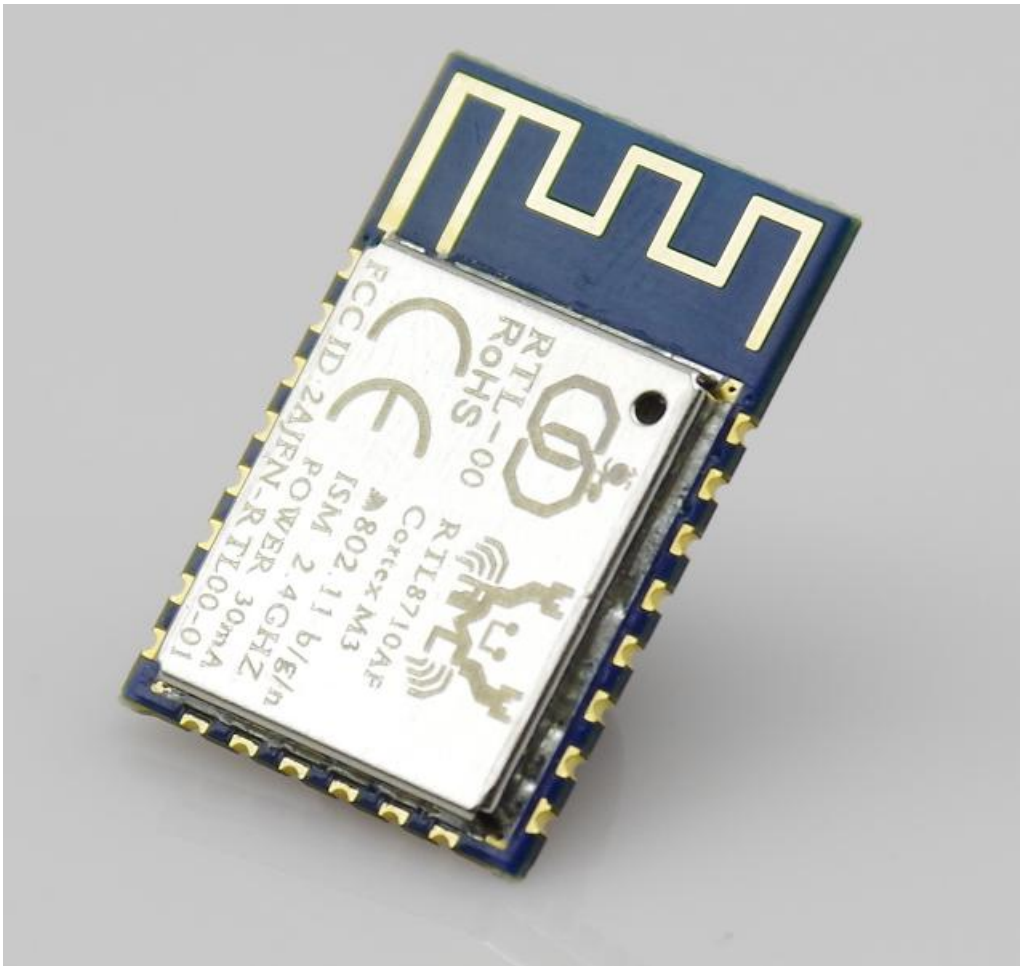




RTL8710AF

RTL8710 专业型 IOT WIFI SOC



RTL00 WiFi Module



Revision 2.1

Release Date :  
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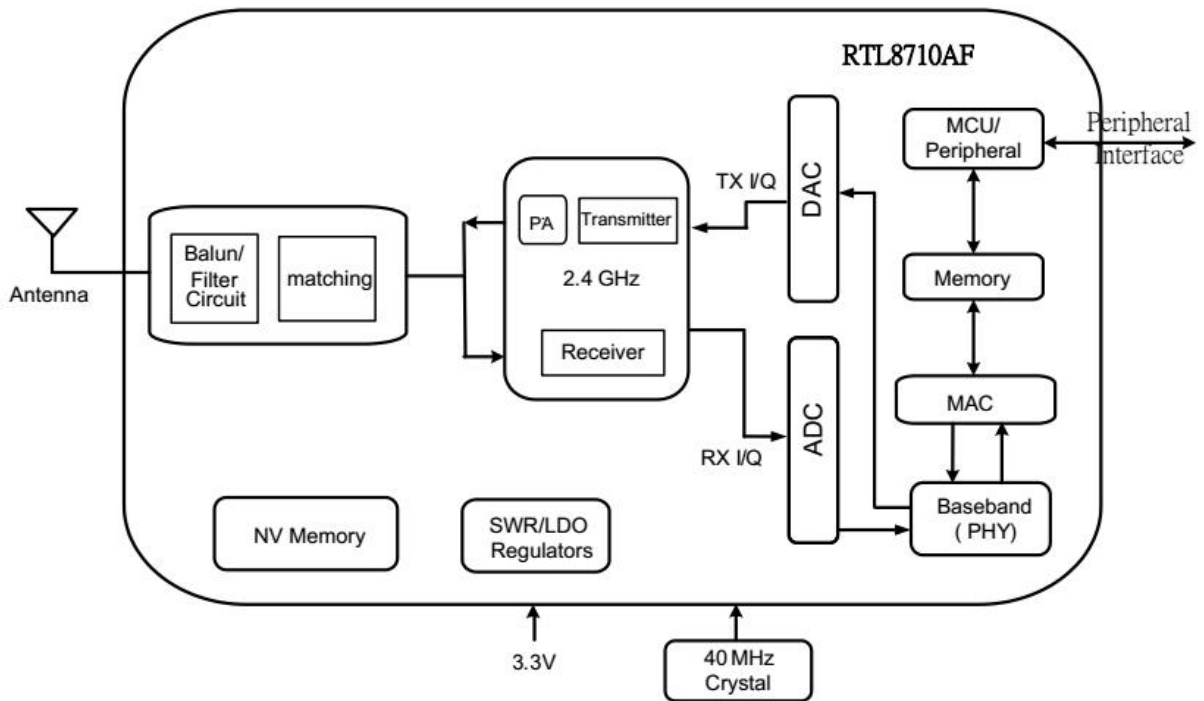
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### 1. Product Profile

Realtek intelligent platform of the Internet **and** Realtek 8710 high performance wireless SOC bring the blessedness for mobile platform designers with maximum availability at the lowest cost, which provides endless possibilities for WiFi function embedded into other systems.



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**Figure 2. Single-Band 11n (1x1) Solution**

Realtek 8710 can run independently as a complete and self-contained WiFi network solution, which also be used to running as slave machine embark on other host MCU. Realtek 8710 with applications can directly start from an external flash memory as the only application processor of the equipment. Its built-in cache improves system performance and reduce memory requirements.

There is another situation that Realtek 8710 is responsible for wireless Internet access, undertaking the task of the WiFi adapter, which can be added to any design based on microcontroller just through simple connection with SPI/SDIO interface or I2C/UART port.

Realtek 8710 powerful processing and storage capacity on chip, make it can integrate sensors through the GPIO ports and other application with specific equipment, which realizes the lowest cost in preliminary development and the leastest occupation of system resources.

Realtek 8710 integrates highly on chip, including antenna switch , balun , power management converter, so that it takes only a few external circuit, which minimizes the space when engineer designs PCB on the whole solution, including front-end module.



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## 1.1 Characteristics

- 802.11 b/g/n , CMOS MAC , Baseband PHY
- Internal low power 32 位 CPU : as application processor
- Internal TCP/IP protocol stack
- Internal TR Switch、 balun、 LNA、 Power Amplifier and Matching Network
- Internal PLL、 VLDO and Power Management Components
- MO、 2x1 MIMO
- A-MPDU 、 A-MSDU aggregation and 0.4 s Guard Interval
- WiFi @ 2.4 GHz , Support WPA/WPA2 Security Mode
- Support STA/AP/STA+AP Module
- Support Smart Config function ( include Android 和 iOS devices )
- HSPI 、 UART、 I2C、 I2S、 IR Remote Control、 PWM、 GPIO
- Deep Sleep Current 10 uA , Shutdown Current below 5 uA
- Wake up, connect and transfer data packets within 2 ms
- 802.11b mode+ 17 dBm Output Power
- Stand down Power below 1.0 mW (DTIM3)
- Operating Temperature Range : -20°C - 85°C



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## 1.2 Main Parameters

Table 1 Introduction of Main parameters of the Module

**Table 1**

Category	Arguments	Statements
Wireless Parameter	wireless standards	802.11 b/g/n
	frequency range	2.4GHz-2.5GHz (2412M-2462M)
	data interface	UART/HSPI/I2C/I2S/Ir Remote Control
Hardware Paramaters	operating voltage	GPIO
		3.0~3.6V ( suggested :3.3V )
	operating current	average : 80mA
	operating temperature	-20°~85°
	Storage Temp	normal
	Package Size	24mm*16mm*0.8mm
	external interface	N/A
	Wireless Network Mode	station/softAP/SoftAP+station
Software Parameters	security mechanism	WPA/WPA2
	encryption type	WEP/TKIP/AES
	Upgrade Firmware	local uart burning / OTA / master download burning
	software development	Support user-defined server secondary development with SDK



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network protocols	IPv4, TCP/UDP/HTTP/FTP
User config	AT+ instruction set, Cloud Server, Android/iOS APP

## 2. Interface definition

Figure 2 Definition of the Interface

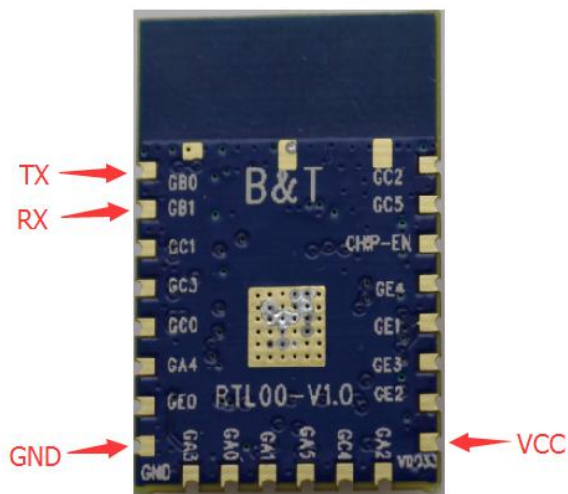


Figure 2

Note: The default naming rules for GC2 means GPIOC second pin





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Table 2 Function Definition of the RTL00 GPIO

NO	Pin name	Description
1	GC2	UART0_RTS,SPI0_MOSI,I2S1_SD_TX,PCM1_OUT,PWM2,ETE2
2	GC5	I2C1_SCL,SPI0_CS2,GPIO_INT
3	CHIP_EN	Enable chip 1: enable chip; 0: shutdown chip
4	GE4	JTAG_CLK , SPI0_CS1
5	GE1	JTAG_TDI,UART0_RTS,I2C2_SDA,SPI0_CLK,PCM0_CLK,PWM1,GPIO_INT
6	GE3	JATG_TMS,UART0_IN,I2C3_SDA,SPI0_MISO,PCM0_IN,PWM3,WKDT3,GPIO_INT
7	GE2	JATG_TDO,UART0_CTS,I2C3_SCL,SPI0_MOSI,PCM_OUT,PWM2, GPIO_INT,WKDT3
8	VDD33	3.3V
9	GA2	SD_CMD,UART2_RTS,SPI1_CLK
10	GC4	I2C1_SDA,SPI0_CS1,I2S1_SD_RX, GPIO_INT
11	GA5	SD_D1,WKDT0
12	GA1	SD_D3,UART2_CTS,SPI1_MOSI,GPIO_INT
13	GA0	SD_D2,UART2_IN,SPI1_MISO,GPIO_INT
14	GA3	SD_CLK
15	GND	GND

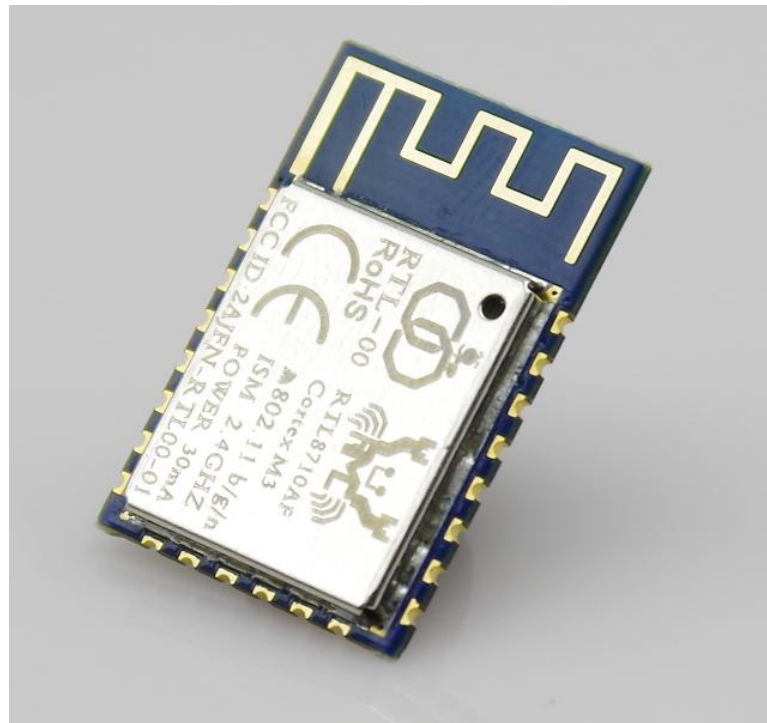


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16	GE0	JTAG_TRST,UART0_OUT,I2C2_SCL,SPI0_CS0,PCM0_SYNC,PWM0
17	GA4	SD_D0 , UART2_OUT,SPI1_CS
18	GC0	UART0_IN,SPI0_CS0 , I2S1_WS,PCM1_SYNC,PWM0,ETE0
19	GC3	UART0_OUT,SPI0_MISO,I2S1_MCK,PCM1_IN,PWM3,ETE3,GPIO_INT
20	GC1	UART0_CTS,SPI0_CLK,I2S1_CLK,PCM1_CLK,PWM1,ETE1, GPIO_INT
21	GB1	UART_LOG_IN,ETE1,WKDT0
22	GB0	UART_LOG_OUT,ETE0

### 3. Shape and size

RTL00 patch type module size 24mm \* 16mm \* 3mm ( As shown in figure 3 ) 。 The module uses 3 DBi PCB On-board antenna.





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Figure 3 RTL00 module appearance

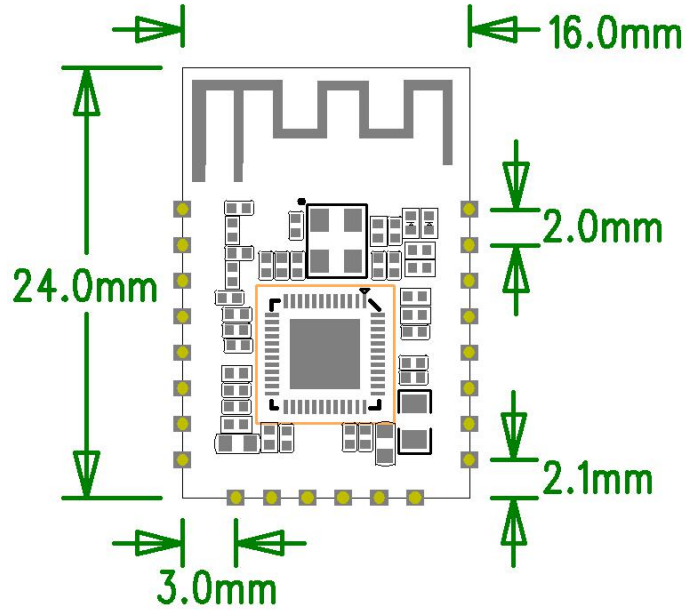


Figure 4 RTL00 module size plan

Table 5 RTL00 module size table

length	width	height	PAD size ( bottom )	Pin distance
24mm	16mm	3 mm	0.9 mm x 1.0 mm	2.0mm

## 4. Function description

### 4.1 MCU



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Realtek rtl8710af is a low power single chip. It integrates a ARM-CM3 MCU, 802.11 n wireless network controller. It also provides some peripherals with configurable GPIO.

### 4.2. storage description

#### 4.2.1. built in SRAM and ROM

Realtek 8710 has internal memory controller including ROM and SRAM. MCU can access memory controller by iBus, dBus and AHB interface. These interfaces can access ROM or RAM unit as memory arbitrator determines the running order according to arrival sequence. Given the SRAM used by our Demo SDK in current situation, the user can use the remaining SRAM size > 48 KB.

#### 4.2.2. SPI Flash

Now the module internal integrate 1 MB of SPI Flash, which does not support external SPI Flash.

### 4.3. Maximum Ratings

**Table 7** Maximum Ratings

Ratings	condition	value	units
<b>Storage Temperature</b>		-40 to 125	°C
maximum welding temperature		260	°C
Voltage supply	IPC/JEDEC J-STD-020	+3.0 to +3.6	V

### 4.4. Recommended Working Environment



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**Table 8** Recommended Working Environment

Working Environment	Name	Min	Typ	Max	units
Operating Temp		-20	20	85	°C
Voltage supply	VDD	3.0	3.3	3.6	V

## 4.5. Digital Port Characteristics

**Table 9** Digital Port Characteristics

port	Typ	Min	Typ	Max	units
Input logic level low	V <sub>IL</sub>	-0.3		0.25VDD	V
Input logic level high	V <sub>IH</sub>	0.75VDD		VDD+0.3	V
Input logic level low	V <sub>OL</sub>	N		0.1VDD	V
Input logic level high	V <sub>OH</sub>	0.8VDD		N	V

Note: If no special instructions, test condition is: VDD = 3.3 V, temperature = 20 °C.

## 5. RF Parameters

Parameters	Typ		units
Input Frequency	2412-2483.5		MHz
Input resistance	50		Ω
Output Power	802.11b	>17	dBm
	802.11g	>15	dBm



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	802.11n(HT20)	>14	dBm
	802.11n(HT40)	>14	dBm
Rx sensitivity	11M	≤-76	dBm
	54M	≤-65	dBm
	65M(HT20)	≤-64	dBm
	150M(HT40)	≤-61	dBm

## 6. Power Consumption

The following data is based on the 3.3 V power supply, around 25 ° C temperature, measured by the internal voltage regulator.

All measurements in the absence of SAW filter, completed in the antenna interface.

All emission data is based on 90% of the duty ratio, measured in continuous emission mode.

Model	Min	Tye	Max	unit
Transmit 802.11b, CCK 11Mbps, P <sub>OUT</sub> = +17dBm		87		mA
Transmit 802.11g, OFDM 54Mbps, P <sub>OUT</sub> = +15dBm		180		mA
Transmit 802.11n(HT20), MCS7, P <sub>OUT</sub> = +14dBm		168		mA
Transmit 802.11n(HT40), MCS7, P <sub>OUT</sub> = +14dBm		148		mA
Receive 802.11b, packet length 1024 bytes, -76dBm		68		mA
Receive 802.11g, packet length 1024 bytes, -65dBm		68		mA



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Receive 802.11n, packet length 1024 bytes, -64dBm		68		mA
Modem-Sleep①		15		mA
Light-Sleep②		0.9		mA
Deep-Sleep③		10		uA
Normal stand down		30		mA

Note 1: Modem - Sleep is applied to the CPU in the continuous working condition Such as PWM or I2S application, etc. With keeping the WiFi connection, if there is no data transfer, close the WiFi Modem circuit to save electricity according to 802.11 standard (such as U - APSD). For example, When DTIM3, 300 ms sleep time includes awaking time 3 ms to receive AP Beacon packets and so on, the overall average current is about 15 ma.

Note 2: Light - Sleep is applied to the CPU which suspend the application of such as WiFi switch. With keeping the WiFi connection, if there is no data transfer, close the WiFi Modem circuit to save electricity according to 802.11 standard (such as U - APSD). For example, When DTIM3, 300 ms sleep time includes awaking time 3 ms to receive AP Beacon packets and so on, the overall average current is about 0.9 ma.

Note 3: Deep-Sleep without keeping WiFi connection, is applied to the application which sends a packet with long time interval , such as measurement temperature sensor works once every 100 seconds. For example, 300 ms sleep time including awaking time 0.3~1s to connect AP , the overall average current can be far less than 1 mA.



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## 7. Temperature Drift

Temperature Drift $T_S \text{ Max} - T_L$	Max 3°C/sec
preheating $T_S \text{ Min.}$ $T_S \text{ Typ.}$ $T_S \text{ Max.}$ T	150°C 175°C 200°C 60~180 sec
Drift up ( $T_L$ to $T_p$ )	Max 3°C/sec
Lasting time / Temp ( $T_L$ ) / time ( $T_L$ )	217°C/60~150 sec
Temp peak ( $T_p$ )	Max Temp 260°C , lasting 10 sec
target Temp peak ( $T_p$ target)	260°C +0/-5°C
Actual ( $t_p$ ) 5°C lasting time	20~40 sec
Drift down	Max 6°C/sec
From 25°C to Temp peak time (t)	Max 8 minutes





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### 8. Module Installation notes

Antenna radiation space is very important, the environment good or bad will affect the transmission distance. Metal or other such as motors, cameras, speakers such as components will directly affect the performance of the antenna, which is equivalent to add a layer mask. RTL00 using on-board PCB antenna, the module has surrounding environment requirements. Are as follows: as shown in figure 5, don't put influential components to antenna surrounding within 5-10 mm; As shown in figure 6, don't place influential components t below the antenna within 3 to 5 mm, if there is need to lay the ground that clear treatment is vital. Under modules ,it has no high frequency signal lines and components as far as possible .

