

WF-R710-RWA1

IEEE 802.11b/g/n 1T1R UART SoC Module

Features :

➤ **Reserving System**

IEEE Std. 802.11b/g/n Wi-Fi

1T1R System-on-Chip UART module

➤ **Chip Solution**

RTL8710B

➤ **I/O Interface & Size**

Standard two UART/GPIO I/O Interface

Support RF Testing and OTP/Flash Programming

37.8mm x21.6mm x4.8mm

Model Overview :

Model	Interface	RF Standard	Frequency	Voltage Input
WF-R710-RWA1	UART	IEEE 802.11b/g/n	2.4G	5V

WF-R710-RWA1 SoC module designed base on RTL8710B chip solution, The SOC module is a highly intelligent platform for the Internet of Everything that contains a low-power Wi-Fi connectivity solution on one package. It includes a number of TCP/IP based connectivity protocols along with SSL, enabling a low-cost, low-complexity system to obtain full-featured internet connectivity and reliable information exchange.

Realtek RTL8710B is a highly integrated single-chip low power 802.11n Wireless LAN (WLAN) network controller. It combines an ARM-CM4F MCU, WLAN MAC, a 1T1R capable WLAN baseband, and RF in a single chip. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

RTL8710B integrates internal memories for complete WIFI protocol functions. The embedded memory configuration also provides simple application developments.

1.1 RF module Overview

The general HW architecture for the module is shown in Figure-1, The WF-R710-RWA1 module is a alone chipset solution, system-on-chip-module, 1x1 802.11 b/g/n device optimized for low-power embedded applications with single-stream capability for both transmit and receive. It has an integrated network processor with a large set of TCP/IP with IPv4/IPv6 based services.

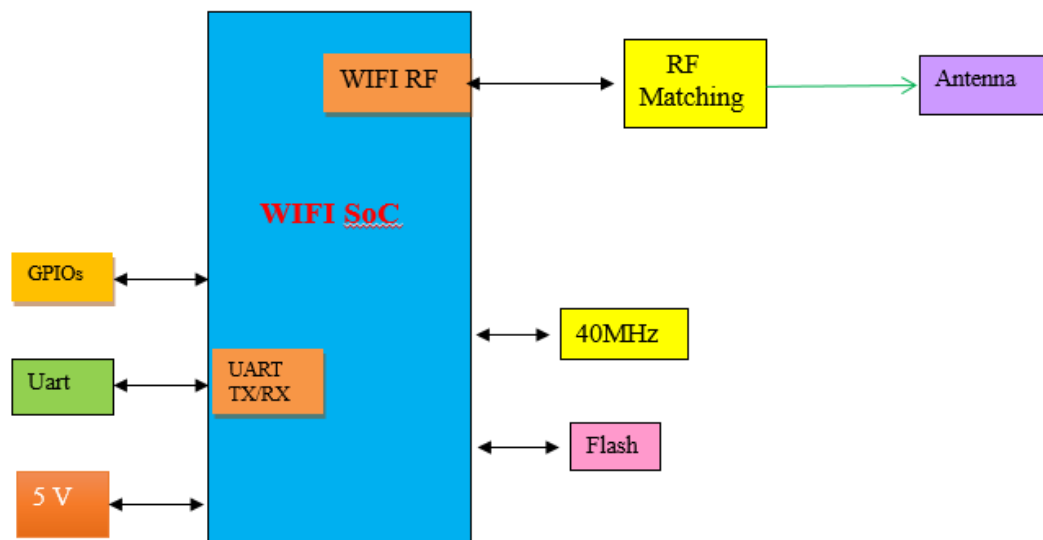


Figure 1 WF-R710-RWA1 Block Diagram

1.2. RF Specification Reference

SoC RF specification refer to below list.

Main Chipset	RTL8710B
SoC RF standard	IEEE 802.11 b/g/n
Operating Frequency	2.412~2.484 GHz
UART Interface	For testing and OTP programming (Calibration data)
Antenna Design Options	PCB天线
RF Modulation	WIFI: 11b: DBPSK, DQPSK and CCK and DSSS 11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM
Operation Voltage	5.0V +/-10% input

1.3. System Functions

SoC S/W & system general specification refer to below list:

