

Tuya Smart Wi-Fi Module

1 Product Overview

TYLC6 is a low power-consuming built-in Wi-Fi module developed by Hangzhou Tuya Inc. It consists of a highly integrated RF microchip (ESP8285) and several peripheral components, with a built-in Wi-Fi network protocol stack and robust library functions. TYLC6 is embedded with a 32-bit CPU with low power consumption, 1 MB flash memory, 50 KB SRAM, and rich peripheral resources.

TYLC6 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 shows the architecture of TYLC6.

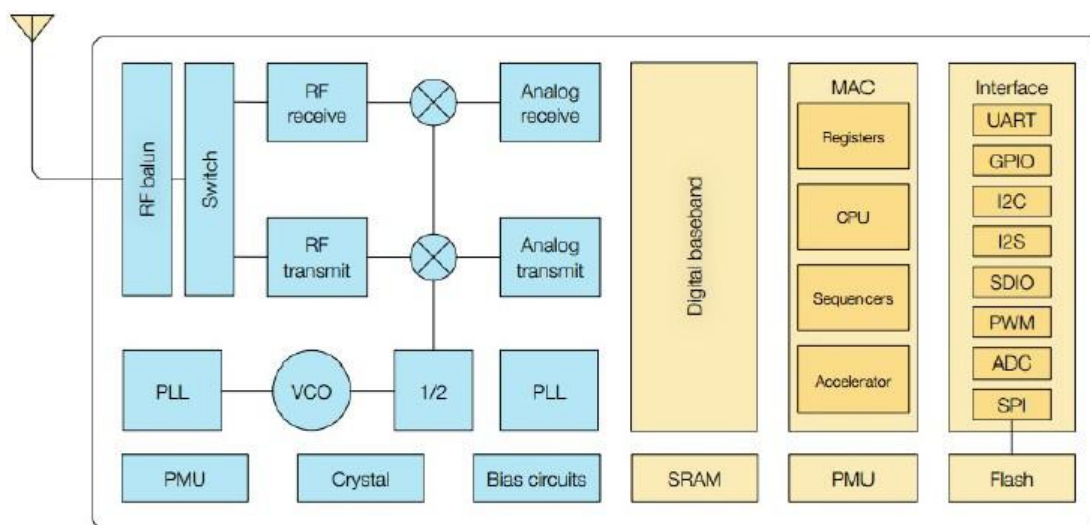


Figure 1 TYLC6 architecture

1.1 Features

- ◇ Built-in low power-consuming 32-bit CPU functioning as an application processor
 - Basic frequencies: 80 MHz and 160 MHz
- ◇ Working voltage: 3.0 V to 3.6 V
- ◇ Peripherals: three GPIOs
- ◇ Wi-Fi connectivity
 - 802.11b/g/n

- Channels 1 to 14 at 2.4 GHz
- WPA/WPA2 security mode
- Up to +20 dBm EIRP output power in 802.11b mode
- STA/AP/STA+AP working mode
- SmartConfig and AP network configuration modes (for Android and iOS devices)
- External welded helical spring antenna
- Working temperature: -20°C to +105°C

1.2 Applications

- ◇ Intelligent building
- ◇ Smart home and household appliances
- ◇ Intelligent socket and light
- ◇ Industrial wireless control
- ◇ Baby monitor
- ◇ Network camera
- ◇ Intelligent bus

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2 Module Interfaces

2.1 Dimensions and Footprint

TYLC6 has two rows of pins with a 2 mm pin pitch.

Dimensions (H x W x D) of TYLC6 are as follows: 3 mm x 12 mm x 14 mm. The error tolerance is ± 0.3 mm. Figure 2 shows the dimensions of TYLC6.

