TCL TYWE1S Smart Wi-Fi Module User Manual

Contents

TCL TYWE1S Smart Wi-Fi Module Use

Product Overview

TYWE1S is a low power consumption module with a built-in Wi-Fi connectivity solution designed by TCL Air conditioner (Zhong Shan) Co., Ltd.. The Wi-Fi Module consists of a highly integrated wireless radio chip ESP8266 and some extra component that has been programed with Wi-Fi network protocol and plenty of software examples. TYWE1S include a 32-bit CPU, 1Mbyte flash, 50k SRAM, and various peripheral

Features

- Integrated low power consumption 32-bit CPU, also known as application processor
- Basic frequency of the CPU can support both 80MHz and 160MHz
- Supply voltage range: 3V to 3.6V
- Peripherals: 9 GPIO channels, 1 UART, 1 ADC
- Wi-Fi connectivity:
- 802.11 b/g/n
- channel 1 to 11@2.4G for FCC, channel 1 to 13 @2.4G for EU and Japan
- Support WPA/WPA2
- +20dBm output power in 802.11b mode
- Support STA/AP/STA+AP opera
- Support SmartConfig function for both Android and IOS devices
- On-board PCB antenna
- Operating temperature range: -20℃ to 85℃

Main Application Fields

- Intelligent Building
- Intelligent home, Intelligent household applications

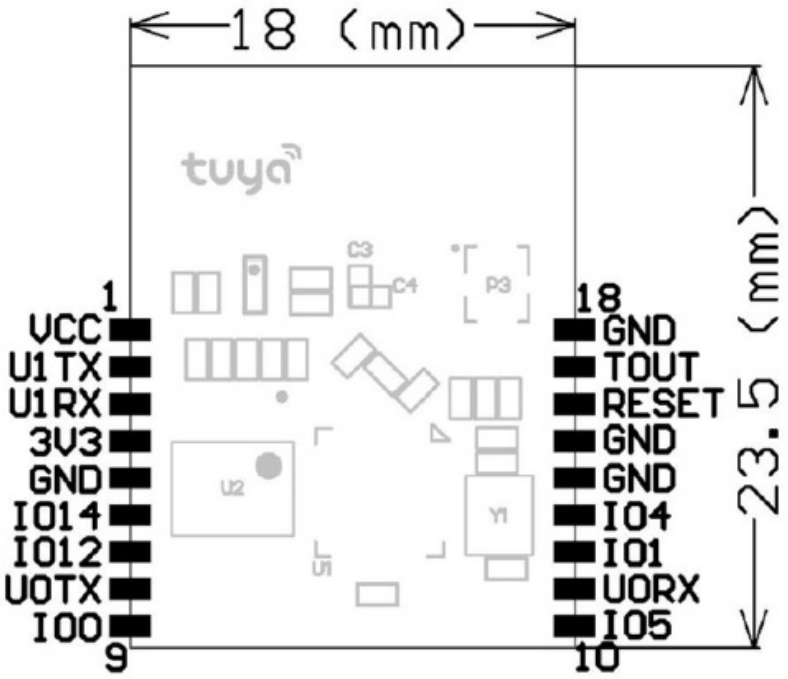
- Health care
- Industrial wireless control
- Baby monitor
- Webcam
- Intelligent bus

Dimensions and Footprint

2.1 Dimensions

TYWE1S has 2 columns of Pins. The distance between each Pin is 2mm. Size of TYWE1S: 16mm(W)*24mm(L)*3.5mm(H)
Figure 2 shows the dimensions of TYWE1S.

Figure 2. The dimensions of TYWE1S



Pin Definition

Pin	Name	Type	Discreption
1	VCC	P	Power supply 3.3V
2	U1TX	I/O	TXD port user
3	U1RX	I/O	RXD Port user

4	3V3	P	Module mains 3.3V
5	GND	P	Reference Ground
6	IO14	O	GPIO_14
7	IO12	O	GPIO_14
8	U0TX	P	TXD print internal data
9	IO0	P	/
10	IO5	I/O	GPIO_5
11	U0RX	I/O	RXD print internal data
12	IO1	I/O	GPIO_1
13	IO4	I/O	GPIO_4
14	GND	P	Reference Ground
15	GND	P	Reference Ground
16	RESET	I/O	External reset
17	TOUT	AI	ADC port
18	GND	P	Reference Ground

Electrical Characteristics

Absolute Maximum Ratings

PARAMETERS	DESCRIPTION	MIN	MAX	UNIT
Ts	Storage temperature	**-20**	**85**	℃
VCC	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**

Electrical Conditions

Table 2. Electrical Conditions

PARAMETERS	DESCRIPTION	MIN	TYPICAL	MAX	UNIT
Ta	Working temperature	-20	-	85	℃
VCC	Working voltage	3	3.3	3.6	V
VIL	IO low level input	-0.3	-	VCC*0.25	V
VIH	IO high level input	VCC*0.75	-	VCC	V
VOL	IO low level output	-	-	VCC*0.1	V
VoH	IO high level output	VCC*0.8	-	VCC	V
Imax	IO drive current	-	-	12	mA

