1. **Product Overview**

WR3L is a low power-consuming built-in Wi-Fi module developed by Hangzhou Tuya Information Technology Co., Ltd. It consists of a highly integrated radio frequency chip (RTL8710BX) and an external flash chip, with a built-in Wi-Fi network protocol stack and robust library functions. WR3L also contains a low power-consuming ARM CM4F, a WLAN MAC, a 1T1R WLAN, and the maximum basic frequency of 125 MHz, and is embedded with a 256 KB SRAM, a 2 MB flash, and robust peripheral resources.

WR3L 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.

1.1 Features

Built-in low power-consuming 32-bit CPU functioning as an application processor

- Basic frequency: 125 MHz
- ✧ Working voltage: 3 V to 3.6 V
- ✧ Peripherals: seven GPIOs, two UARTs, and one ADC
- ✧ Wi-Fi connectivity
  - ● 802.11 B/G/N20/N40
  - ● Channels 1-11@2.4GHz
  - ● Supports WPA/WPA2 safe modes
  - ● SmartConfig mode (for Android and iOS devices)
  - ● Passing the CE, FCC, and SRRC certification
 - ● Working temperature: –20°C to +105°C

1.2 Major Application Fields

- ✧ Intelligent building
- ✧ Intelligent home and household appliances
- ✧ Healthcare
- ✧ Industrial wireless control
- ✧ Baby monitors
- ✧ Network camera
- ✧ Intelligent bus

Version1.0.0

2. Module Interfaces

2.1 Dimensions and Pin Layout

WR3L provides two rows of pins (2 x 8) with the distance of 2 mm between every two pins.

WR3L dimensions: 16 mm (W) x 24 mm (L) x 3.3 mm (H) (see figure 2.1)
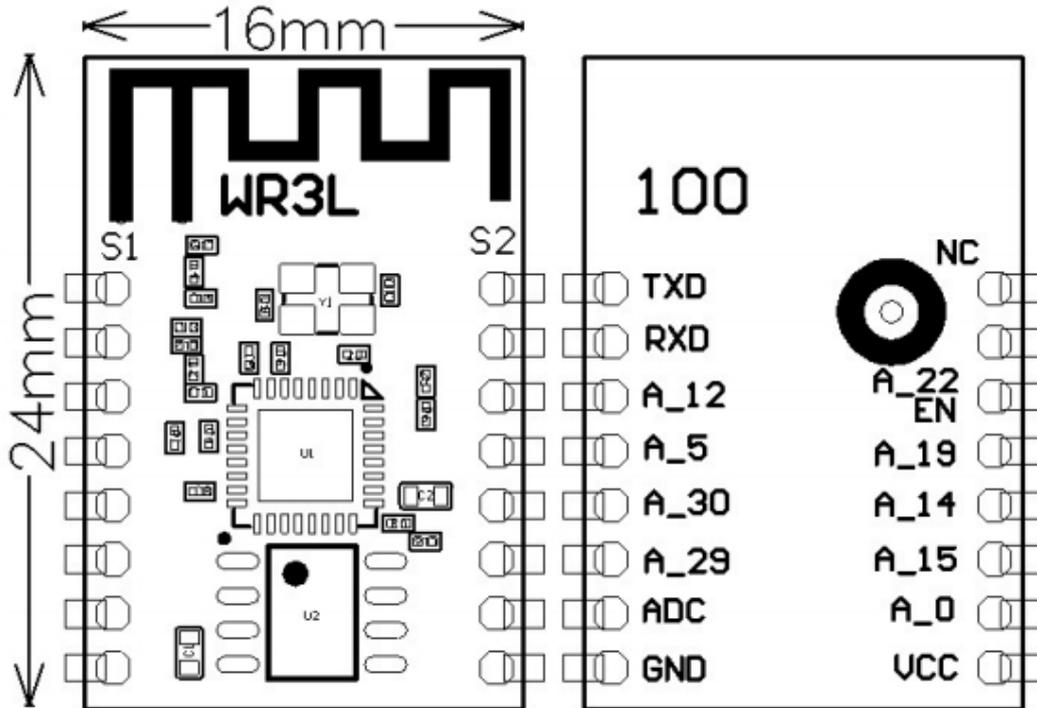
2.2 Pin definition

Table 2.1 describes the common pins.

