



Tuya Smart Wi-Fi Module

1. Product Overview

AUX_LM is a low power consumption module with Serial Communication of 12V Level to 3.3V Level Wi-Fi connectivity solution designed by Hangzhou Tuya Information Technology Co.,Ltd..The Wi-Fi Module consists of a highly integrated wireless radio chip W302I1160P1 and some extra flash that has been programmed with Wi-Fi network protocol and plenty of software examples. AUX_LM include a ARM CM4F, WLAN MAC, 1T1R WLAN, maximum frequency reaches 125MHz, 256K SRAM, 2M byte flash and various peripheral resources.

AUX_LM is a RTOS platform, embedded with all the Wi-Fi MAC and TCP/IP protocol function examples, users can customize their Wi-Fi product by using these software examples.

Features

- ✧ Integrated low power consumption 32-bit CPU, also known as application processor
- ✧ Basic frequency of the CPU can support 125 MHz
- ✧ Peripherals: 7 GPIO channels, 1 UART
- ✧ Wi-Fi connectivity:
 - 802.11 B/G/N20/N40
 - Channel 1 to 11 @ 2.4GHz
 - Support WPA/WPA2
 - Support SmartConfig function for both Android and IOS devices
 - On-board PCB antenna
 - Operating temperature range: -20°C to 85°C

Main Application Fields

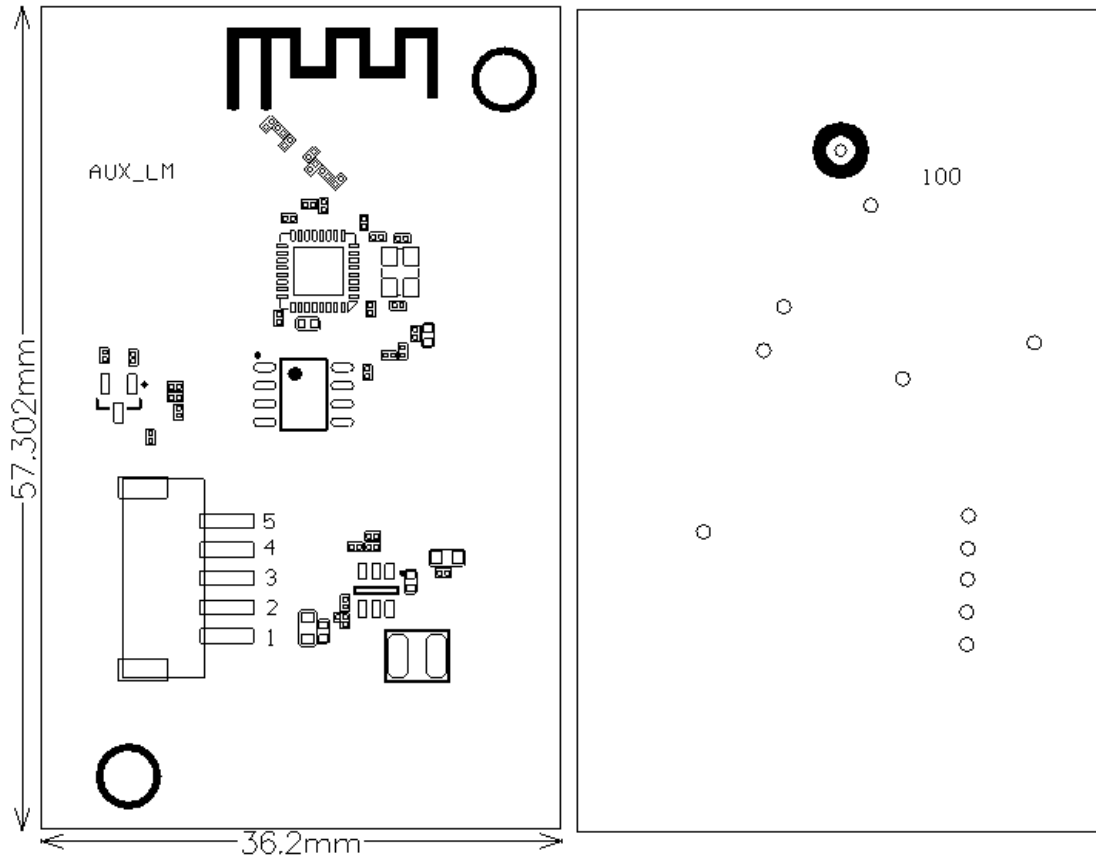
- ✧ Intelligent Building
- ✧ Intelligent home, Intelligent household applications
- ✧ Healthy devices
- ✧ Industrial wireless control
- ✧ Baby monitor
- ✧ Webcam
- ✧ Intelligent bus

2. Dimensions and Footprint

2.1 Dimensions

AUX_LM size: 57.3 mm (W)*36.2 mm (L)*7.2 mm (H) package as shown in Figure 2.1:
The tolerance of length and width of PCB is (± 0.25 mm) and that of thickness is (± 0.1 mm).

