Redpine Signals' RS9116 family of SoCs and modules provides a comprehensive multi-protocol wireless connectivity solution including 802.11 a/b/g/n (2.4 GHz and 5 GHz), 802.11j, dual-mode Bluetooth 5, 802.15.4 (capable of running Thread or ZigBee®) and 802.11ah.

Solution Highlights

- Co-existence of multiple wireless protocols managed by an internal protocol arbitration manager
- Ultra-low power consumption with multiple power modes to reduce the system energy consumption
- Multiple levels of security including FIPS 140-2 and PUF (Physically Unclonable Function) to create a highly secure system
- Fully integrated and wireless certified modules with multiple sizes as small as 4.63 mm x 7.80 mm
- Multiple software architectures (hosted and embedded) and host interfaces (SDIO, USB, SPI, UART) for easy integration with different processor families and operating systems
- Footprint compatible single band and dual band modules as well as hosted and embedded modules for easy migration within the product family
- Leading edge RF performance providing long range and higher throughputs

Features

Wi-Fi®

- Compliant to single-spatial stream IEEE 802.11 a/b/g/n, 802.11j (hosted mode) with dual band (2.4 and 5 GHz) support
- Support for 20 MHz and 40 MHz channel bandwidths
- Transmit power up to +20 dBm[1] with integrated PA
- Receive sensitivity as low as -97 dBm[1]
- Application data throughput up to 100 Mbps[1] (Hosted Mode) in 802.11n with 40 MHz bandwidth and up to 50 Mbps with 20 MHz bandwidth

Bluetooth

- Compliant to dual-mode Bluetooth 5
- Transmit power up to +20 dBm[1] with integrated PA
- Receive sensitivity as low as -106 dBm[1]
- <5 mA[1] transmit current in BT 5 mode, 0 dBm output power, 2 Mbps data rate
- Data rates: 125/500 kbps, 1, 2, 3 Mbps

802.15.4

- Compliant to IEEE 802.15.4, 2.4 GHz
- Transmit power up to +20 dBm[1] with integrated PA
- Receive sensitivity of -102 dBm[1]

802.11ah[2]

- Integrated 1x1 802.11ah Baseband and MAC with 1, 2, 4 MHz BW support

Wake-Fi™ [2]

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

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)

Operating Modes

- Hosted mode (n-Link™): Wi-Fi stack, Bluetooth stack and profiles, ZigBee stack and profiles, Thread stack and all network stacks reside on the host processor
- Embedded mode (WiSeConnect™): Wi-Fi stack, TCP/IP Stack, IP module, Bluetooth stack and ZigBee PRO stack reside in RS9116W; Some of Bluetooth profiles and all of Zigbee profiles reside in host processor

Hosted Mode (n-Link™)

- Available host interfaces: SDIO 2.0 and USB HS
- Host drivers for Linux, Android™, and Windows®
- Support for Client mode, Access point mode, Wi-Fi Direct, Concurrent client and access point mode, Enterprise Security
- Support for concurrent Wi-Fi, dual-mode Bluetooth 5 and 802.15.4[2]
- Support for multiple Virtual Access Points

Embedded Mode (WiSeConnect™)

- Available host interface: UART, SPI, SDIO, USB HS, and USB HS CDC
- Support for Embedded Client mode, Access Point mode, Wi-Fi Direct and Enterprise Security
- Supports advanced security features: WPA/WPA2-Personal and Enterprise (EAP-TLS, EAP-FAST, EAP-TTLS, EAP-PEAP, EAP-LEAP, PEP-MSCHAP-V2)
- Integrated TCP/IP stack (IPV4/IPV6), HTTP/HTTPS, DHCP, ICMP, SSL 3.0/TLS1.2, WebSockets, IGMP, DNS, DNS-SD, SNMP, FTP Client
- BT profile support[2] for SPP, A2DP, AVRCP, HFP, PBAP, IAP, GAP, SDP, L2CAP, RFCOMM, GATT, IAP1, IAP2
- Wireless firmware upgrade and provisioning
- Support for concurrent Wi-Fi, dual-mode Bluetooth 5 and 802.15.4[2]

Security

- HW device identity and key storage with PUF
- Accelerators: AES128/256, SHA256/384/512, RSA, ECC, ECDH, RNG, CRC