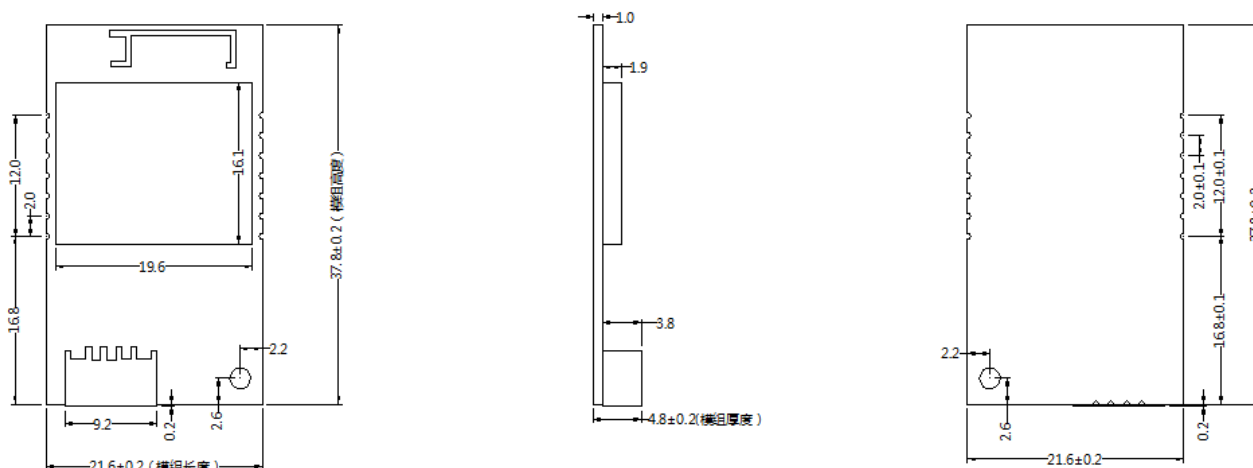
Main Chipset	RTL8710B
WLAN PHY Features	1T1R
Connective	WIFI Direct support
Package	QFN32 (5x5mm)
HW acceleration	WPA,WPA2, WPS2.0
Form factor	Maximum 12 GPIO pins
PCB Stack	2-layers design (1+/-0.15mm)
Module Dimension	Typical, 37.8mm x21.6mm x4.8mm
Operation Temperature	-20℃ to +85℃
Storage Temperature	-40℃ to +125℃

2. Mechanical Specification

2.1 PCBA Mechanical Outline Drawing

Typical Dimension (W x L x T): 37.8mm x21.6mm x4.8mm (+/-0.2 mm)

PCB Thickness: 1mm (+/-0.15mm)



2.2 Pin Distribution Definition

Pins sequence and distribution list as follows

Pins Explanation		
1	TXD1	Uart_TX
2	RXD1	Uart_RX
3	GND	GND
4	Vin	5V
5	LOG_U_OUT	debug/UART TX
6	LOG_U_IN	debug/UART RX
7	BOOT	GPIOA_12
8	KEY	GPIOA_5
9	GND	GND
10	3.3V	3.3V
11	CHIP_EN	CHIP_EN
12	SWD_CLK	GPIOA_14
13	SWD_DATA	GPIOA_15

3. Electrical Specification

This Specification is based-on conductive DVT testing result. The extreme condition include overall temperature +25℃ and overall voltage 3.3V.

3.1 IEEE 802.11b Section:

Items	Contents				
Specification	IEEE802.11b				
Mode	DBPSK, DQPSK and CCK and DSSS				
Channel	CH1 to CH11				
Data rate	1, 2, 5.5, 11Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels(Calibrated)					
1) 15Bm Target (For Each antenna port)	-	15	19	dBm	
2. Spectrum Mask @ Target Power					
1) fc +/-11MHz to +/-22MHz	-	-	-30	dBr	
2) fc > +/-22MHz	-	-	-50	dBr	
3. Constellation Error(EVM) @ Target Power					
1) 1Mbps	-	-	-10	dB	
2) 2Mbps	-	-	-10	dB	
3) 5.5Mbps	-	-	-10	dB	
4) 11Mbps	-	-	-10	dB	
4. Frequency Error	-15	-	15	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 1Mbps (FER ≤ 8%)	-	-	-88	dBm	
2) 2Mbps (FER ≤ 8%)	-	-	-86	dBm	
3) 5.5Mbps (FER ≤ 8%)	-	-	-83	dBm	
4) 11Mbps (FER ≤ 8%)	-	-	-79	dBm	
6. Maximum Input Level (FER ≤ 8%)	-10	-	-	dBm	

3.2 IEEE 802.11g Section:

Items	Contents				
Specification	IEEE802.11g				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH1 to CH11 @ 11g				
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) 14dBm Target (For Each antenna port) @ 11g	-	14	17	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-40	dBr	
3. Constellation Error(EVM) @ Target Power					
1) 6Mbps	-	-	-10	dB	
2) 9Mbps	-	-	-11	dB	
3) 12Mbps	-	-	-12	dB	
4) 18Mbps	-	-	-13	dB	
5) 24Mbps	-	-	-16	dB	
6) 36Mbps	-	-	-19	dB	
7) 48Mbps	-	-	-22	dB	
8) 54Mbps	-	-	-25	dB	
4. Frequency Error					
1) IEEE802.11g	-15	-	15	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 6Mbps (PER $\leq 10\%$)	-	-	-82	dBm	
2) 9Mbps (PER $\leq 10\%$)	-	-	-81	dBm	
3) 12Mbps (PER $\leq 10\%$)	-	-	-79	dBm	
4) 18Mbps (PER $\leq 10\%$)	-	-	-77	dBm	
5) 24Mbps (PER $\leq 10\%$)	-	-	-74	dBm	
6) 36Mbps (PER $\leq 10\%$)	-	-	-70	dBm	
7) 48Mbps (PER $\leq 10\%$)	-	-	-66	dBm	
8) 54Mbps (PER $\leq 10\%$)	-	-	-65	dBm	
6. Maximum Input Level (PER $\leq 10\%$)					
1) IEEE802.11g	-20	-	-	dBm	