Table 2.1，WR3L pins description

No.	Symbol	I/OType	Function
1	NC	/	Disconnected to be compatible with other modules
2	GPIOA_22	I/O	GPIOA_22
3	CHIP_EN	I/O	External enablement reset pin (valid at low level)
4	GPIOA_19	I/O	GPIOA_19
5	GPIOA_14	I/O	GPIOA_14, used for hardware PWM
6	GPIOA_15	I/O	GPIOA_15, used for hardware PWM
7	GPIOA_0	I/O	GPIOA_0, which cannot be pulled up during power-on and can be configured after power-on. It is used for hardware PWM.

8	VD33	P	Module power supply pin (3.3 V)
9	GND	P	Power supply reference ground pin
10	ADC	AI	ADC port, with the maximum input voltage of 5 V
11	GPIOA_29	I/O	UART_Log_RXD (used for printing the internal information of the module)
12	GPIOA_30	I/O	UART_Log_TXD (used for printing the internal information of the module)
13	GPIOA_5	I/O	GPIOA_5, used for hardware PWM
14	GPIOA_12	I/O	GPIOA_12, used for hardware PWM
15	RXD	I/O	UART0_RXD (user's serial port)
16	TXD	I/O	UART0_TXD (user's serial port)

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

3. Electrical Parameters

3.1 Absolute electrical parameters

Table 3.1,Absolute Parameters

Parameters	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	–40	125	°C
VDD	Power-supply voltage	–0.3	3.6	V
Static electricity voltage (human model)	TAMB – 25°C	-	2	kV
Static electricity voltage (machine model)	TAMB – 25°C	-	0.5	kV

3.2 Electrical Conditions

Table 3.2 Normal electrical conditions

Parameters	Description	Min	Typ	Max	Unit
Ta	Working temperature	–20	-	105	°C
VDD	Working voltage	3.0	3.3	3.6	V
VIL	I/O low-level input	–0.3	-	VDD x 0.25	V

VIH	I/O high-level input	VDD x 0.75	-	3.6	V
VOL	I/O low-level output	-	-	VDD x 0.1	V
VOH	I/O high-level output	VDD x 0.8	-	VDD	V
Imax	I/O drive current	-	-	16	mA
Cpad	Input pin capacitance	-	2	-	pF

3.3 Wi-Fi TX power consumption

Table 3.3 TX power during constant emission

Symbol	Mode	Power	Typ	Unit
IRF	11b 11 Mbit/s	20.63 dBm	287	mA
IRF	11g 54 Mbit/s	22.2 dBm	255	mA
IRF	11n BW20 MCS7	21.27 dBm	244	mA
IRF	11n BW40 MCS7	20.82 dBm	230	mA

3.4 Wi-Fi RX power consumption

Table 3.4 RX power during constant receiving

Symbol	Mode	Typ	Unit
IRF	CPU sleep	90	mA
IRF	CPU active	120	mA

3.5 Power consumption in operating mode

Table 3.5, Module operating current

Operation Mode	Operating condition, TA=25℃	Typ	Peak	Unit
EZ mode	The module is in the EZ state and the Wi-Fi indicator fast flashes.	115	125	mA
Idle mode	The module is in the connected state and the Wi-Fi indicator is steady on.	60	209	mA
Working mode	The module is in the connected state and the Wi-Fi indicator is steady on.	118	198	mA
Disconnection mode	The module is in the disconnected state and the Wi-Fi indicator is steady off.	34	192	mA

Notes: The peak period is approx. 5us.

The preceding parameter values vary depending on the firmware functions.

