

## Overview

Redpine Signals' RS14100 WiSeMCU™ family of SoCs and modules are the industry's first Wireless Secure MCU family with a comprehensive multi-protocol wireless sub-system. It has an integrated ultra-low-power microcontroller, a built-in wireless subsystem, advanced security, high performance mixed-signal peripherals and integrated power-management.

## Solution Highlights

- Efficient on-chip application processor based on ARM® Cortex®-M4F with up to 180 MHz performance, up to 4 MB dedicated flash
- Co-existence of multiple wireless protocols including 802.11a/b/g/n (2.4 GHz and 5 GHz), dual-mode Bluetooth 5
- 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
- Fully integrated and wireless certified modules with multiple sizes as small as 4.63 mm x 7.90 mm
- Integrated networking and wireless stacks for ease of integration
- Leading edge RF performance providing long range and higher throughputs
- Unique peripherals like ULP sub-system, voice activity detection (VAD) and up to 8 capacitive touch sensor inputs

## 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 208 KB SRAM
- 4-way set-associative 16KB 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

### Wi-Fi

- Compliant to single-spatial stream IEEE 802.11 a/b/g/n with dual band (2.4 and 5GHz) support
- Support for 20 MHz and 40 MHz channel bandwidths
- Transmit power up to +20 dBm<sup>1</sup> with integrated PA
- Receive sensitivity as low as -97 dBm<sup>1</sup>
- Application data throughput up to 40 Mbps<sup>1</sup> in TCP mode

### Bluetooth

- Compliant to dual-mode Bluetooth 5
- Transmit power up to +20 dBm<sup>1</sup> with integrated PA
- Receive sensitivity as low as -104 dBm<sup>1</sup>
- Data rates: 125 kbps, 500 kbps, 1 Mbps, 2 Mbps, 3 Mbps

### RF Features

- Integrated baseband processor with calibration memory, RF transceiver, high-power amplifier, balun, T/R switch and flash memory
- Dual external antenna (diversity supported)

### Embedded Wi-Fi Stack

- Support for Embedded Wi-Fi Client mode, Wi-Fi Access point mode, Wi-Fi Direct and Enterprise Security
- Supports advanced Wi-Fi security features: WPA/WPA2-Personal and Enterprise (EAP-TLS, EAP-FAST, EAP-TTLS, EAP-PEAP, EAP-LEAP, PEAP-MSCHAP-V2)
- Integrated TCP/IP stack (IPv4/IPv6), HTTP/HTTPS, DHCP, ICMP, SSL/TLS, Web sockets, IGMP, DNS, DNS-SD, SNMP, FTP Client
- Wi-Fi firmware upgrade and provisioning
- Support for concurrent Wi-Fi, dual-mode Bluetooth 5

### Embedded Bluetooth Stack

- 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>1</sup> for SPP, A2DP, AVRCP, HFP, PBAP, IAP, GAP, SDP, L2CAP, RFCOMM, GATT, IAP1, IAP2

### MCU Sub-system Power Consumption

- Active current as low as 19 uA/MHz<sup>1</sup> in low power mode
- Deep sleep mode current: ~450 nA<sup>1</sup>
- Dynamic Voltage & Frequency Scaling
- Deep sleep mode with only timer active – with and without RAM retention

### Wireless Sub-system Power Consumption

- Wi-Fi standby associated current of <90 uA<sup>1</sup> for DTIM 3 (2.4 GHz)
- Wi-Fi TX current = 260 mA<sup>1</sup> (6 Mbps, 20 dBm, 2.4 GHz), RX current = 30 mA<sup>1</sup> (6 Mbps, 2.4 GHz)
- <7 mA<sup>1</sup> transmit current in BT 5 mode, 0 dBm output power, 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

