

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 and 802.15.4 (capable of running Thread or ZigBee®)
- 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 400 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 dBm¹ with integrated PA
- Receive sensitivity as low as -97 dBm¹
- Application data throughput up to 40 Mbps¹ in TCP mode

Bluetooth

- Compliant to dual-mode Bluetooth 5
- Transmit power up to +20 dBm¹ with integrated PA
- Receive sensitivity as low as -104 dBm¹
- Data rates: 125 kbps, 500 kbps, 1 Mbps, 2 Mbps, 3 Mbps

802.15.4²

- Compliant to IEEE 802.15.4, 2.4 GHz
- Transmit power up to +20 dBm¹ with integrated PA
- Receive sensitivity of -102 dBm¹

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)

Wake-Fi™²

- Ultra-low power wake-up receiver with secure wakeup pattern to prevent battery drain attack

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 and 802.15.4²

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 support¹ for SPP, A2DP, AVRCP, HFP, PBAP, IAP, GAP, SDP, L2CAP, RFCOMM, GATT, IAP1, IAP2

Embedded Zigbee Stack

- ZigBee PRO and Thread stack embedded
- Supported modes: ZigBee Coordinator, Router¹, End device
- Supported profiles: Zigbee Light Link (ZLL), Home Automation (HA) and Smart Energy (SEP)

MCU Sub-system Power Consumption

- Active current as low as 19 uA/MHz¹ in low power mode
- Deep sleep mode current: ~450 nA¹
- 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 uA¹ for DTIM 3 (2.4 GHz)
- Wi-Fi TX current = 260 mA¹ (6 Mbps, 20 dBm, 2.4 GHz), RX current = 30 mA¹ (6 Mbps, 2.4 GHz)
- <7 mA¹ 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
- ZigBee Certification², Bluetooth Qualification²
- Regulatory certifications (FCC, IC, CE, ETSI, TELEC)²

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, QFN and BGA

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 1.2 | Single Band (2.4 GHz) | No |

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) |

Part Ordering Options

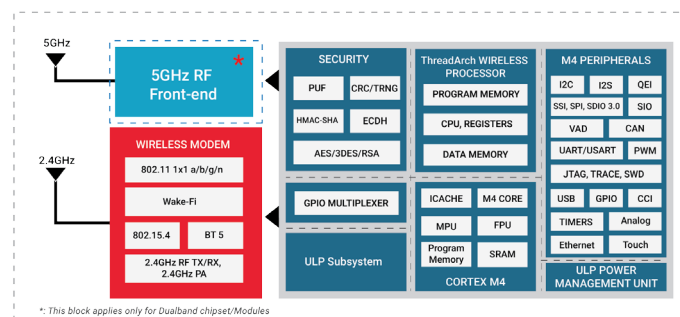
| Part Number | Wireless | Other Wireless | CPU Freq | Flash+RAM | SoC Packages (ppg) | Module Packages (ppg) |
|------------------------------------|----------------|----------------|----------|-------------|--------------------|-----------------------|
| RS14100-0B00-1m0F-ppg | BT5 | - | 100 MHz | 4 MB+208 KB | QMS, WMS, BTS | B00 |
| RS14100-SB00-1m0F-ppg | SB+BT5 | - | 100 MHz | 4 MB+208 KB | QMS, WMS, BTS | B00, CA0, CA1 |
| RS14100-SBT0-1m0F-ppg | SB+BT5+ZB/THR | - | 100 MHz | 4 MB+208 KB | QMS, WMS, BTS | B00, CA0, CA1 |
| RS14100-SB00-2m0F-ppg | SBW+BT5 | - | 180 MHz | 4 MB+208 KB | QMS, WMS, BTS | B00, CA0, CA1 |
| RS14100-SBT0-2m0F-ppg | SBW+BT5+ZB/THR | - | 180 MHz | 4 MB+208 KB | QMS, WMS, BTS | B00, CA0, CA1 |
| RS14100-SBT1-2m0F-ppg ² | SBW+BT5+ZB/THR | Wake-Fi | 180 MHz | 4 MB+208 KB | QMS, WMS, BTS | B00, CA0, CA1 |
| RS14100-DB00-140F-ppg | DBW+BT5 | - | 100 MHz | 4 MB+208 KB | - | CC0, CC1 |
| RS14100-DBT0-140F-ppg | DB+BT5+ZB/THR | - | 100 MHz | 4 MB+208 KB | - | CC0, CC1 |
| RS14100-DB00-240F-ppg ² | DBW+BT5 | - | 180 MHz | 4 MB+208 KB | - | CC0, CC1 |
| RS14100-DBT0-240F-ppg ² | DBW+BT5+ZB/THR | - | 180 MHz | 4 MB+208 KB | - | CC0, CC1 |
| RS14100-DBT1-240F-ppg ² | DBW+BT5+ZB/THR | Wake-Fi | 180 MHz | 4 MB+208 KB | - | CC0, CC1 |

Notes: Replace 'ppg' with desired SoC / Module Packages code; Replace 'm' with the flash (4 or 0 for 4 MB and 0 respectively) supported in a package (QMS and WMS packages support no internal flash, BTS/B00/CA0/CA1 support 4 MB internal flash)

SBW: Single Band Wi-Fi (2.4 GHz); **DBW:** Dual Band Wi-Fi (2.4/5 GHz); **ZB:** ZigBee; **THR:** Thread

¹: Subject to change. Contact Redpine Signals for final numbers. ²: Contact Redpine for availability.

Block diagram



Redpine Signals, Inc.

2107 North First Street, Suite #540, San Jose, California 95131, United States of America.

Phone: +1-408-748-3385 | Fax: +1-408-705-2019

Email: sales@redpinesignals.com | Website: www.redpinesignals.com