4. RF Characteristics

4.1 Basic RF characteristics

Table 4.1,Basic RF characteristics

Parameter	Description
Frequency band	2.412 GHz to 2.462 GHz
Wi-Fi standard	IEEE 802.11b/g/n20/n40 (channels 1 to 11)
Data transmission rate	11b: 1, 2, 5.5, 11 (Mbit/s) 11g: 6, 9, 12, 18, 24, 36, 48, 54 (Mbit/s) 11n: HT20 MCS0 to MCS7 11n: HT40 MCS0 to MCS7
Antenna type	Onboard PCB antenna

4.2 Wi-Fi RX sensitivity

Table 4.2,RX Sensitivity

Parameter		Min	Typ	Max	Unit
PER < 8%, RX sensitivity, 802.11b CCK mode	11 Mbit/s	-	−91	-	dBm
PER < 10%, RX sensitivity, 802.11g OFDM mode	54 Mbit/s	-	−75	-	dBm
PER < 10%, RX sensitivity, 802.11n OFDM mode	MCS7	-	−72	-	dBm

5. Antenna Information

### 5.1 Antenna types

Only the onboard PCB antenna is used.

5.2 Antenna interference reduction

When using an onboard PCB antenna on a Wi-Fi module, make sure that the antenna on the module is at least 15 mm away from other metal parts to ensure optimal wireless performance.

6. Packaging information and production guidance

6.1 Mechanical dimensions

Figure 6.1 Module dimensions
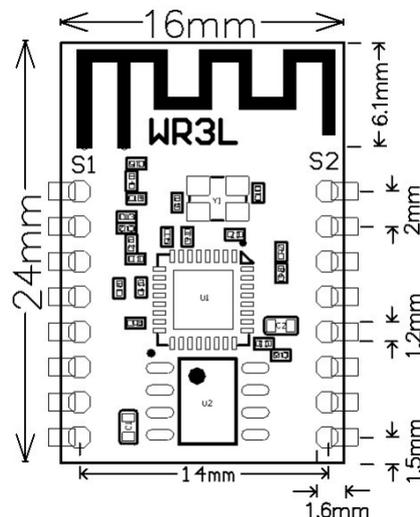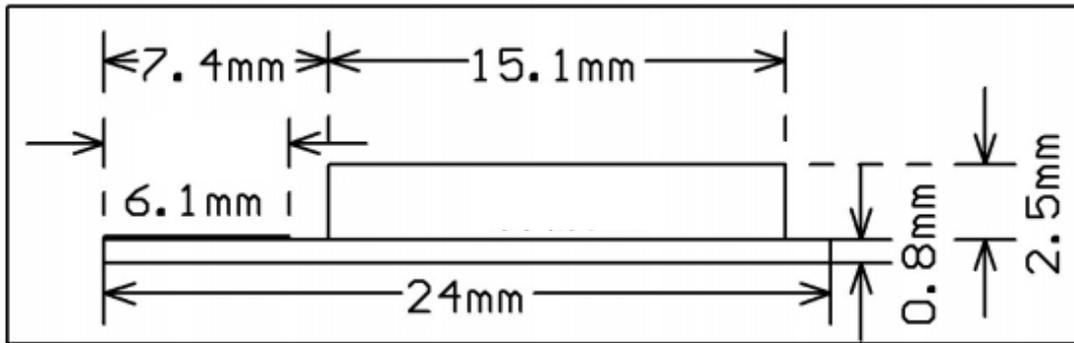
6.2 Production Instructions

Storage conditions of a delivered module are as follows:

1.The anti-moisture bag must be 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.

Note:

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.

6.3 Recommended Oven Temperature Profile
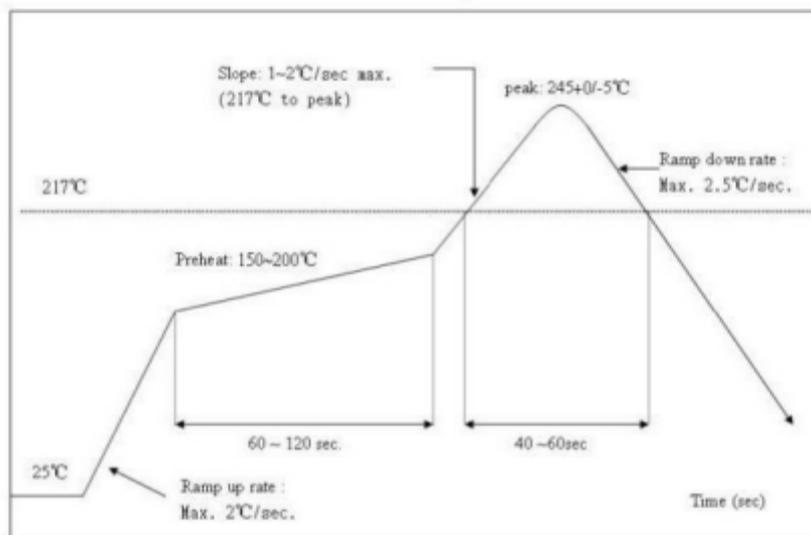
Regulatory Module Integration Instructions

2.2 List of applicable FCC rules

This device complies with part 15.247 of the FCC Rules.
According to the definition of mobile and fixed device is described in Part 2.1091(b), this device is a mobile device.