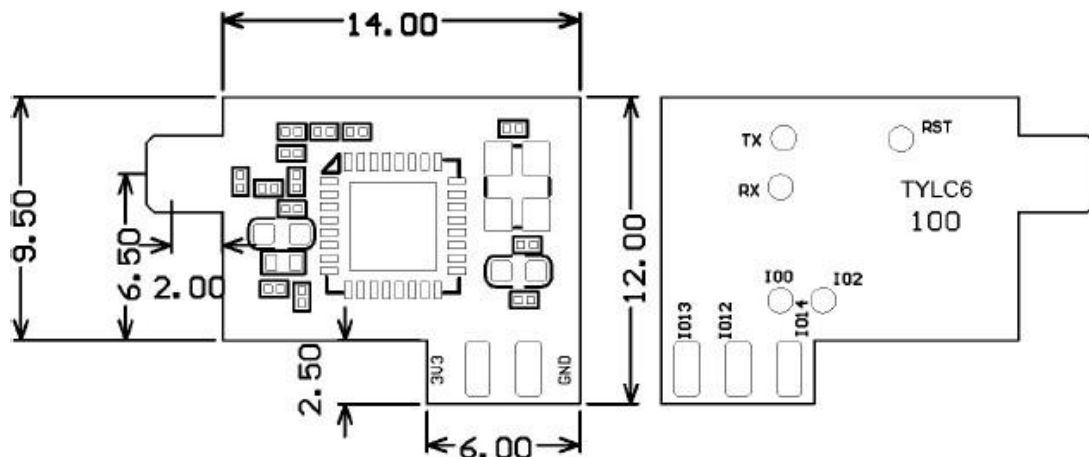


Figure 2 TYLC6 dimensions

2.2 Pin Definition

Table 1 TYLC6 interface pins

No.	Symbol	I/O Type	Function
1	GPIO14	I/O	GPIO_14
2	VCC	P	Module power supply pin (3.3 V)
3	GPIO12	I/O	GPIO_12
4	GND	P	Power supply reference ground pin
5	GPIO13	I/O	GPIO_13

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

2.3 Test Pin Definition

Table 2 TYLC6 test pins

No.	Symbol	I/O Type	Function
1	TP1	I/O	GPIO2, used for query of the module printing information
2	TP2	I/O	GPIO0, used for the module production testing
3	TP3	Rst	Module hardware reset pin, which cannot clear the Wi-Fi network configuration
4	TP4	U0TXD	User serial port, which generates information for module production testing when the module is powered on and starts
5	TP5	U0RXD	User serial port, which generates information for module production testing when the module is powered on and starts

3 Electrical Parameters

3.1 Absolute Electrical Parameters

Table 3 Absolute electrical parameters

Parameter	Description	Minimum Value	Maximum Value	Unit
T _s	Storage temperature	-40	+125	°C
V _{CC}	Power supply voltage	-0.3	+3.6	V
Static electricity voltage (human body model)	TAMB – 25°C	N/A	2	kV
Static electricity voltage (machine model)	TAMB – 25°C	N/A	0.5	kV

3.2 Electrical Conditions

Table 4 Normal electrical conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
T _a	Working temperature	-20	N/A	+105	°C
V _{CC}	Working voltage	3.0	3.3	3.6	V
V _{IL}	I/O low-level input	-0.3	N/A	V _{CC} x 0.25	V
V _{IH}	I/O high-level input	V _{CC} x 0.75	N/A	V _{CC}	V
V _{OL}	I/O low-level output	N/A	N/A	V _{CC} x 0.1	V
V _{OH}	I/O high-level output	V _{CC} x 0.8	N/A	V _{CC}	V

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
I_{max}	I/O drive current	N/A	N/A	12	mA

3.3 Wi-Fi TX Power Consumption

Table 5 TX power consumption during constant emission

Symbol	Parameter			Typical Value	Unit
	Mode	Rate	TX Power		
I_{RF}	802.11b	11 Mbit/s	+17 dBm	220	mA
I_{RF}	802.11g	54 Mbit/s	+15 dBm	110	mA
I_{RF}	802.11n	MCS7	+13 dBm	100	mA

