



# WR3L Module Datasheet

Version: 20211009

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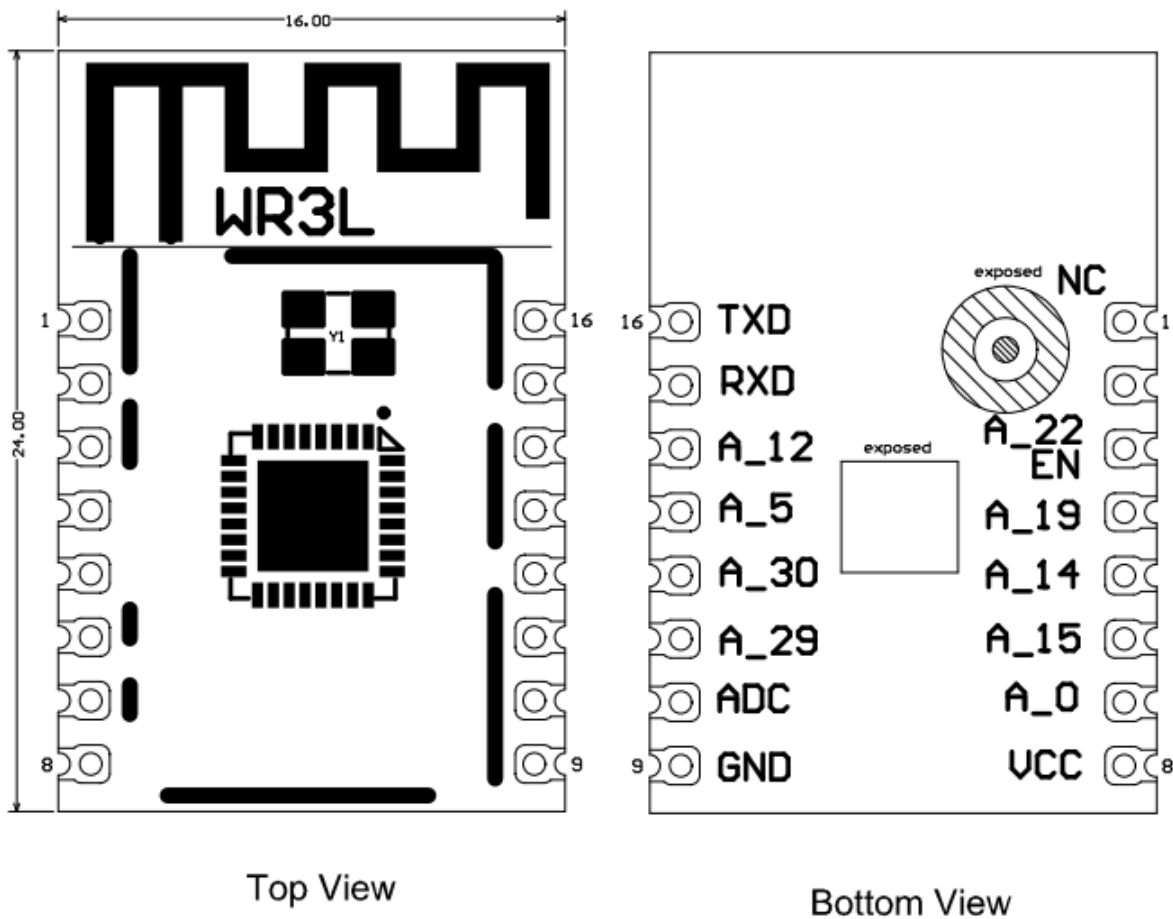


WR3L is a low power-consuming built-in Wi-Fi module developed by Hangzhou Tuya Information Technology Co., Ltd. It consists of a highly integrated radio frequency chip (RTL8710BX) and an external flash chip, with a built-in Wi-Fi network protocol stack and robust library functions. WR3L also contains 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.

## 1 Overview

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.

Figure 1.1 shows the schematic diagram of WR3L.



