

Redpine Signals' RS13100 WiSeMCU<sup>™</sup> family of SoCs and modules provides ultra-low power dual-mode Bluetooth<sup>®</sup> 5, 802.15.4 and up to 180 MHz ARM<sup>®</sup> Cortex<sup>®</sup>-M4F application processor with advanced security and a rich set of digital/analog peripherals. The RS13100 provides the necessary wireless connectivity options and processing power for audio, data transfer, locationing and control/monitoring applications for wearable, home automation, industrial automation, lighting and home appliance markets.

## Solution Highlights

- Highly integrated and secure solution with dual-mode Bluetooth 5 and 802.15.4 (capable of running ZigBee or Thread)
- Efficient on-chip application processor based on ARM Cortex-M4F with up to 180 MHz performance, up to 4 MB dedicated flash and up to 400 kB of RAM
- Support for BLE 5 long range (125 kbps), high data rate (2 Mbps) and advertising extensions
- Ultra-low power consumption with multiple power modes to reduce the system energy consumption
- Multiple levels of security including PUF (Physically Unclonable Function), Crypto HW accelerators, Secure Bootloader and Secure Zone, to create a highly secure system
- Ultra-small size SoC (3.51 mm x 3.6 mm) and module (4.63 mm x 7.90 mm) options (additional package options are also available)
- Integrated wireless stacks and profiles for easy evaluation and integration
- Leading edge RF performance (up to 20 dBm output power for BLE and 802.15.4) providing long range up and higher throughputs
- Unique peripherals like ULP sub-system, Voice Activity Detection (VAD) and up to 8 capacitive touch sensor inputs



Ultra-Low Power



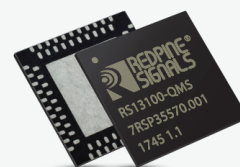
High Performance



Multi-Level Security



Small Form Factor

LGA Module (B00)  
4.63 mm X 7.90 mmQFN (QMS)  
7 mm x 7 mmWLCSP (WMS)  
3.51 mm X 3.60 mm

## Features

### Microcontroller

- ARM Cortex-M4 core with up to 180 MHz
- Integrated FPU, MPU and NVIC
- SWD and JTAG debug options
- Internal and external oscillators with PLLs
- Flash In-Application Programming (IAP), In-System Programming (ISP) and Over-the-Air Wireless Firmware Upgrade
- Power-On Reset (POR), Brown-Out and Black-out Detect (BOD) with separate thresholds

### Memory

- Up to 4 MB integrated Quad-SPI flash with inline AES engine and XIP
- Up to 400 KB SRAM<sup>2</sup>
- 4-way set-associative 16 KB I-Cache

### Security

- HW device identity and key storage with PUF
- Trusted Execution Environment with Secure Boot loader
- Accelerators: AES128/256, SHA256/384/512, RSA, ECC, ECDH, RNG, CRC

### Bluetooth

- Compliant to dual-mode Bluetooth 5
- Transmit power up to +20 dBm<sup>1</sup> for Bluetooth LE with integrated PA
- Transmit power up to +15 dBm<sup>1</sup> for Bluetooth EDR with integrated PA
- Receiver sensitivity as low as -104 dBm<sup>1</sup>
- Data rates: 125 kbps, 500 kbps, 1 Mbps, 2 Mbps, 3 Mbps
- EDR+2.1, 4.0, 4.1, 4.2 and 5.0
- BT LE 1 Mbps, 2 Mbps and Long Range modes

- Piconet and scatternet
- BT profile support<sup>2</sup> for SPP, A2DP, AVRCP, HFP, PBAP, IAP, GAP, SDP, L2CAP, RFCOMM, GATT, IAP1, IAP2
- BLE profile support<sup>2</sup>: GATT, PXP, HTP, HRP, BPM, VSPP, IPSP/IPSS, BLP, CGMP/CGMS, HOGP HID

### 802.15.4<sup>2</sup>

- Compliant to IEEE 802.15.4, 2.4 GHz
- Transmit power up to +20 dBm<sup>1</sup> with integrated PA
- Receiver sensitivity of -102 dBm<sup>1</sup>
- ZigBee PRO and Thread stack embedded
- Supported ZigBee modes<sup>2</sup>: ZigBee Coordinator, Router, End device
- Supported ZigBee profiles<sup>2</sup>: Zigbee Light Link (ZLL), Home Automation (HA) and Smart Energy (SEP)
- Supported Thread modes<sup>2</sup>: Border Router, Router, End Device

### RF Features

- Integrated baseband processor with calibration memory, RF transceiver, high-power amplifier, balun, T/R switch and flash memory

### MCU Sub-system Power Consumption

- Active current as low as 19uA/MHz<sup>1</sup> in low power mode
- Deep sleep mode current: ~500nA<sup>1</sup>
- Dynamic Voltage & Frequency Scaling
- Deep sleep mode with only timer active - with and without RAM retention