2.3 Summarize the specific operational use conditions

This module can be used in household electrical appliances as well as lighting

equipments. The input voltage to the module should be nominally 3.0 to 3.6V VDC ,typical

value 3.3VDC and the ambient temperature of the module should not exceed 105℃.

This module using only one kind of antennas with maximum gain is 2.5dBi .Other antenna

arrangement is not covered by this certification.

The antenna is not field replaceable. If the antenna needs to be changed, the certification

should be re-applied.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled

environment .This equipment should be installed and operated with minimum distance

20cm between the radiator& your body. If the device built into a host as a portable usage,

the additional RF exposure evaluation may be required as specified by§ 2.1093.

This transmitter must not be co-located or operating in conjunction with any other
antenna or transmitter. Country Code selection feature to be disabled for products marketed
to the US.

2.7 Antennas

Module only contains one PCB antenna. No additional external connectors.

2.8 Label and compliance information

The outside of final products that contains this module device must display a label

referring to the enclosed module. This exterior label can use wording such as: "Contains

Transmitter Module FCC ID: 2ANDL-WR3L ",or "Contains FCC ID: 2ANDL-WR3L ", Any

similar wording that expresses the same meaning may be used.

2.9 Information on test modes and additional testing requirements

a) The modular transmitter has been fully tested by the module grantee on the required

number of channels, modulation types, and modes, it should not be necessary for the

host installer to re-test all the available transmitter modes or settings. It is

recommended that the host product manufacturer, installing the modular transmitter,

perform some investigative measurements to confirm that the resulting composite

system does not exceed the spurious emissions limits or band edge limits (e.g., where a

different antenna may be causing additional emissions).

b) The testing should check for emissions that may occur due to the intermixing of

emissions with the other transmitters, digital circuitry, or due to physical properties of

the host product (enclosure). This investigation is especially important when integrating

multiple modular transmitters where the certification is based on testing each of them in

a stand-alone configuration. It is important to note that host product manufacturers

should not assume that because the modular transmitter is certified that they do not

have any responsibility for final product compliance.

c) If the investigation indicates a compliance concern the host product manufacturer is

obligated to mitigate the issue. Host products using a modular transmitter are subject to

all the applicable individual technical rules as well as to the general conditions of

operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of

the host product will be obligated to stop operating the device until the interference has

been corrected

Below are steps for on test modes：

tx_contin_en 1　　　　// return：wifi tx continuous test!

wifitxout　< parameter 1>　< parameter 2>　< parameter 3>

：Send channel option and allowed number is 1~11.

：Send data rate option, the relationship between input parameters and

rates is shown in table 1.

：Send power attenuation

Table 1: allowed input for speed of receiving or sending data package

11b mode		11g mode		11n mode	
Input	Dial Speed	Input	Dial Speed	Input	Dial Speed
0x0	1M	0xb	6M	0x10	6.5M / MCS0
0x1	2M	0xf	9M	0x11	13M / MCS1
0x2	5.5M	0xa	12M	0x12	19.5M / MCS2

0x3	11M	0xe	18M	0x13	26M / MCS3
		0x9	24M	0x14	39M / MCS4
		0xd	36M	0x15	52M / MCS5
		0x8	48M	0x16	58.5M / MCS6
		0xc	54M	0x17	65M / MCS7

cmdstop   // Stop sending data package command

2.10 Additional testing, Part 15 subpart B disclaimer

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369.

Frequency spectrum to be investigated

For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation.

Operating the host product

When testing the host product, all the transmitters must be operating.The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available.

When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

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.

FCC Statement

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