### 1.1 Features

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

- Basic frequency: 125 MHz

Operating voltage: 3 V to 3.6 V

Peripherals: 7 GPIOs, 2 UARTs, and 1 ADC

Wi-Fi connectivity

- 802.11 b/g/n20/n40
- Channels 1 to 14@2.4 GHz
- WEP/WPA/WPA2/WPA2 PSK (AES) security mode
- Up to +20 dBm output power in 802.11b mode
- SmartConfig mode (for Android and iOS devices)
- Passed the CE, FCC, and SRRC certifications
- Operating temperature: -20°C to +105°C

## 1.2 Applications

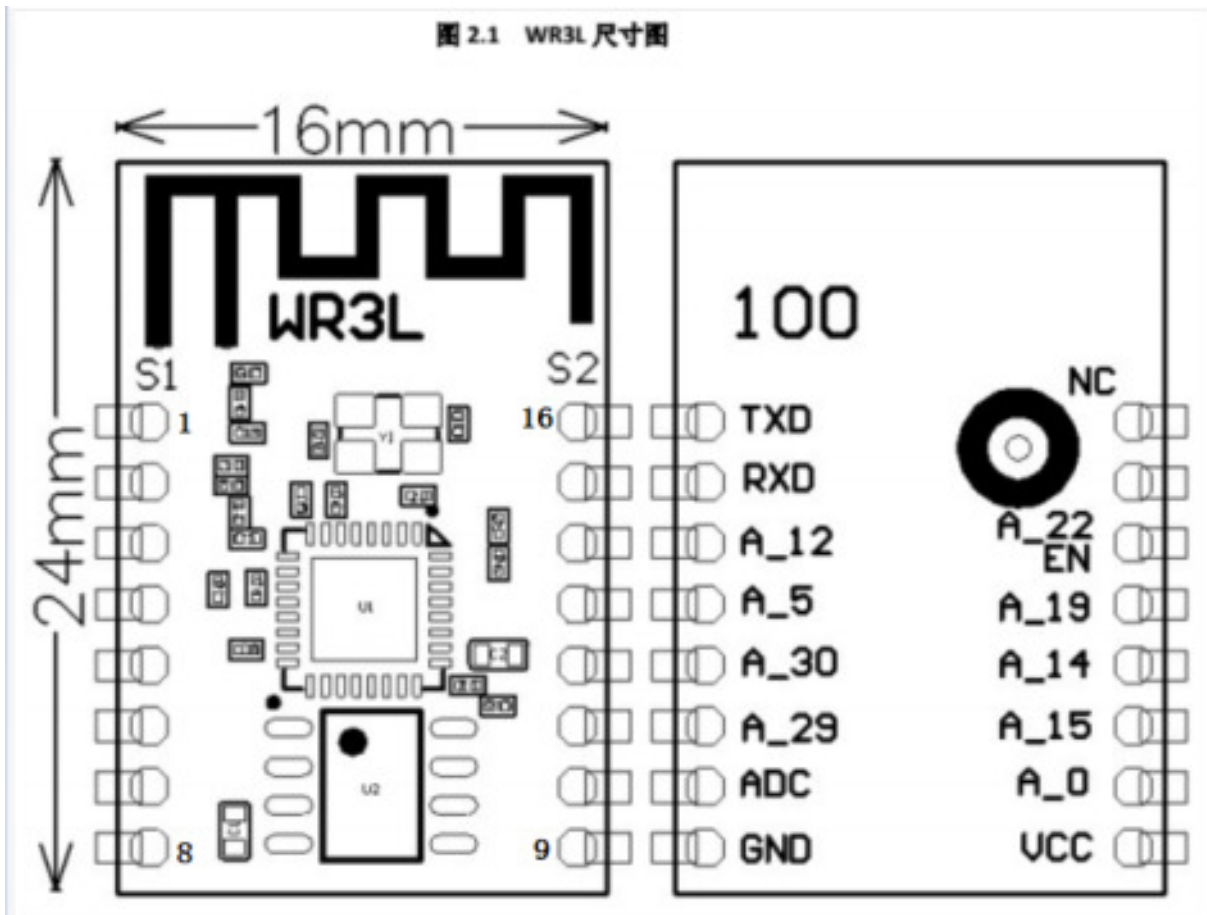
- Intelligent building
- Intelligent home and household appliances
- Healthcare
- Industrial wireless control
- Baby monitor
- Network camera
- Intelligent bus

## 2 Module interfaces

### 2.1 Dimensions and Pin Layout

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

WR3L dimensions: 16 mm (W) x 24 mm (L) x 3.3 mm (H) (see the following figure)



### 2.2 Pin Definition

Table 2.1 describes the common pins.