3.4 Wi-Fi RX Power Consumption

Table 6 RX power consumption during constant receiving

Symbol	Mode	Rate	Typical Value	Unit
I_{RF}	802.11b	11 Mbit/s	76	mA
I_{RF}	802.11g	54 Mbit/s	76	mA
I_{RF}	802.11n	MCS7	76	mA

3.5 Working Power Consumption

Table 7 TYLC6 operating current

Working Mode	Working Status (Ta = 25°C)	Average Value	Maximum Value	Unit
EZ mode	The module is in EZ mode, and the Wi-Fi indicator quickly flashes.	80	151	mA
AP mode	The module is in AP mode, and the Wi-Fi indicator slowly flashes.	90	451	mA
Connection mode	The module is connected to the network, and the Wi-Fi indicator is steady on.	58.5	411	mA
Disconnection mode	The module is disconnected from the network, and the Wi-Fi indicator is steady off.	80	430	mA

4 RF Features

4.1 Basic RF Features

Table 8 Basic RF features

Parameter	Description
Frequency band	2.412 GHz to 2.484 GHz (Ch1-11 for US/CA, Ch1-13 for EU/CN)
Wi-Fi standard	IEEE 802.11b/g/n (channels 1 to 14)
Data transmission rate	802.11b: 1, 2, 5.5, or 11 (Mbit/s) 802.11g: 6, 9, 12, 18, 24, 36, 48, or 54 (Mbit/s) 802.11n: HT20 MCS0 to MCS7
Antenna type	External antenna (welded)

4.2 Wi-Fi Output Power

Table 9 TX power during constant emission

Parameter		Minimum Value	Typical Value	Maximum Value	Unit
Average RF output power, 802.11b CCK mode	1 Mbit/s	N/A	20	N/A	dBm
Average RF output power, 802.11g OFDM mode	54 Mbit/s	N/A	17	N/A	dBm
Average RF output power, 802.11n OFDM mode	MCS7	N/A	14	N/A	dBm
Frequency error		-10	N/A	+10	ppm

4.3 Wi-Fi RX Sensitivity

Table 10 RX sensitivity

Parameter		Minimum Value	Typical Value	Maximum Value	Unit
PER < 8%, 802.11b CCK mode	1 Mbit/s	N/A	-91	N/A	dBm
PER < 10%, 802.11g OFDM mode	54 Mbit/s	N/A	-75	N/A	dBm
PER < 10%, 802.11n OFDM mode	MCS7	N/A	-72	N/A	dBm

5 Antenna Information

5.1 Antenna Types

An external antenna can be welded to the ANT connector of the module.
A 28 mm antenna is recommended. Figure 3 shows the antenna dimensions.

