RENESAS
BIG IDEAS FOR EVERY SPACE

SOTB™: ADVANCED LOW POWER PROCESS TECHNOLOGY

Disruptive extreme low-power technology exclusively from Renesas

Energy Harvesting in Embedded Systems is now a Reality

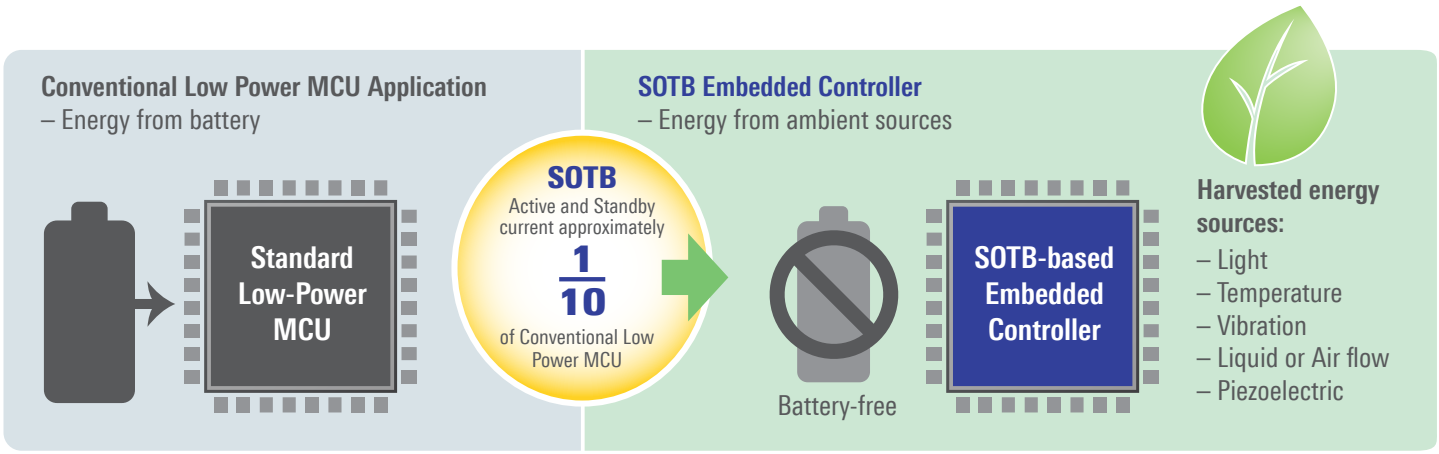
Exclusive SOTB technology from Renesas breaks the previous trade-off between getting either low active current or low standby current consumption – previously you could only choose one. With SOTB, you get both without compromise. Additionally, SOTB supports high operating frequency for high performance and small silicon node geometry for high-density memory. This is a recipe for very capable, extreme low-power applications that run from harvested ambient energy – no batteries required.

No Compromises

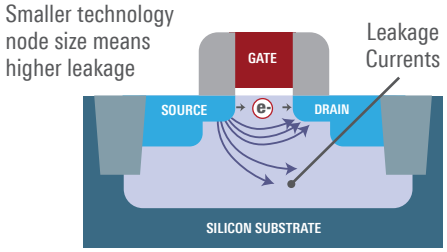
		Max. Frequency		Active Current		Standby Current	
		Higher	Lower	High	Low	High	Low
Conventional Technology	Larger Geometry		■	■			■
	Smaller Geometry	■			■	■	
SOTB Technology		■			■		■

Key Features

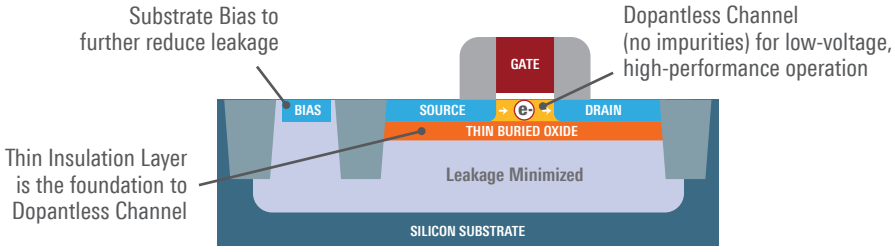
- Enables battery-free applications for industry, home, infrastructure, health devices, and more
- Uses one-tenth the active and standby current of conventional low-power MCUs
- Manages harvested energy sources