No.	Symbol	I/O Type	Function
1	NC	/	Disconnected to be compatible with other modules
2	GPIOA_22	I/O	GPIOA_22
3	CHIP_EN	I/O	The pin function is disabled by firmware, user can choose not to connect.
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

No.	Symbol	I/O Type	Function
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

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

#### 3.2 Electrical conditions

Table 3.2 Normal electrical conditions

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
Ta	Operating temperature	-20	-	105	°C
VDD	Operating voltage	3.0	-	3.6	V
VIL	I/O low-level input	-0.3	-	VDD x 0.25	V

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
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
I <sub>max</sub>	I/O drive current	-	-	16	mA
C <sub>pad</sub>	Input pin capacitance	-	2	-	pF

### 3.3 Wi-Fi TX power consumption

Table 3.3 TX power during constant emission

Symbol	Mode	Rate	Typical value	Unit
IRF	11b 11 Mbit/s	17 dBm	287	mA
IRF	11b 11 Mbit/s	18 dBm	295	mA
IRF	11g 54 Mbit/s	15 dBm	255	mA
IRF	11g 54 Mbit/s	17.5 dBm	267	mA
IRF	11n BW20 MCS7	13 dBm	244	mA
IRF	11n BW20 MCS7	16.5 dBm	257	mA
IRF	11n BW40 MCS7	13 dBm	220	mA

Symbol	Mode	Rate	Typical value	Unit
IRF	11n BW40 MCS7	16.5 dBm	230	mA

### 3.4 Wi-Fi RX power consumption

Table 3.4 RX power during constant receiving

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

### 3.5 Power consumption in working mode

Table 3.5 Operating current

Working mode	Working status (Ta = 25°C)	Typical value	Maximum value	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

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Working mode	Working status (Ta = 25°C)	Typical value	Maximum value	Unit
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

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**Note:** The peak duration is about 5  $\mu$ s.

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 band	2.400 GHz to 2.4835 GHz
Wi-Fi standard	IEEE 802.11b/g/n (channels 1 to 14)
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 output performance

Table 4.2 TX power during constant emission

Parameter	Minimum value	Typical value	Maximum value	Unit
RF average output power, 802.11b CCK mode	-	17.5	-	dBm
RF average output power, 802.11g OFDM mode	-	14.5	-	dBm

Parameter		Minimum value	Typical value	Maximum value	Unit
RF average output power, 802.11n OFDM mode	MCS7	-	13.5	-	dBm
Frequency error		-20	-	20	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	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