3.3 IEEE 802.11n HT20 Section:

Items	Contents				
Specification	IEEE802.11n HT20				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH1 to CH11				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) 12dBm Target (For Each antenna port) @ 2.4G	-	12	15	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-45	dBr	
3. Constellation Error(EVM) @ Target Power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-	-28	dB	
4. Frequency Error					
1) IEEE802.11n HT20 @ 2.4G	-15	-	15	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) MCS0 (PER $\leq 10\%$)	-	-	-82	dBm	
2) MCS1 (PER $\leq 10\%$)	-	-	-79	dBm	
3) MCS2 (PER $\leq 10\%$)	-	-	-77	dBm	
4) MCS3 (PER $\leq 10\%$)	-	-	-74	dBm	
5) MCS4 (PER $\leq 10\%$)	-	-	-70	dBm	
6) MCS5 (PER $\leq 10\%$)	-	-	-66	dBm	
7) MCS6 (PER $\leq 10\%$)	-	-	-65	dBm	
8) MCS7 (PER $\leq 10\%$)	-	-	-64	dBm	
6. Maximum Input Level (PER $\leq 10\%$)					
1) IEEE802.11n HT20 @ 2.4G	-20	-	-	dBm	

3.3 IEEE 802.11n HT40 Section:

Items	Contents				
Specification	IEEE802.11n HT40				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH3 to CH9				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) 12dBm Target (For Each antenna port) @ 2.4G	-	12	15	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-45	dBr	
3. Constellation Error(EVM) @ Target Power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-	-28	dB	
4. Frequency Error					
1) IEEE802.11n HT40 @ 2.4G	-15	-	15	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) MCS0 (PER $\leq 10\%$)	-	-	-79	dBm	
2) MCS1 (PER $\leq 10\%$)	-	-	-76	dBm	
3) MCS2 (PER $\leq 10\%$)	-	-	-74	dBm	
4) MCS3 (PER $\leq 10\%$)	-	-	-71	dBm	
5) MCS4 (PER $\leq 10\%$)	-	-	-67	dBm	
6) MCS5 (PER $\leq 10\%$)	-	-	-63	dBm	
7) MCS6 (PER $\leq 10\%$)	-	-	-62	dBm	
8) MCS7 (PER $\leq 10\%$)	-	-	-61	dBm	
6. Maximum Input Level (PER $\leq 10\%$)					
1) IEEE802.11n HT20 @ 2.4G	-20	-	-	dBm	

4. Requirement of FCC KDB 996369 D03 for module certification:

4.1 List of applicable FCC rules rules:

The module complies with FCC Part 15.247,

4.2 Summarize the specific operational use conditions:

The module has been certified for Fix/Mobile applications. The host product operating conditions must be such that there is a minimum separation distance of 20 cm (or possibly greater than 20 cm) between the antenna radiating structures and nearby persons. The host manufacturer is obligated to confirm the use conditions of the host product to ensure that distance specified in the instructions is met. In this case the host product is classified as either a mobile device or a fixed device for RF exposure purposes. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

4.3 Limited module procedures:

Not applicable.

4.4 Trace antenna designs:

Not applicable.

4.5 RF exposure considerations:

This equipment complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must be installed and operated to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. Installers must ensure that 20cm separation distance will be maintained between the device and users.

Note: the OEM product manuals must include a statement in order to alert the users of FCC RF exposure compliance.

4.6 Antennas:

Type	Gain	Impedance	Application	Min Separation
PCB type Antenna	1.0 dBi	50Ω	Fixed	20 cm

The antenna is permanently attached, can't be replaced.

4.7 Label and compliance information:

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or changes to this equipment. Such modifications or changes could void the user's authority to operate the equipment.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The system integrator must place an exterior label on the outside of the final product housing the WF-R710-RWA1 Modules. Below is the contents that must be included on this label.

OEM Labeling Requirements:

NOTICE: The OEM must make sure that FCC labeling requirements are met. This includes a clearly visible exterior label on the outside of the final product housing that displays the contents shown in below:

Model : WF-R710-RWA1 Contains FCC ID: 2AZ3C720HEALTH

4.8 Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04

Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options

for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software. For wireless LAN, the product under test is set into a link/association with a partnering WLAN device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content. Alternatively, a Wi-Fi test set may be used. Simultaneously transmitting modules installed in the host should be all active.

4.9 Additional testing, Part 15 Subpart B disclaimer:

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) list on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry