4.3 Wi-Fi

Figure 9 shows a functional block diagram for the Wi-Fi circuits.
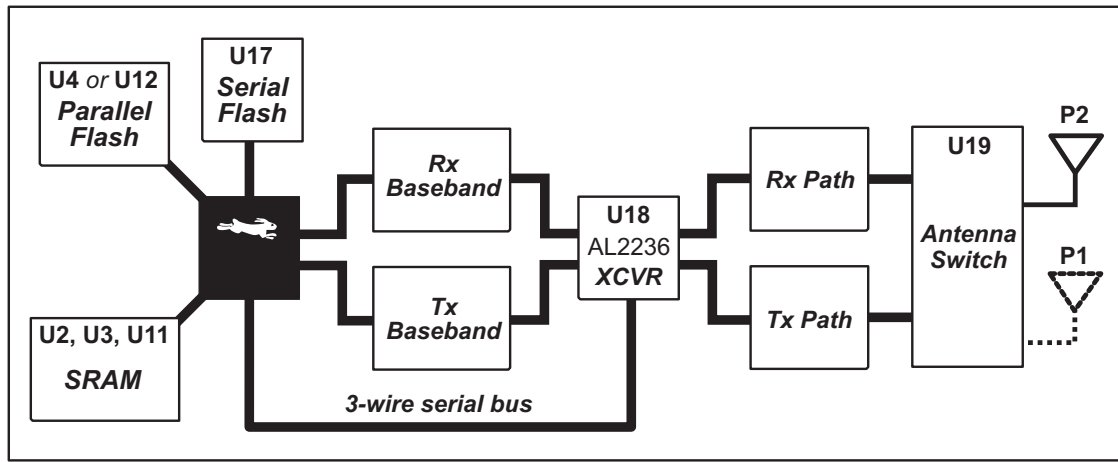

Figure 9. RCM5400W Wi-Fi Block Diagram

The Wi-Fi transmission is controlled by the Rabbit 5000 chip, which contains the Wi-Fi Media Access Control (MAC). The Rabbit 5000 implements the 802.11b/g baseband MAC functionality, and controls the 802.11b/g integrated Airoha AL2236 transceiver.

Program code is stored in parallel flash and is loaded into a fast SRAM for execution when power is applied to the RCM5400W modules. Serial flash and low-power SRAM memories are available for data storage. The data interface between the processor MAC and the AL2236 transceiver consists of a D/A converter and an A/D converter. Both converters convert "I" and "Q" data samples at a rate of 40 MHz.

The AL2236 is a single-chip transceiver with integrated power amplifier for the 2.4 GHz Industrial, Scientific, and Medical (ISM) band. It is configured and controlled by the Rabbit 5000 via a 3-wire serial data bus. The AL2236 contains the entire receiver, transmitter, VCO, PLL, and power amplifier necessary to implement an 802.11b/g radio.

The AL2236 can transmit and receive data at up to 11Mbits/s in the 802.11b mode and at up to 54 Mbits/s in the 802.11g mode. It supports 802.11b/g channels 1–13 (2.401 GHz to 2.472 GHz). Channel 14 is not used. The data modulate the channel carrier in such a way so as to produce a spread spectrum signal within the 22 MHz channel bandwidth of the selected channel. The channel numbers and associated frequencies are listed below in Table 4.

The Wi-Fi channels have a certain amount of overlap with each other. The further apart two channel numbers are, the less the likelihood of interference. If you encounter interference with a neighboring WLAN, change to a different channel. For example, use channels 1, 6, and 11 to minimize any overlap.

Table 4. Wi-Fi Channel Allocations

Channel	Center Frequency (GHz)	Frequency Spread (GHz)
1	2.412	2.401–2.423
2	2.417	2.406–2.428
3	2.422	2.411–2.433
4	2.427	2.416–2.438
5	2.432	2.421–2.443
6	2.437	2.426–2.448
7	2.442	2.431–2.453
8	2.447	2.436–2.458
9	2.452	2.441–2.463
10	2.457	2.446–2.468
11	2.462	2.451–2.473
12[*]	2.467	2.456–2.478
13[*]	2.472	2.461–2.483
14 (not used)	2.484	2.473–2.495

*   These channels are disabled for units delivered for sale in the United States and Canada.

Many countries specify the channel range and power limits for Wi-Fi devices operated within their borders, and these limits are set automatically in the RCM5400W in firmware according to the country or region. For example, only channels 1–11 are authorized for use in the United States or Canada, and so channels 12 and 13 are disabled. See Section 6.2.4.1 for additional information and sample programs demonstrating how to configure an end device to meet the regulatory channel range and power limit requirements. Table 5 provides additional information on which channels are allowed in selected countries. *Any attempt to operate a device outside the allowed channel range or power limits will void your regulatory approval to operate the device in that country.*

The following regions have macros and region numbers defined for convenience.

Table 5. Worldwide Wi-Fi Macros and Region Numbers

Region	Macro	Region Number	Channel Range
Americas	`IFPARAM_WIFI_REGION_AMERICAS`	0	1–11
Mexico	`IFPARAM_WIFI_REGION__MEXICO_ INDOORS`	1	1–11 (indoors)
	`IFPARAM_WIFI_REGION_MEXICO_ OUTDOORS`	2	9–11 (outdoors)
Canada	`IFPARAM_WIFI_REGION_CANADA`	3	1–11
Europe, Middle East, Africa, except France	`IFPARAM_WIFI_REGION_EMEA`	4	1–13
France	`IFPARAM_WIFI_REGION_FRANCE`	5	10–13
Israel	`IFPARAM_WIFI_REGION_ISRAEL`	6	3–11
China	`IFPARAM_WIFI_REGION_CHINA`	7	1–11
Japan	`IFPARAM_WIFI_REGION_JAPAN`	8	1–14[*]
Australia	`IFPARAM_WIFI_REGION_AUSTRALIA`	9	1–11

* Channel 14 is not available for the RCM4400W.

The same omnidirectional antenna is used to transmit and receive the 802.11b/g RF signal. An antenna switch isolates the high-power RF Tx signal path from the RF Rx signal path. The antenna switch works by alternately connecting the antennas to either the AL2236 Tx output or to the AL2236 Rx input. In order to support this antenna-sharing scheme, the RCM5400W module operates the radio in a half-duplex mode so that receive and transmit operations never occur at the same time The antenna switch at U19 switches the receive/ transmit functionality between the outputs at P2 and P1 (not stuffed) so that P2 is transmitting while P1 would be receiving and vice versa. Dynamic C does not support a P1 output.

The RF connector on P2 is an RP-SMA connector with its outer casing attached to the RCM5400W ground. It is recommended that the OEM integrator of this device improve ESD protection by attaching P2 to chassis ground.

There are two LEDs close to the RP-SMA antenna connector atP2, a green LED at DS2 (**LINK**) to indicate association with the Wi-Fi access point, and a yellow LED at DS1 (**ACT**) to indicate activity.