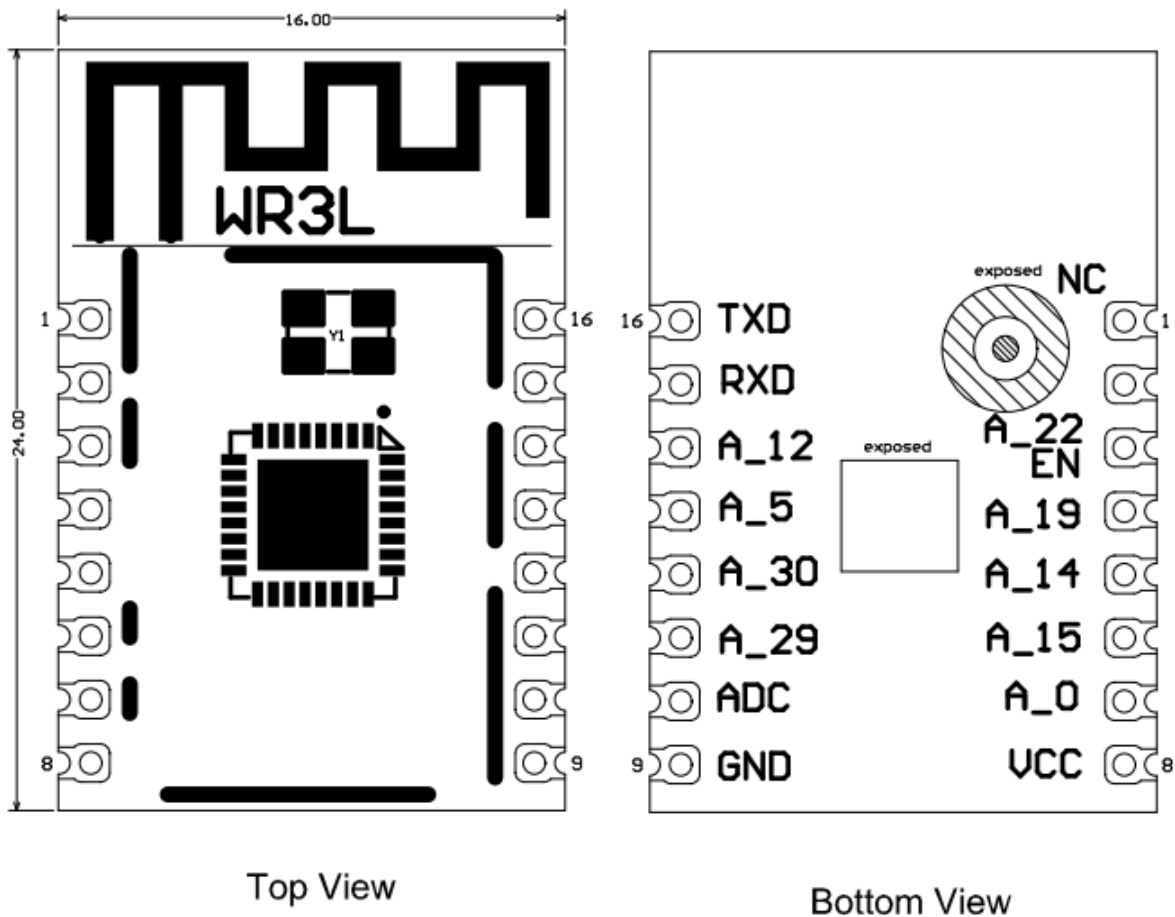
Only the onboard PCB antenna is used.

