RENESAS
BIG IDEAS FOR EVERY SPACE

The World's Most Energy Efficient MCUs with Arm® Cortex® M Core based on SOTB™ process

RENESAS RE FAMILY

Significantly Extend Battery Life with High Performance Operations

The innovative RE Family is developed with the Silicon On Thin Buried Oxide (SOTB™) process technology, realizing ultra-low current consumption in both active and standby mode and enabling high-speed operation (64MHz) at low voltage (1.62V), which is impossible to achieve with conventional bulk silicon process.

The RE01 MCU can significantly extend battery life and deliver higher performance with a smaller battery size. Its on-chip energy harvesting controller can bring development to a new chapter by eliminating a battery completely in achieving a maintenance-free system.
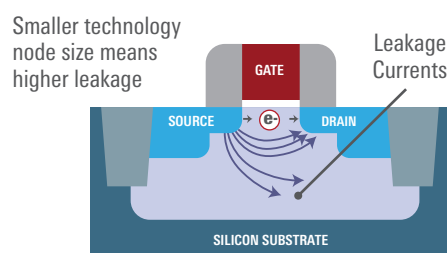
EMBC CERTIFIED

The World's Most Energy Efficient

- 705 ULPMark™-CP score certified by EEMBC ULPMark™ benchmark
- Active current: 25µA/MHz (Int. LDO)
- Active current: 12µA/MHz (Ext. DC/DC ISL9123)
- Standby current: 400nA

High-Speed Operation at Low Voltage

- High-speed operation 64MHz at low voltage 1.62V
- 32-bit CPU Arm Cortex-M Core

Ultra-Low Power Peripherals

- 14-bit ADC: 4µA, Flash programing: 0.6mA
- 2D Graphics, MIP-LCD parallel I/F
- Energy harvesting control circuit

Strong Security

- Trusted Secure IP (AES, random number generation)
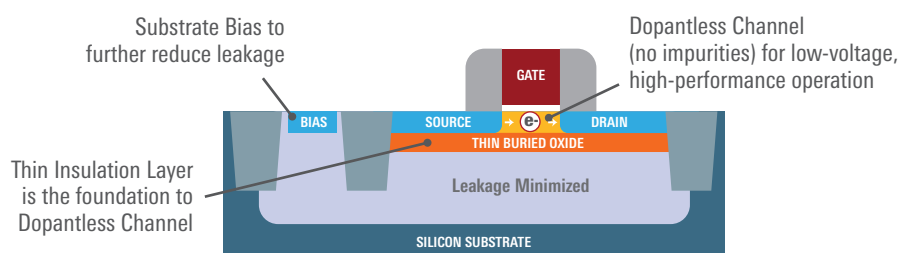- Secure updating of flash memory, secure boot
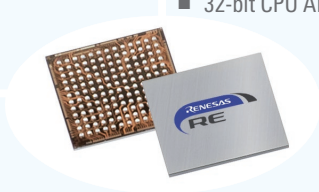
SOTB™ Process Technology

Exclusive SOTB™ process technology makes no compromises in providing ultra-low current consumption in both active and standby mode. The combination of dopantless SOI channel, buried oxide insulation layer, and the back-side gate enables SOTB™ to provide extreme low power operation with low leakage current. Also, SOTB™ supports high performance analog with low noise and more accuracy at a lesser power consumption, improving the overall energy efficiency of the system.

Conventional Bulk Transistor

Smaller technology node size means higher leakage

Leakage Currents

GATE
SOURCE ← e- → DRAIN
SILICON SUBSTRATE

SOTB Transistor and Back Bias Control

Substrate Bias to further reduce leakage

Dopantless Channel (no impurities) for low-voltage, high-performance operation

Thin Insulation Layer is the foundation to Dopantless Channel

GATE
BIAS SOURCE → e- → DRAIN
THIN BURIED OXIDE
Leakage Minimized
SILICON SUBSTRATE

RENESAS RE FAMILY

Target Markets and Benefits

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
- Low power graphics

Tracker
- Preventing missing tracking by maintenance free

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

Healthcare
- High-speed processing at low power
- Ultra low power ADC 4µA for analog sensing
- Ultra low power over-the-air (OTA) 600µA

Development Tools

IDE	Renesas e²studio	IAR EWARM
Compiler	■ GCC GNU Compiler	■ IAR Arm Compiler
Debugger	■ Renesas E2/E2 Lite ■ SEGGER J-Link	■ IAR I-Jet ■ SEGGER J-Link
Programmer	■ Renesas PG-FP6, RFP ■ SEGGER J-Flash, Flasher	
Driver	■ Arm CMSIS Driver ■ Renesas HAL Driver	
Sample code	■ Driver sample code ■ Low level code	

Evaluation Kit

Both EK-RE01 1500KB and EK-RE01 256KB support MCU current measurement, energy harvesting evaluation and sensor connectivity expansion through PMOD or/and Arduino interfaces.
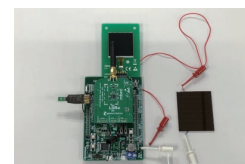
EK-RE01 1500KB ⬀
RTK70E015DS00000BE
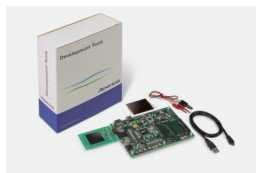
EK-RE01 256KB ⬀
RTK70E0118S00000BJ

Reference Solution

- Battery Maintenance Free GPS Receiver with Energy Harvesting (R01AN5481) ⬀
- Voice Recognition Wearable UI, Home Appliance Remote Control(Bluetooth®) (R01AN5686) ⬀
- Battery Maintenance Free LoRaWAN® Sensor with Energy Harvesting (R01AN5753) ⬀

Ordering References

Products				64 QFN	56 QFN	64 LQFP	72 WLBGA	100 LQFP	144 LQFP	156 WLBGA
Group	Flash/ RAM	TSIP (Security)	BT5.0	8 x 8mm 0.4mm pitch	7 x 7mm 0.4mm pitch	10 x 10mm 0.5mm pitch	3.16x2.88mm 0.3mm pitch	14 x 14mm 0.5mm pitch	20 x 20mm 0.5m pitch	4.27 × 4.47mm 0.3mm pitch
RE01 1500KB	1.5MB/ 256KB	Yes	No	-	-	-	-	R7F0E015D2CFP	R7F0E015D2CFB	R7F0E017D2DBN
		No	No	-	-	-	-	R7F0E014D2CFP	R7F0E014D2CFB	R7F0E016D2DBN
RE01 256KB	256KB/ 128KB	Yes	No	-	R7F0E01182DNG	R7F0E01182CFM	R7F0E01182DBR	R7F0E01182CFP	-	-
		No	No	-	R7F0E01082DNG	R7F0E01082CFM	R7F0E01082DBR	R7F0E01082CFP	-	-
RE01B	1.5MB/ 256KB	Yes	Yes	R7F0E01BD2DNB	-	-	-	-	-	-

64 QFN

72 WLBGA   56 QFN   64 LQFP   100 LQFP
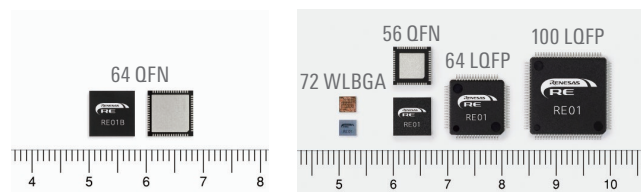
For more details, please visit **www.renesas.com/RE** ⬀