## Wireless Sub-system Power Consumption

- 7.7mA<sup>1</sup> transmit current in BT 5 mode, 0 dBm output power, 1 Mbps data rate
- 15uA<sup>1</sup> in BT 5 Connected mode (1s connection interval, 0 dBm, 0 byte)
- 10.2mA<sup>1</sup> receive current in BT 5 mode, 1 Mbps data rate

## Digital Peripherals

- USB HS OTG with integrated HS transceiver
- 10/100 Mbps Ethernet MAC with RMII
- SDIO 3.0 host and slave, SD/eMMC
- 3x USART, 4x SPI, 3x I2C, 2x I2S, SIO, CAN 2.0B
- Timers: 5x 32-bit, 1x 16/32-bit, 1x 24-bit, WWDT, RTC, RIT, QEI
- Up to 85 GPIOs with GPIO multiplexer

## Analog Peripherals

- 12-bit 16-ch, 5 Msps ADC, 10-bit DAC
- 3x op-amps, 2x Comparators and Temperature Sensor
- 8 capacitive touch sensor inputs
- Voice Activity Detection (VAD)

## Software and Regulatory Certifications

- ZigBee Certification<sup>2</sup>, Bluetooth Qualification<sup>2</sup>
- Regulatory certifications (FCC, IC, CE, ETSI, TELEC)<sup>2</sup>

## Operating Conditions

- Single supply: 2.1 to 3.6V or 1.85V
- Operating temperature: -40°C to +85°C (Industrial grade)

## Packages

- LGA module
- SoC packages - WLCSP, QFN and BGA

## Evaluation Kit:

- RS13100-EVK1

## Package Options

### SoC Packages

Package Code	Package Type, Pins	Dimension, Pitch (mm)	Frequency Band
WMS	WLCSP, 79	3.51 x 3.6 x 0.5, 0.4	Single Band (2.4 GHz)
QMS	QFN, 84	7 x 7 x 0.85, 0.5	Single Band (2.4 GHz)
BTS	BGA, 196	6 x 6.3 x 0.9, 0.5	Single Band (2.4 GHz)

### Module Package

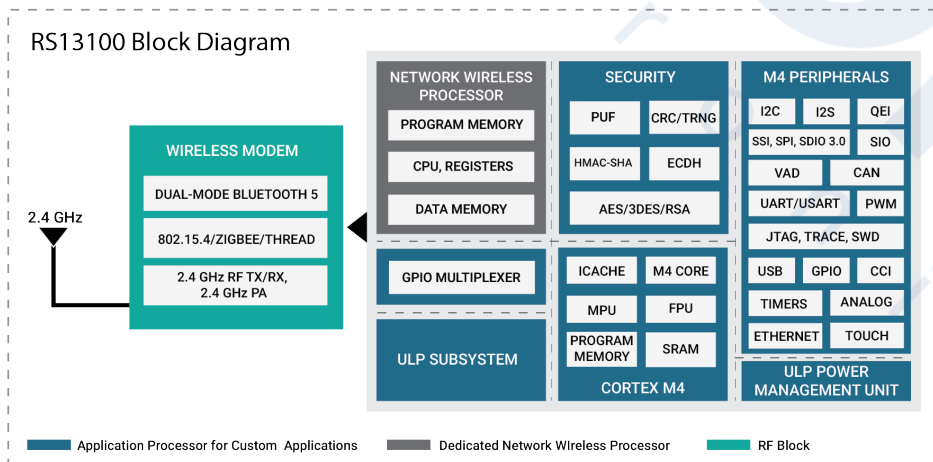
Package Code	Package Type, Pins	Dimension (mm)	Frequency Band	Integrated Antenna
B00	LGA, 126	4.63 x 7.9 x 1.2	Single Band (2.4 GHz)	No

## Part Ordering Options

Part Number	Wireless	CPU Frequency	Flash+RAM	SoC Packages (ppg)	Module Packages (ppg)
RS13100-0BT0-140F-ppg	BT5 + 802.15.4	100 MHz	4 MB + 192 kB	BTS	B00
RS13100-0BT0-240F-ppg	BT5 + 802.15.4	180 MHz	4 MB + 192 kB	BTS	B00
RS13100-0BT0-110F-ppg	BT5 + 802.15.4	100 MHz	1 MB + 192 kB	QMS	-
RS13100-0BT0-210F-ppg	BT5 + 802.15.4	180 MHz	1 MB + 192 kB	QMS	-
RS13100-0BT0-1N0F-ppg	BT5 + 802.15.4	100 MHz	0 MB + 192 kB	QMS, WMS	-
RS13100-0BT0-2N0F-ppg	BT5 + 802.15.4	180 MHz	0 MB + 192 kB	QMS, WMS	-

Notes: Replace 'ppg' with desired SoC / Module Packages code

## Block diagram



<sup>1</sup>: Subject to change. Contact Redpine Signals for final numbers.

<sup>2</sup>: Contact Redpine for availability.