### 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 instructions

### 6.1 Mechanical dimensions



### 6.2 Recommended PCB encapsulation

Figure 6.3 Pin mapping



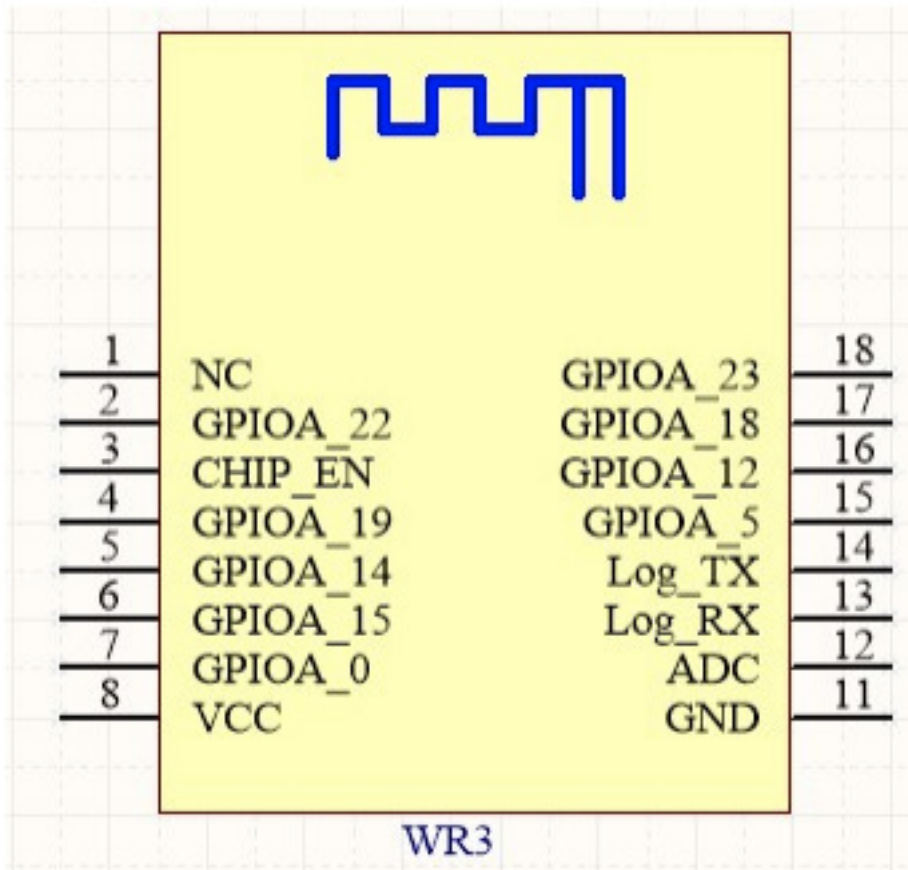
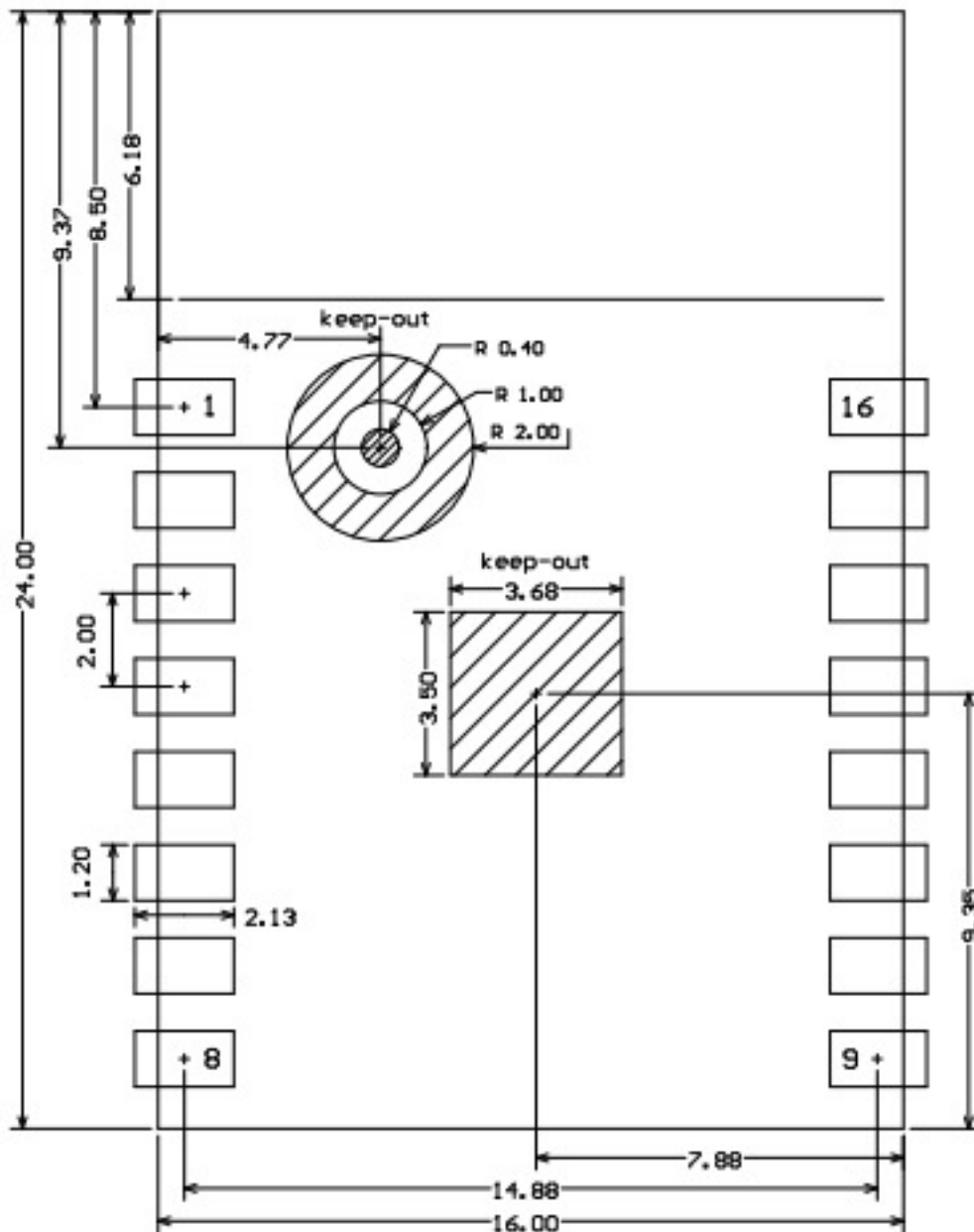