Figure 2.1. The dimensions of AUX_LM



2.2 Pin Definition

Table 1 shows the general pin attributes of AUX_LM

Table 1. The typical pin definition of AUX_LM

PIN NO.	NAME	TYPE	DISCREPTION
1	VDD	P	Supply voltage (12V)
2	GND	P	Ground
3	EN	I/O	DC-DC Power Enabling Foot
4	RXD	I/O	UART0_RXD
5	TXD	I/O	UART0_TXD

Note: P: Power supply pins; I/O: Digital input or output pins; AI: Analog input.

3. Electrical Characteristics

Absolute Maximum Ratings

Table 3.1. Absolute Maximum Ratings

PARAMETERS	DESCRIPTION	MIN	MAX	UNIT
Ts	Storage temperature	-40	125	°C
VCC	Supply voltage	-0.3	18	V
Static electricity voltage (human model)	TAMB-25°C	-	2	KV
Static electricity voltage (machine model)	TAMB-25°C	-	0.5	KV

Electrical Conditions

Table 3.2. Electrical Conditions

PARAMETERS	DESCRIPTION	MIN	TYPICAL	MAX	UNIT
Ta	Working temperature	-20	-	85	°C
VCC	Working voltage	4.5	-	18	V
VIL	IO low level input	-0.3	-	0.8	V
VIH	IO high level input	2.47	-	3.6	V
VOL	IO low level output	-	-	0.34	V
VoH	IO high level output	2.64	-	3.4	V
I _{max}	IO drive current	-	-	16	mA
C _{pad}	Input capacitor	-	2	-	pF

Wi-Fi Transmitting Current Consumptions

Table 3.3. Wi-Fi TX current consumption

PARAMETERS	MODE	RATE	Transmitting power	TYPICAL	UNIT
IRF	11b	1Mbps	+23.09dBm	287	mA
IRF	11g	6Mbps	+25.13dBm	255	mA
IRF	11n-HT20	MCS0	+24.26dBm	244	mA
IRF	11n-HT40	MCS0	+23.53dBm	220	mA

Wi-Fi Receiving Current Consumptions

Table 3.4. Wi-Fi RX current consumption

PARAMETERS	MODE	TYPICAL	UNIT
IRF	CPU sleep	90	mA
IRF	CPU active	120	mA

Working Mode Current Consumptions

Table 3.5. The module working current consumption

WORK MODE	AT TA=25℃	TYPICAL	MAX*	UNIT
EZ Mode	AUX_LM is under EZ pairing mode, Wi-Fi indicator light flashes quickly	115	125	mA
Standby Mode	AUX_LM is connected, Wi-Fi indicator light is on	60	209	mA
Operation Mode	AUX_LM is connected, Wi-Fi indicator light is on	118	198	mA
Disconnection Mode	AUX_LM is disconnected, Wi-Fi indicator light is off	34	192	mA

Note: peak continuous time is about 5us.

The parameter shown above will vary depending on different firmware functions.

4. WLAN Radio Specification

Basic Radio Frequency Characteristics

Table 41. Basic Radio frequency characteristics

PARAMETERS	DESCRIPTION
Frequency band	2.412GHz to 2.462GHz
Wi-Fi standard	IEEE 802.11n/g/b (Terminal 1-11)
Data transmitting rate	11b:1,2,5.5,11(Mbps)
	11g:6,9,12,18,24,36,48,54(Mbps)
	11n:HT20,MCS0~7
	11n:HT40,MCS0~7
Antenna type	On-board PCB Antenna

Wi-Fi Receiving Sensitivity

Table 4.3. Wi-Fi Receiving sensitivity

PARAMETERS		MIN	TYPICAL	MAX	UNIT
PER<8%, Receiving sensitivity, 802.11b CCK Mode	11M	-	-91	-	dBm
PER<10%, Receiving sensitivity, 802.11g OFDM Mode	54M	-	-75	-	dBm
PER<10%, Receiving sensitivity, 802.11n OFDM Mode	MCS7	-	-72	-	dBm

