.16mm x 2.88 mm	7mm x 7mm
Pin pitch	0.5mm	0.5mm	0.3mm	0.4mm



### Target Applications

#### Smart Home/Building

- Improved design with smaller battery
- Reduce the battery maintenance cost by longer battery life and energy harvesting

#### Structural Health Monitoring

- Reduce the battery maintenance cost by energy harvesting.

#### Wearable

- Solar power drive
- High-speed CPU : acceleration / heart rate sensor processing

#### Tracker

- Preventing missing tracking by maintenance free

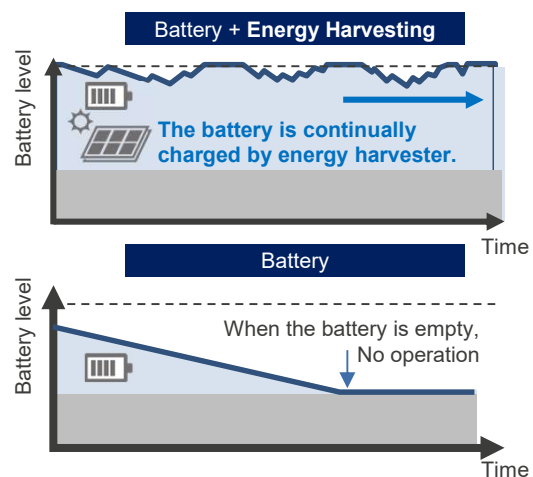
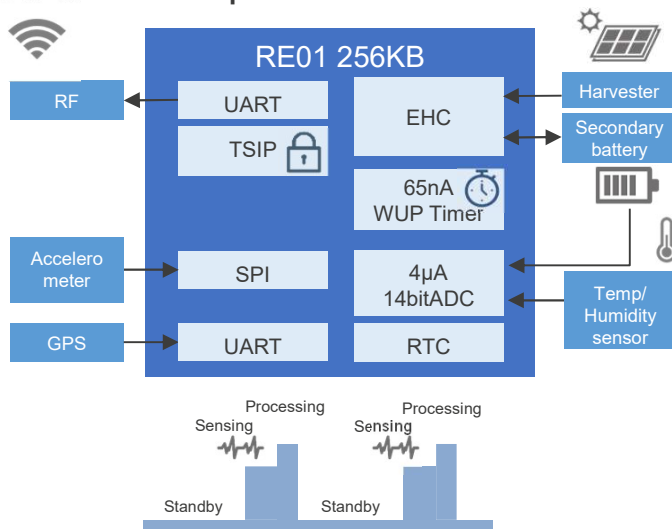
#### Smart Agriculture

- Easy installation and cost reduction of battery maintenance by energy harvesting.

#### Healthcare

- High-speed processing with coin battery
- Ultra low power ADC 4uA for analog sense
- Ultra low power OTA 600uA

### GPS Tracker example



### WW the lowest current consumption

#### Development Tools

##### IDE

IAR EWARM  
Renesas e2studio

##### Compiler

IAR C/C++ Compiler for ARM  
GNU C/C++ Compiler

##### Emulator

SEGGER J-Link  
IAR I-jet  
Renesas E2/ E2 Lite

##### Driver Software

Arm® CMSIS  
Renesas HAL Driver

##### Sample Code

Driver SW sample code  
Low level code

##### Evaluation kit

EK-RE01 256KB

### Evaluation kit: EK-RE01 256KB



#### Part No: RTK70E0118S00000BJ

EK-RE01 256KB supports MCU current measurement, energy harvesting evaluation and sensor connectivity expansion through PMOD or/and Arduino interfaces.

#### Kit included

- Main board
- Solar panel
- MIP-LCD expansion board
- USB cable(type-A male to micro-B male)

#### WEB download

- Software tool
- Sample code
- User's manual
- Schematics
- Gerber data

For more info on the RE01 Family, please go to our website at [www.renesas.com/re](http://www.renesas.com/re).