Figure 6.4 Module PBC Encapsulation

### Recommended footprint

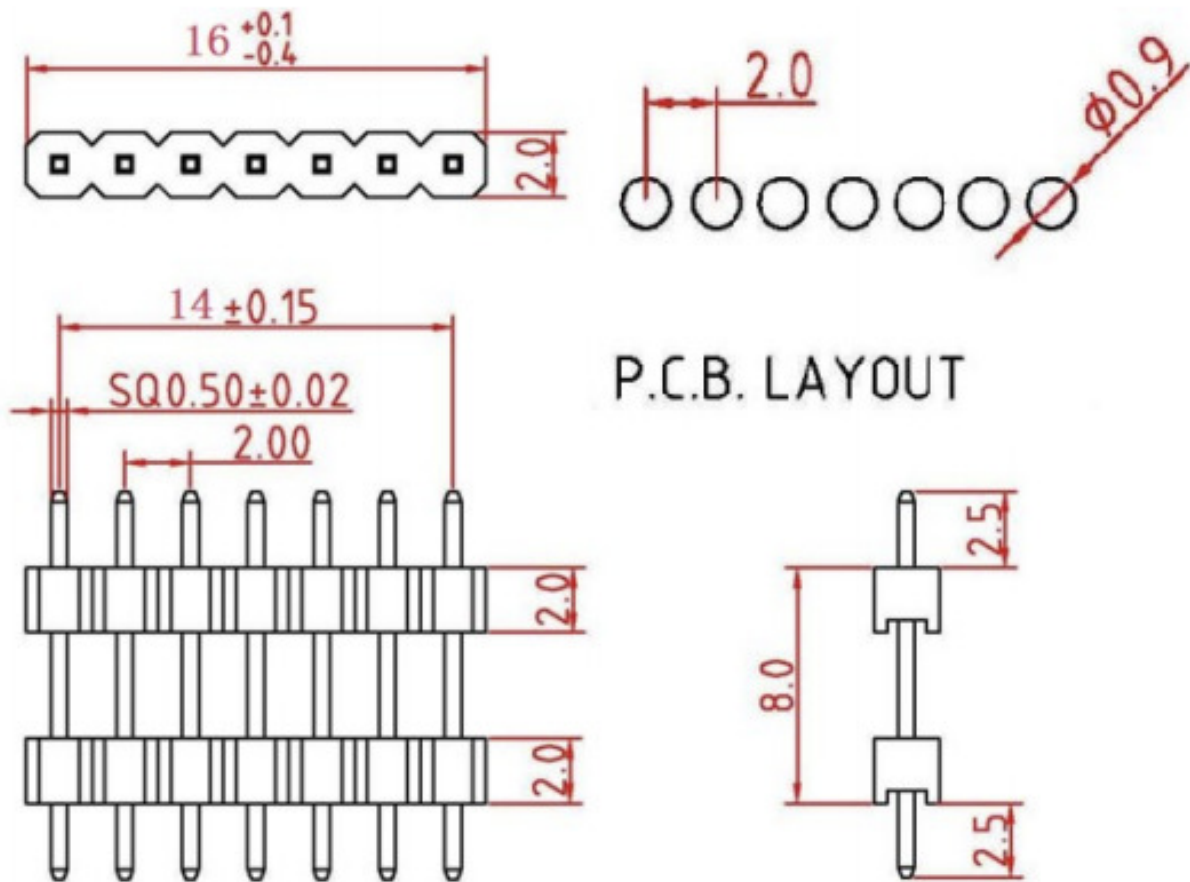


### 6.3 Pin header specifications

WR3L provides models with and without pin headers, respectively, which can be used as required.

The following figure shows the pin header dimensions and recommended layout

(unit: mm).



#### 6.4 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.

### 6.5 Recommended oven temperature profile

Refer to IPC/JEDEC standard ; Peak Temperature :  $<250^{\circ}\text{C}$  ; Number of Times:  $\leq 2$  times ;