- Wi-Fi Alliance<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

- Modules with and without integrated antenna
- SoC packages - WLCSP and QFN

## Evaluation Kit:

- Single band P/N: RS14100-SB-EVK1
- Dual band P/N: RS14100-DB-EVK1

# Package Options

## Module Packages

| Package Code | Package Type, Pins | Dimension (mm)     | Frequency Band          | Integrated Antenna         |
|--------------|--------------------|--------------------|-------------------------|----------------------------|
| CA0          | LGA, 173           | 9.1 x 9.8 x 1.2    | Single Band (2.4 GHz)   | No                         |
| CC0          | LGA, 173           | 9.1 x 9.8 x 1.2    | Dual Band (2.4 / 5 GHz) | No                         |
| CA1          | LGA, 107           | 15.0 x 15.70 x 2.2 | Single Band (2.4 GHz)   | Antenna and u.FL Connector |
| CC1          | LGA, 107           | 15.0 x 15.70 x 2.2 | Dual Band (2.4 / 5 GHz) |                            |
| B00          | LGA, 126           | 4.63 x 7.90 x 0.9  | Single Band (2.4 GHz)   | No                         |

## SoC Packages

| Package Code | Package Type, Pins | Dimension, Pitch (mm) | Frequency Band        |
|--------------|--------------------|-----------------------|-----------------------|
| WMS          | WLCSP, 96          | 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) |

## Part Ordering Options

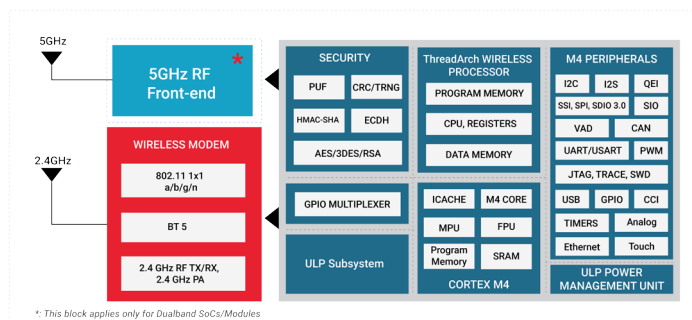
| Part Number           | Wireless   | CPU Freq | Flash+RAM     | SoC Packages (ppg) | Module Packages (ppg) |
|-----------------------|------------|----------|---------------|--------------------|-----------------------|
| RS14100-SB00-140F-ppg | SBW + BT 5 | 100 MHz  | 4 MB + 208 KB | -                  | CA0, CA1              |
| RS14100-SB00-240F-ppg | SBW + BT 5 | 180 MHz  | 4 MB + 208 KB | -                  | CA0, CA1              |
| RS14100-SB00-110F-ppg | SBW + BT 5 | 100 MHz  | 1MB + 208 KB  | QMS                | B00                   |
| RS14100-SB00-210F-ppg | SBW + BT 5 | 180 MHz  | 1MB + 208 KB  | QMS                | B00                   |
| RS14100-SB00-1N0F-ppg | SBW + BT 5 | 100 MHz  | 0MB + 208 KB  | QMS, WMS           | B00                   |
| RS14100-SB00-2N0F-ppg | SBW + BT 5 | 180 MHz  | 0MB + 208 KB  | QMS, WMS           | B00                   |
| RS14100-DB00-140F-ppg | DBW + BT 5 | 100 MHz  | 4 MB + 208 KB | -                  | CC0, CC1              |
| RS14100-DB00-240F-ppg | DBW + BT 5 | 180 MHz  | 4 MB + 208 KB | -                  | CC0, CC1              |

**Note:** Replace 'ppg' with desired SoC / Module Packages code

**SBW:** Single Band Wi-Fi (2.4 GHz);

**DBW:** Dual Band Wi-Fi (2.4/5 GHz)

# Block diagram



**Note:** The BTSIG certified production parts for this product family will be available in early 2019.

<sup>1</sup>: Subject to change. Contact Redpine Signals for final numbers. <sup>2</sup>:Contact Redpine for availability.

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