WR4 Module Datasheet

Device Development > Module > Wi-Fi Module

Version: 20200221

Contents

1 Product Overview

WR4 is a low power-consuming built-in Wi-Fi module developed by Hangzhou Tuya Information Technology Co., Ltd. It consists of a highly integrated wireless radio chip (RTL8710BN) and an external flash chip, with a built-in Wi-Fi network protocol stack and robust library functions. WR4 also contains a low power-consuming ARM CM4F, a WLAN MAC, a 1T1R WLAN, a basic frequency of up to 125 MHz, a 256 KB SRAM, a 1 MB flash, and various peripheral resources.

WR4 is an RTOS platform that integrates all the function libraries of the Wi-Fi MAC and TCP/IP protocols. You can develop built-in Wi-Fi products as required.

Figure 1.1 shows the architecture of WR4.
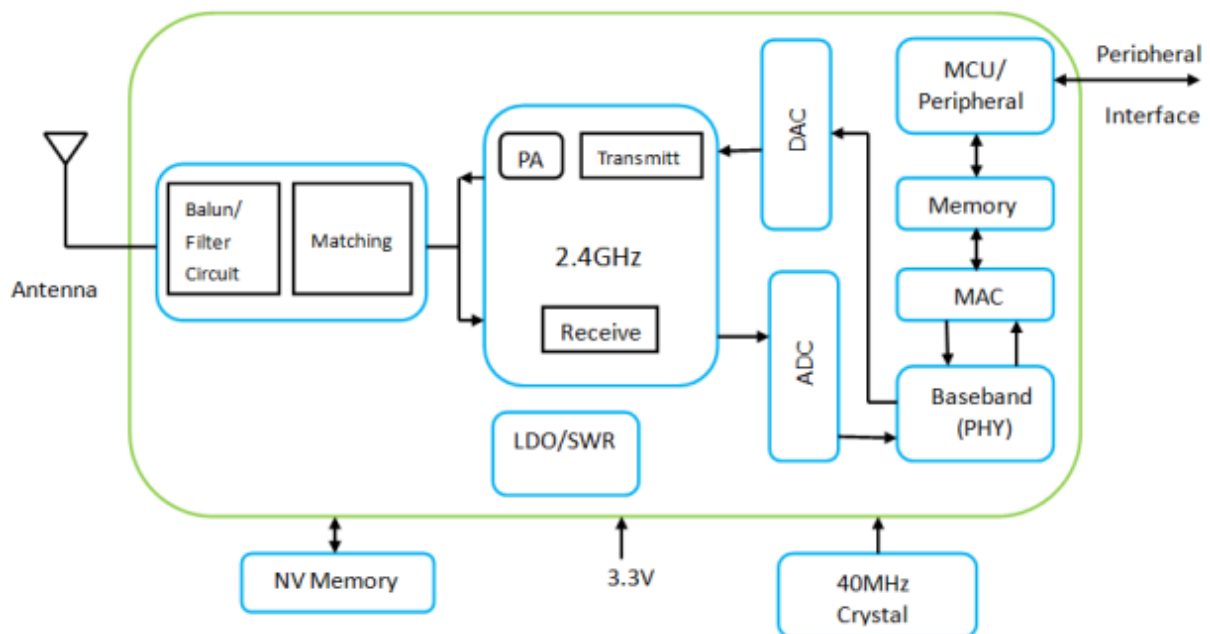
Figure 1.1 WR4 architecture

1.1 Features

Built-in low power-consuming 32-bit CPU, which can also be used as an application processor

- Basic frequency: 125 MHz

Working voltage:3 V to 3.6 V

Peripherals: nine GPIOs, one UART, and one ADC

Wi-Fi connectivity

- 802.11 B/G/N20/N40

- Channel 1–14@2.4 GHz

- WPA/WPA2 security mode supported

- +20 dBm output power in 802.11b mode

- SmartConfig function supported (for Android and iOS devices)

- IPEX connector for external antennas

- Certified by CE, FCC, and SRRC

- Working temperature: –40°C to +85°C

- AES 128/256-based hardware encryption

1.2 Major Application Fields

- Intelligent building
- Intelligent home and household applications
- Health care
- Industrial wireless control
- Baby monitor
- Network camera
- Intelligent bus

2 Module Interfaces

2.1 Dimensions and Footprint

WR4 provides two rows of pins (2 x 8) with the distance of 1.5 mm between every two pins.

WR4 dimensions: 13.8 mm (W) x 15.5 mm (L) x 3.3 mm (H) (see figure 2.1)

Figure 2.1 WR4 dimensions

Figure 2.1 WR4 dimensions
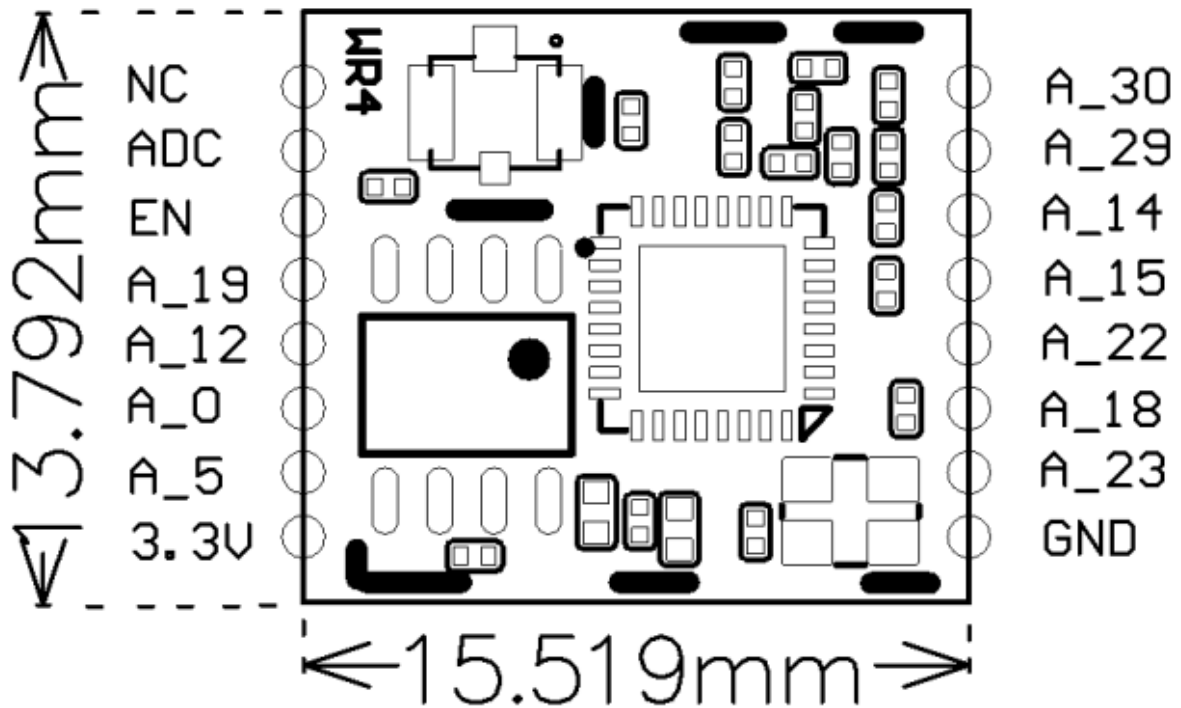
2.2 Pin Definition

Table 2.1 describes the common pins.   Table 2.1 WR4 pins

Pin	Symbol	I/O Type	Functions
1	NC	/	NC, not connected

Pin	Symbol	I/O Type	Functions
2	ADC	AI	ADC interface, with the maximum output power of 5 V
3	EN	I/O	The pin function is disabled by firmware, user can choose not to connect.
4	A_19	I/O	GPIOA_19
5	A_12	I/O	GPIOA_12
6	A_0	I/O	GPIOA_0, which cannot be pulled up during power-on and can be configured after power-on
7	A_5	I/O	GPIOA_5
8	3.3 V	P	Module power supply pin (3.3 V)
9	GND	P	Power supply reference ground pin
10	A_23	I/O	UART0_TXD (user's serial port)
11	A_18	I/O	UART0_RXD (user's serial port)
12	A_22	I/O	GPIOA_22
13	A_15	I/O	GPIOA_15
14	A_14	I/O	GPIOA_14
15	A_29	I/O	UART_Log_RXD (used for printing of the module internal information), which can also be used as the GPIO
16	A_30	I/O	UART_Log_TXD (used for printing of the module internal information), which can also be used as the GPIO

Note: P indicates power-supply pins, I/O indicates input/output pins, and AI indicates analog input pins.

3 ElectricalCharacteristics

3.1 Absolute Electrical Characteristics

Table 3.1 Absolute electrical characteristics

Parameters	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	-40	105	℃
VDD	Power supply voltage	-0.3	3.6	V
Static electricity voltage (human model)	TAMB-25℃	-	2	KV
Static electricity voltage (machine model)	TAMB-25℃	-	0.5	KV

3.2 Electrical conditions

Table 3.2 Normal electrical conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
Ta	Working temperature	–20	-	85	℃
VDD	Working voltage	3.0	-	3.6	V
VIL	I/O low-level input	–0.3	-	VDD*0.25	V
VIH	I/O high-level input	VDD*0.75	-	3.6	V
VOL	I/O low-level output	-	-	VDD*0.1	V

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
VOH	I/O high-level output	VDD*0.8	-	VDD	V
Imax	I/O drive current	-	-	16	mA
Cpad	Input pin capacitor	-	2	-	pF

3.3 Wi-Fi TX Power Consumption

Table 3.3 TX power consumption during constant emission

Symbol	Mode	Power	Typical Value	Unit
IRF	11b11 Mbit/s	17 dBm	287	mA
IRF	11b11 Mbit/s	18 dBm	295	mA
IRF	11g54 Mbit/s	15 dBm	255	mA
IRF	11g54 Mbit/s	17.5 dBm	267	mA
IRF	11n BW20MCS7	13 dBm	244	mA
IRF	11n BW20MCS7	16.5 dBm	257	mA
IRF	11n BW40MCS7	13 dBm	220	mA
IRF	11n BW40MCS7	16.5 dBm	230	mA

Note: When the preceding data is used for testing, the amount of constantly emitted data (duty cycle) is 100%.

3.4 Wi-Fi RX Power Consumption

Table 3.4 RX power consumption during constant emission

Symbol	Mode	Typical Value	Unit
IRF	CPU sleep	90	mA
IRF	CPU active	120	mA

3.5 Power Consumption in Operating Mode

Table 3.5 Module working current

Working Mode	Working Status (Ta = 25°C)	Typical Value	Peak Value*	Unit
EZ mode	The module is in EZ status and the Wi-Fi indicator quickly flashes.	115	130	mA
Idle mode	The module is in connected status and the Wi-Fi indicator is steady on.	50	110	mA
Operation mode	The module is in connected status and the Wi-Fi indicator is steady on.	120	265	mA
Disconnection mode	The module is in disconnected status and the Wi-Fi indicator is steady off.	35	90	mA

Note: The peak duration is about 5 μs. The preceding parameter values vary depending on the firmware functions.

4 RF Features

4.1 Basic RF Features

Table 4.1,Basic RF features

Parameter	Description
Frequency range	2.400–2.4835 GHz
Wi-Fi standard	IEEE 802.11b/g/n (channel 1–14)
Data transmitting rate	11b: 1, 2, 5.5, 11 (Mbit/s)11g: 6, 9, 12, 18, 24, 36, 48, 54 (Mbit/s)11n: HT20 MCS0–MCS711n: HT40 MCS0–MCS7
Antenna type	External antenna connected through the U.FL RF connector

4.2 WI-FI Output Power

Table 4.2 TX power during constant emission

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
RF average output power, 802.11b CCK mode	11M -	17.5	-	dBm
RF average output power, 802.11g OFDM mode	54M-	14.5	-	dBm
RF average output power, 802.11n OFDM mode	MC! -	13.5	-	dBm
Frequency error	-10	-	10	ppm

4.3 WI-FI RX sensitivity

Table 4.3 RX Sensitivity

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
PER < 8%, RX sensitivity, 802.11b CCK mode	11M -	–91	-	dBm
PER < 10%, RX sensitivity, 802.11g OFDM mode	54M-	–75	-	dBm
PER < 10%, RX sensitivity, 802.11n OFDM mode	MCS -	–72	-	dBm

5 Antenna Information

5.1 Antenna types

The FPC antenna is recommended. Figure 5.1 shows the recommended antenna connection method and the dimensions. You can also select standard antennas based on the product assembly method.

Figure 5.1 Recommended antenna dimensions
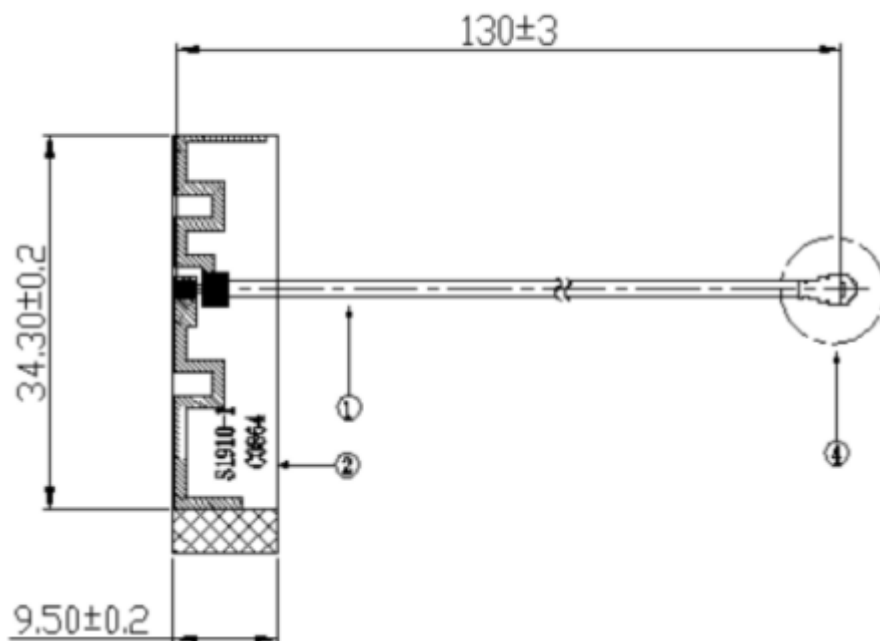
5.2 Antenna Interference Reduction

To ensure optimal Wi-Fi performance when the Wi-Fi module uses the onboard PCB antenna, it is recommended that there be a space of at least 15 mm between the module antenna and other metal parts.

5.3 U.FL RF connector
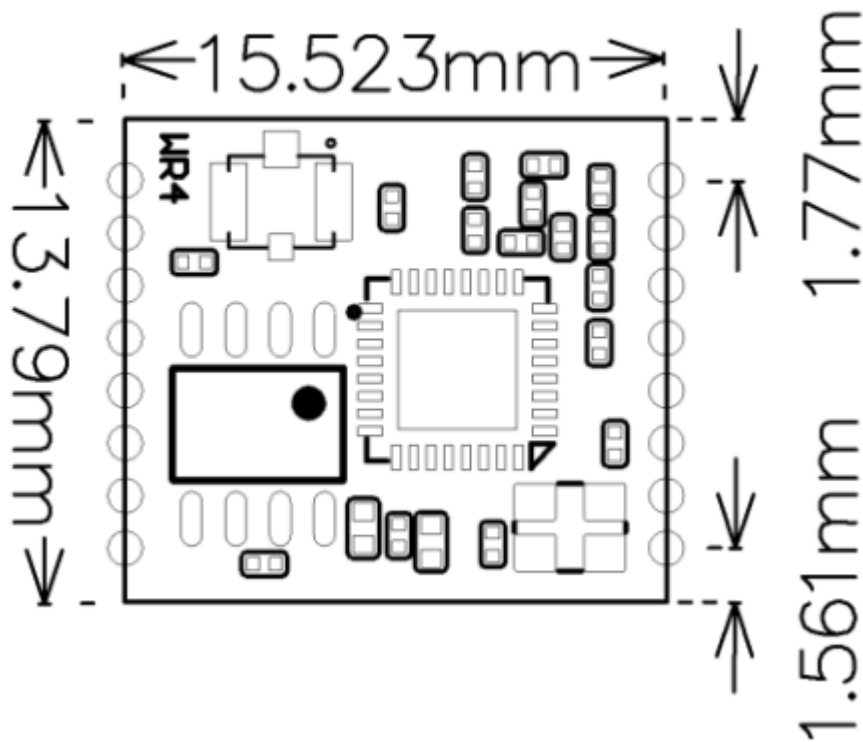
Figure 5.2 shows the U.FL RF connector parameters.

Figure 5.2 U.FL RF connector parameters
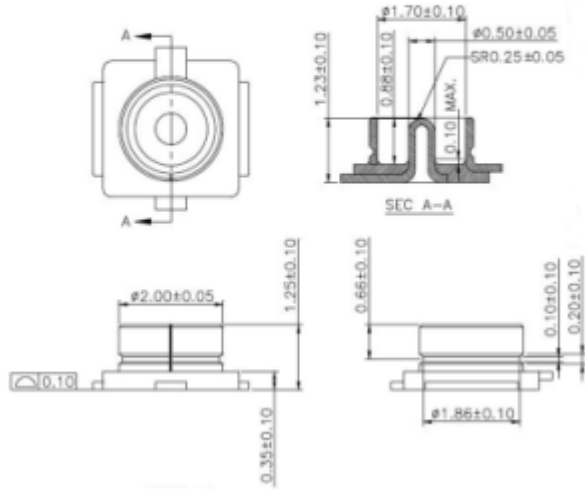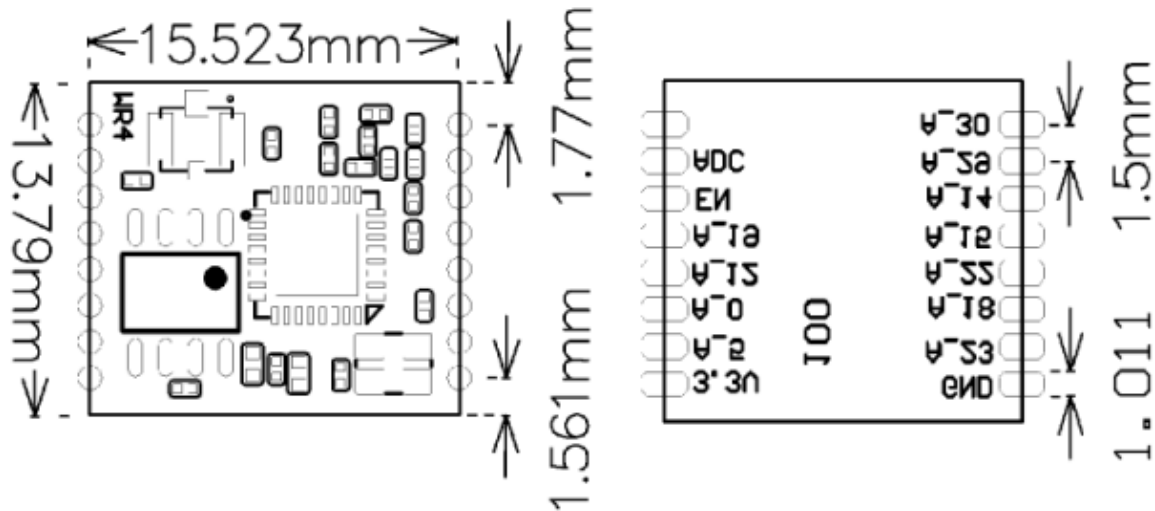
6 Packaging Information and Poduction Instructions

6.1 Mechanical Dimensions

Figure 6.1 Module front view

6.2 Recommended PCB Encapsulation

Figure 6.2 Module PCB encapsulation

6.3 Production Instructions

Storage conditions of a delivered module are as follows:

1. The anti-moisture bag is placed in an environment where the temperature is under 30°C and the relative humidity is under 85%.
2. The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed.

Precautions:

1. Throughout the production process, each involved operator must wear an electrostatic ring.
2. During the operation, strictly protect the module from water and strains.

6.4 Recommended Oven Temperature Profile

Refer to IPC/JEDEC standard ; Peak Temperature : <250°C ; Number of Times: ≤2 times ;