5. Antenna Information

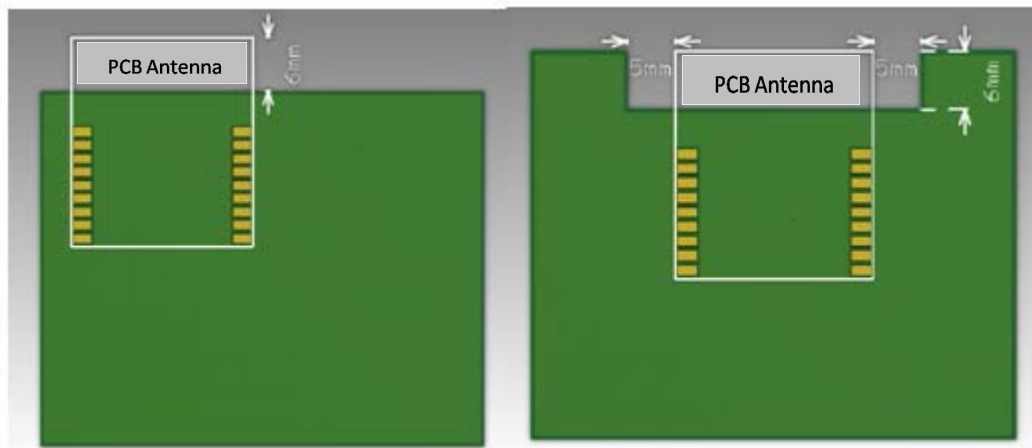
Antenna Type

PCB board antenna

Reduce Antenna Interference

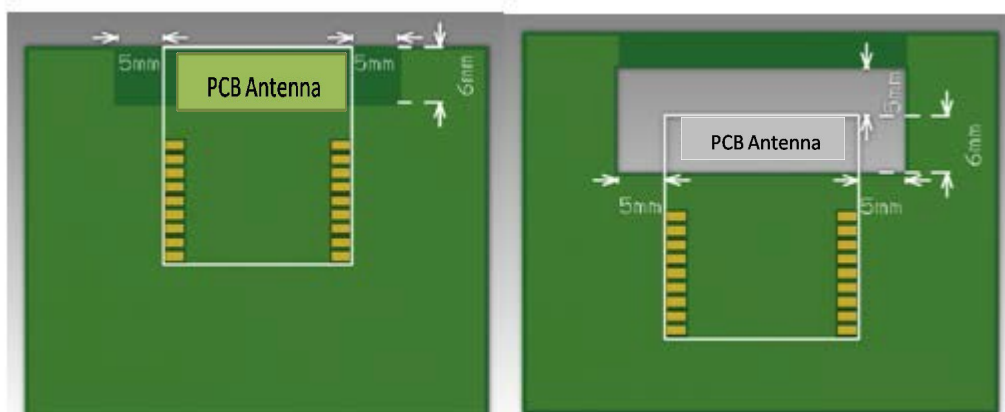
While using the On-board PCB antenna, in order to have the best Wi-Fi performance, it's recommended to keep a minimum 15mm distance between the antenna part and the other metal pieces.

Fig. 1 shows five common antenna placement modes, of which scheme 1 and scheme 2 have the best performance, and have little influence on the RF performance, which is comparable to the RF performance tested by the module alone. If the design is limited, the PCB antenna must be placed on the bottom board, you can refer to the placement of scheme 3, but there will be some loss of radio frequency performance, almost 1-2 dBm attenuation. The radio frequency performance of scheme 5 is the worst. Because the antenna is placed in the bottom plate, the radio frequency signal can not be transmitted and received well, so it is not recommended to use.



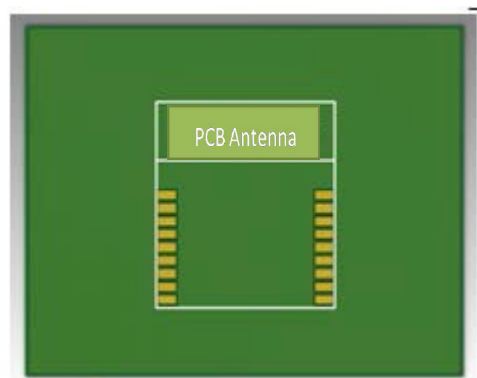
Scheme 1: The antenna is outside the frame.