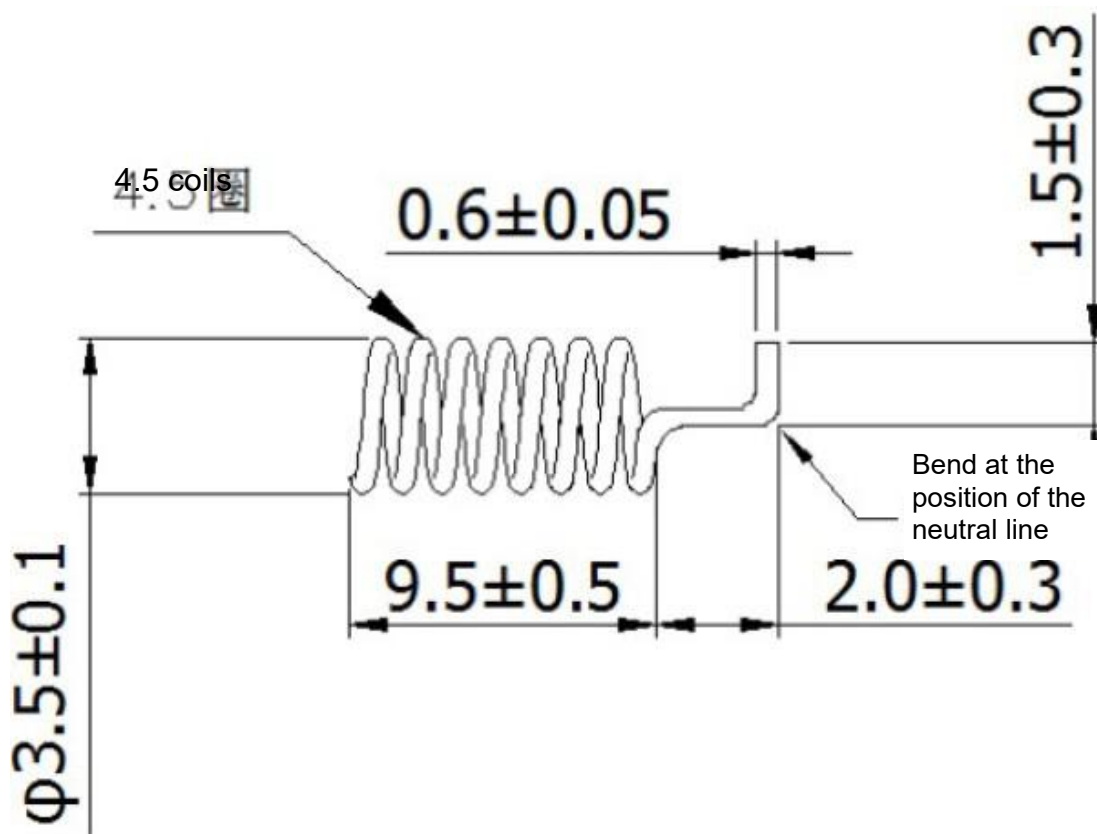


Figure 3 Antenna dimensions

5.2 Antenna Interference Reduction

To ensure optimal Wi-Fi performance when the Wi-Fi module uses an external antenna, it is recommended that the antenna be at least 10 mm away from other metal parts.

6 Packaging Information and Production

Instructions

6.1 Mechanical Dimensions

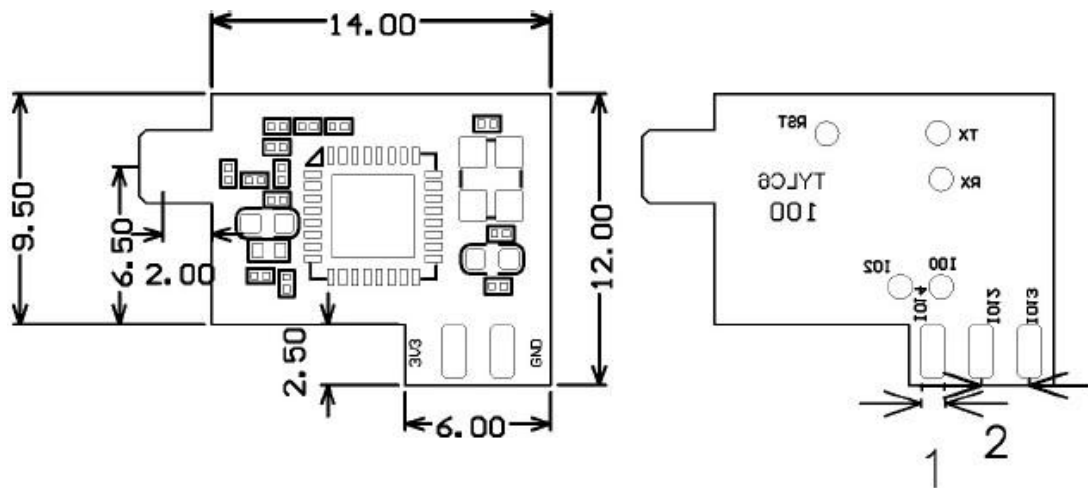


Figure 4 TYLC6 mechanical dimensions (unit: mm)

6.2 Recommended PCB Encapsulation

It is recommended that the thickness of the PCB be 1.0 mm, with a ± 0.1 mm error tolerance.