Conventional Bulk Transistor



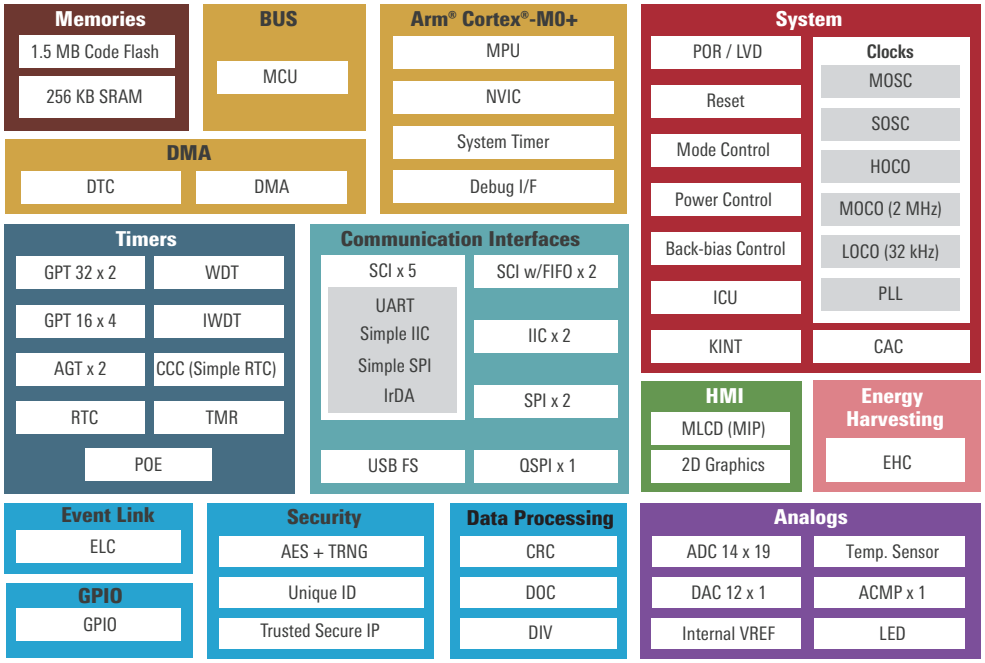
SOTB Transistor and Back Bias Control



R7F0E EMBEDDED CONTROLLER

Extreme Low Power with Energy Harvesting Management

R7F0E Block Diagram



The R7F0E is the first device based on Renesas' SOTB™ technology. You can now design applications that need no battery or recharging.

Applications

- Battery-free connected IoT sensing devices with endpoint intelligence in industrial, business, residential, agricultural, healthcare, and public infrastructure, as well as health and fitness apparel, shoes, wearables, smart watches, drones and more.

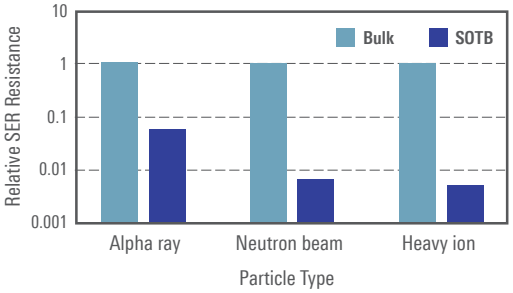
R7F0E Key Features

- Energy Harvesting Controller (EHC):
  - Interface for direct robust connection to energy generating devices
  - Charge management of local energy storage devices
  - Start-up current management – only 5 µA required from harvested energy source
- CPU: Arm® Cortex®-M0+
- Operating voltage: 1.62 V to 3.6 V
- Operating frequency: Up to 32 MHz, up to 64 MHz in boost mode
- Memory: 1.5 MB flash, 256 KB SRAM
  - Up to 256 KB SRAM data retention consuming only 1 nA per each KB
- Current consumption at 3.0 V:
  - Active: 20 µA/MHz
  - Deep Standby: 150 nA with real-time clock source and reset manager active
  - Software Standby: 400 nA while retaining core logic and 32 KB SRAM data. Real-time clock source and reset manager active
- Analog-to-Digital Converter (ADC): 14-bit, 33 ksps operation frequency, 3 µA consumption
- Graphics: 2D graphics data conversion and Memory-In-Pixel display interface
- Security and Encryption: True random number generator, unique ID for each R7F0E device, AES encryption acceleration
- Packages: 100LQFP/144LQFP/156WLBGA

Other Renesas SOTB Benefits

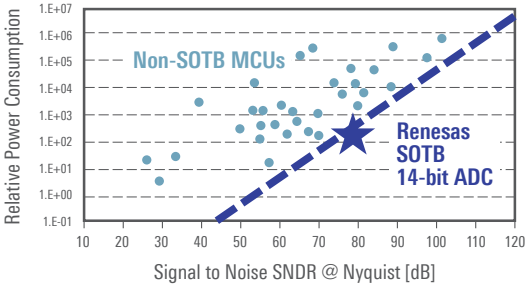
Soft Error Rate (SER) approaches zero

Immunity to code/data corruption by radiation



High performance analog and low noise

More accuracy while consuming less power



Learn more about our SOTB technology: **www.renesas.com/SOTB**