Power Consumption

- Wi-Fi standby associated current of <0.2 mA[1]
- Wi-Fi tx current = 220 mA1, rx current of 40 mA[1]
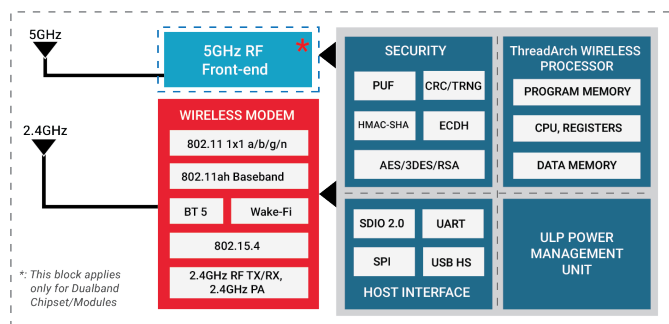- BLE tx current = TBD, rx current = 6 mA[1]

Software and Regulatory Certifications

- Wi-Fi Alliance (802.11 a/b/g/n, WPA, WPA2 Personal and Enterprise, Certification Support for WMM, WMM-PS, WPS, Wi-Fi Direct™, Voice-Personal, Protected management frames)
- ZigBee Certification[2], Bluetooth Qualification[2]
- FIPS 140-2 Certification[2]
- Regulatory certifications (FCC, IC, CE, ETSI, TELEC)[2]

Operating Conditions

- Single supply: 2.1 to 3.6 V or 1.85 V
- Operating temperature: -40ºC to +85º C (Industrial Grade)

Packages

- Module packages with and without antenna
- SoC packages: WLCSP, QFN and BGA

Evaluation Kit:

- n-Link EVK P/N: RS9116N-EVK1
- WiSeConnect EVK P/N: RS9116W-EVK1

Block diagram

Package Options

Module Packages

Package Code	Package Type	Dimensions (mm)	Frequency Band	Integrated Antenna	Note
AA0	LGA,101	14 x 15 x 2.1	Single Band (2.4 GHz)	No	RS9113 compatible
AB0	LGA, 101	14 x 15 x 2.1	Dual Band (2.4 / 5 GHz)		
AA1	LGA,79	16 x 27 x 3.1	Single Band (2.4 GHz)	Yes	RS9113 compatible
AB1	LGA,79	16 x 27 x 3.1	Dual Band (2.4 / 5 GHz)		
CA0	LGA,TBD	9.1 x 9.8 x 1.0	Single Band (2.4 GHz)	No	
CC0	LGA,110	9.1 x 9.8 x 1.0	Dual Band (2.4 / 5 GHz)		
CA1	LGA,84	TBD	Single Band (2.4 GHz)	Yes	
CC1	LGA,84	TBD	Dual Band (2.4 / 5 GHz)		
B00	LGA,113	4.63 x 7.8 x 1.0	Single Band (2.4 GHz)	No	
B01	LGA,113	5.8 x 7.8 x 2.0	Single Band (2.4 GHz)	Yes	
MA0	M.2, TBD	23 x 30	Dual Band (2.4 / 5 GHz)	No (u.FL connectors)	
HA0	Half Mini PCIe Card, 52	30 x 26.8	Dual Band (2.4 / 5 GHz)	No (u.FL connectors)	USB interface

SoC Packages

Package Code	Type of Package	Dimensions, Pitch (mm)	Frequency Band
WMS	WLCSP, 79	3.51 x 3.60 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 x 0.9, 0.5	Single Band (2.4 GHz)

Part Ordering Options

Part Number	Wireless	SoC Packages (ppg)	Module Packages (ppg)
RS9116X-SB00-ppg	SB+BT5	QMS, WMS, BTS	AA0, AA1, CA0, CA1, B00, B01
RS9116X-SBT0-ppg	SB+BT5+ZB/THR	QMS, WMS, BTS	AA0, AA1, CA0, CA1, B00, B01
RS9116X-SBT1-ppg	SB+BT5+ZB/THR+Wake-Fi	QMS, WMS, BTS	AA0, AA1, CA0, CA1, B00, B01
RS9116X-DB00-ppg	DB+BT5	None	AB0, AB1, CC0, CC1, MA0, HA0
RS9116X-DB01-ppg	DB+BT5+ Wake-Fi	None	AB0, AB1, CC0, CC1, MA0, HA0
RS9116X-DBT0-ppg	DB+BT5+ZB/THR	None	AB0, AB1, CC0, CC1, MA0, HA0
RS9116X-DBT1-ppg	DB+BT5+ZB/THR+Wake-Fi	None	AB0, AB1, CC0, CC1, MA0, HA0

Note:
Replace 'X' with 'N' for n-Link and W' for WiSeConnect; Replace 'ppg' with desired SoC / Module Packages code;
***SB**: Single Band Wi-Fi (2.4 GHz); **DB**: 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.

www.redpinesignals.com