3.3 Wi-Fi Transmitting Current Consumptions

Table 3. Wi-Fi TX current consumption

PARAMETERS	MODE	RATE	transmitting power	TYPICAL	UNIT
IRF	11b	11Mbps	+17dBm	220	mA
IRF	11g	54Mbps	+15dBm	110	mA
IRF	11n	MCS7	+13dBm	100	mA

3.4 Wi-Fi Receiving Current Consumptions

Table 5. Wi-Fi RX current consumption

PARAMETERS	MODE	RATE	TYPICAL	UNIT
IRF	11b	11Mbps	76	mA
IRF	11g	54Mbps	76	mA
IRF	11n	MCS7	76	mA

Working Mode Current Consumptions

Table 5. The module working current consumption

WORK MODE	AT TA=25℃	TYPICAL	MAX*	UNIT
EZ Mode	TYWE3S is under EZ paring mode, Wi-Fi indicator light flashes quickly	80	151	mA
AP Mode	TYWE3S is under AP paring mode, Wi-Fi indicator light flashes slowly	90	451	mA
Operation Mode	TYWE3S is connected, Wi-Fi indicator light is on	58.5	411	mA
Disconnection Mode	TYWE3S is disconnected, Wi-Fi indicator light is off	80	430	mA

WLAN Radio Specification

Basic Radio Frequency Characteristics

Table 6. Basic Radio frequency characteristics

PARAMETERS	DESCRIPTION
Frequency band	2.412GHz to 2.484GHz
Wi-Fi standard	IEEE 802.11n/g/b (Terminal 1-14)
Data transmitting rate	11b:1,2,5.5,11(Mbps)
	11g:6,9,12,18,24,36,48,54(Mbps)
	11n:HT20, MCS0~7
Antenna type	On-board PCB Antenna

4.2 Wi-Fi Transmitting Power

Table 7. Wi-Fi transmitting power

PARAMETERS		MIN	TYPICAL	MAX	UNIT
RF average output power, 802.11b CCK Mode	11M	-	20	-	dBm
RF average output power, 802.11g OFDM Mode	54M	-	17	-	dBm
RF average output power, 802.11n OFDM Mode	MCS7	-	14	-	dBm
The Frequency error		-10	-	10	ppm

4.3 Wi-Fi Receiving Sensitivity

Table 8. 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

Antenna Information

Antenna Type

The antenna can be connected only using onboard PCB antenna.

Reduce Antenna Interference

While using the Onboard 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.
The user's own PCBA design is recommended NOT to pass any wire, NOT do copper pour under the region of the module's antenna, to avoid interferences.

IC Warning

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) This device may not cause interference, and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.For a host manufacture's using a certified modular, if (1) the module's IC number is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the IC number of the module is visible; then an additional permanent label referring to the enclosed module: "Contains Transmitter Module IC: "
27228-TYWE1S " or "Contains IC: 27228-TYWE1S" must be used.

FCC Statement

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. Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: 2AJCLTYWE1S Or Contains FCC ID: 2AJCLTYWE1S"
When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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. (2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. Radiation Exposure Statement This modular complies with RF 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. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

General Statements

1. Module use PCB antenna, the maximum gain is 0dBi.
2. Any change of antenna type is not allowed, the module only use a PCB antenna.
3. The host containing modules must comply with FCC Rule requirements.

List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3
Explanation: This module meets the requirements of FCC part 15.247. 2.3 Summarize the specific operational use conditions Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or

compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.
Explanation: The EUT has a PCB Antenna, and the antenna use a permanently attached antenna that is not replaceable.

Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.
A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.
This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.
Explanation: The module is not a limited module.

Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

- Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- Appropriate parts by manufacturer and specifications;
- Test procedures for design verification; and
- Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.
Explanation: Yes, The module with trace antenna designs, and This manual has been shown the layout of trace design, antenna, connectors, and isolation requirements.

RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end-users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).
Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID 2AJCLTYWE1S.

Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "Omni-directional antenna" is not considered to be a specific "antenna type")).
For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.
Explanation: The EUT has a PCB Antenna, and the antenna use a permanently attached antenna which is unique.

Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.
Explanation: The host system using this module, should have the label in a visible area indicating the following texts: "Contains FCC ID:

Information on test modes and additional testing requirements 5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.
Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulate or characterize a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.
Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulate or characterize a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.
Explanation: The module is without unintentional-radiator digital circuity, so the module does not require an

evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.

Documents / Resources

	TCL TYWE1S Smart Wi-Fi Module [pdf] User Manual TYWE1S, 2AJCLTYWE1S, TYWE1S, Smart Wi-Fi Module