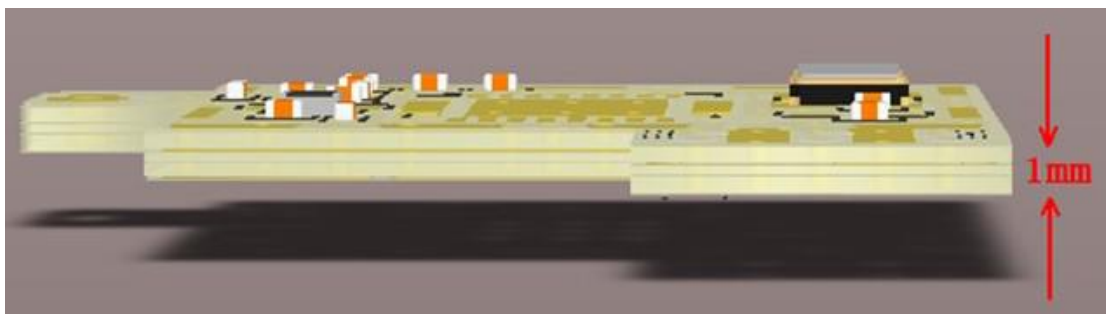


Figure 5 PCB thickness

6.3 Production Instructions

Storage conditions of a delivered module are as follows:

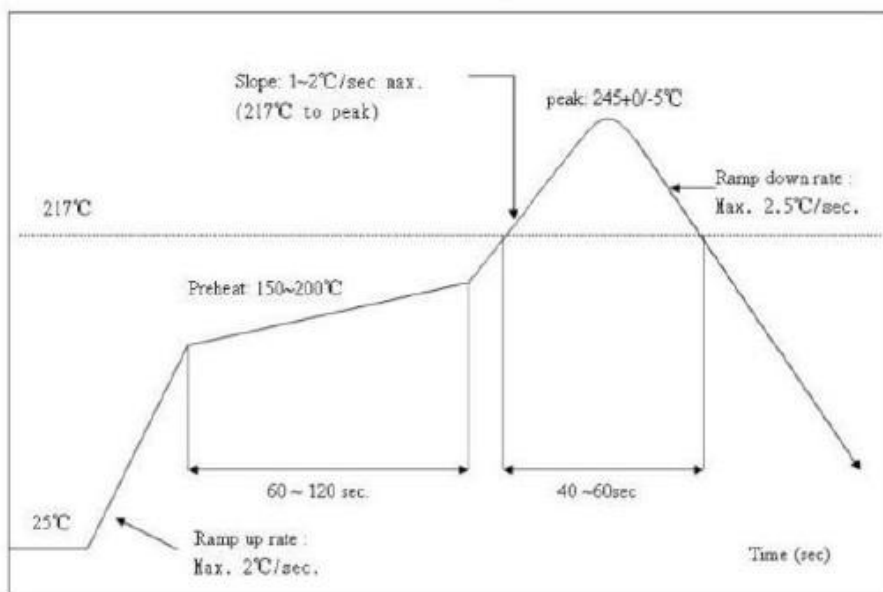
1. The anti-moisture bag must be placed in an environment where the temperature is below 30°C and the relative humidity is lower than 85%.
2. The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed.

Precautions:

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

6.4 Recommended Oven Temperature Curve

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



Change History

No.	Date	Change Description	Version After Change
1	2019-02-19	This is the first release.	V1.0.0

Appendix: Statement

Federal Communications Commission (FCC) Declaration of Conformity

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body.

Radiation Exposure Statement:

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The availability of some specific channels and/or operational frequency bands is country dependent and firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labeled in a visible area with the following:

"Contains Transmitter Module FCC ID:2ANDL-TYLC6"

This radio module must not be installed to co-locate and operating simultaneously with other radios in host system, additional testing and equipment authorization may be required to operating simultaneously with other radio.

Declaration of Conformity European notice

Hereby, Hangzhou Tuya Information Technology Co., Ltd. declares that this Wi-Fi module product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU. A copy of the Declaration of conformity can be found at <https://www.tuya.com>.