Scheme 2: The antenna is placed along the edge of the plate and hollowed underneath.



Scheme 3: The antenna is placed along the edge of the plate without copper cladding underneath.

Scheme 4: The antenna is placed in the frame and hollowed out below.

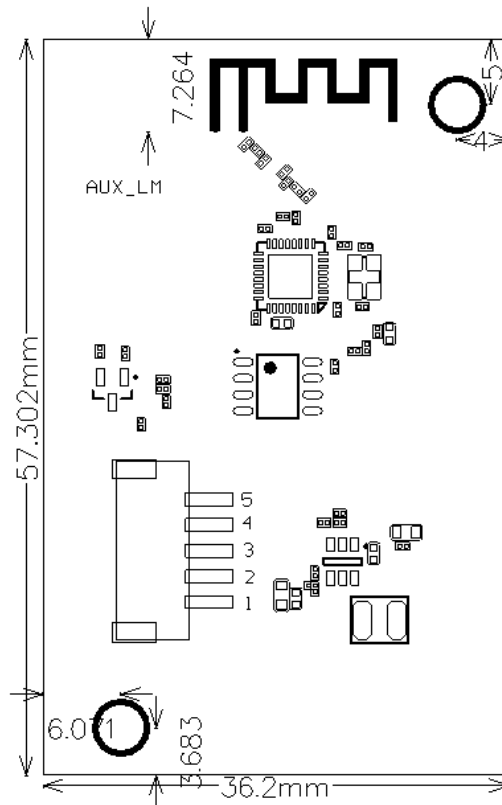


Scheme 5: The antenna is in the frame and there is no clearance below.

6. Packaging Information And Production Guide

Mechanical Dimensions

Figure 6.1. Top view of the module



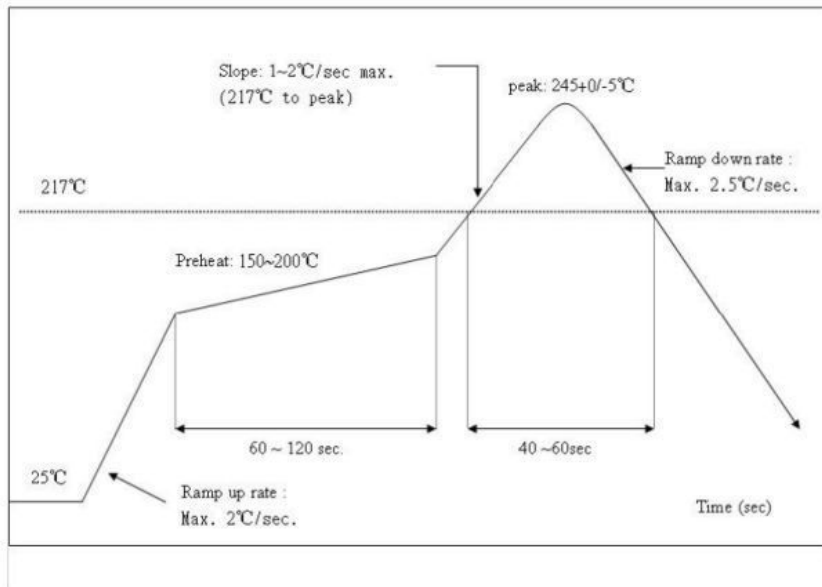
Production Guide

- ◇ The storage for the delivered module should meet the following condition:
 1. The anti-moisture bag should be kept in the environment with temperature <math>< 30^{\circ}\text{C}</math> and humidity <math>< 85\% \text{ RH}</math>.
 2. The expiration date is 6 months since the dry packaging products was sealed.
- ◇ Cautions:
 1. All the operators should wear electrostatic ring in the whole process of production.
 2. While operating, water and dirt should not have any contact with the modules.

Recommended furnace temperature curve

Figure 6.4. PCB Package Drawing Recommended furnace temperature curve

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



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.

FCC Radiation Exposure Statement:

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.

FCC Label Instructions:

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-AUXLM", or "Contains FCC ID: 2ANDL-AUXLM", Any similar wording that expresses the same meaning may be used.

Regulatory Module Integration Instructions

This device complies with part 15.247 of the FCC Rules.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The antenna is integral PCB Antenna and maximum gain is 2.5dBi .

This Wi-Fi module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

The host product with the module installed must be evaluated for simultaneous transmission requirements.

The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, use this module only with the included onboard antenna.

The final host / module combination may also 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.