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1 Product Overview

TYWE2S is a low-power embedded Wi-Fi module developed by Tuya Smart. It consists of a highly integrated ESP8285 wireless RF chip and a small number of peripheral components, and incorporates a Wi-Fi protocol stack together with a rich set of library functions. TYWE2S integrates a low-power 32-bit CPU, 2 MB flash memory, 50 KB SRAM, and extensive peripheral resources. TYWE2S is an RTOS platform that integrates all Wi-Fi MAC and TCP/IP protocol libraries. Users can develop embedded Wi-Fi products that meet their own requirements on this platform.

1.1 Features

- Built-in low-power 32-bit CPU that can also serve as the application processor
  - Clock frequency supports 80 MHz and 160 MHz
- Operating voltage: 3.0-3.6 V
- Peripherals: 5 x GPIO, 1 x UART, and 1 x ADC
- Wi-Fi connectivity
  - IEEE 802.11 b/g/n
  - Channels 1-14 at 2.4 GHz (CH1-11 for US/CA; CH1-13 for EU/CN)
  - Supports WPA/WPA2 security modes
  - Maximum output power of +20 dBm in 802.11b mode
  - Supports STA, AP, and STA+AP operating modes
  - Supports SmartConfig and AP provisioning for Android and iOS devices
  - Onboard PCB antenna
  - Operating temperature: -20°C to 85°C

1.2 Main Applications

- Smart buildings
- Smart homes and appliances
- Smart plugs and smart lighting
- Industrial wireless control
- Baby monitors
- Network cameras
- Smart public transit

2 Revision History

No.	Date	Description	Version
1	2019-07-23	Initial release	V2.0.0
2	2019-09-21	Updated the production process for the plug-in module	V2.0.1

3 Module Interfaces

3.1 Dimensions and Package

TYWE2S has two rows of pins with a 2 mm pin pitch. The module dimensions are 17.3 mm ± 0.35 mm (W) x 15 mm ± 0.35 mm (L) x 2.9 mm ± 0.15 mm (H). The PCB thickness is 0.8 mm ± 0.1 mm.

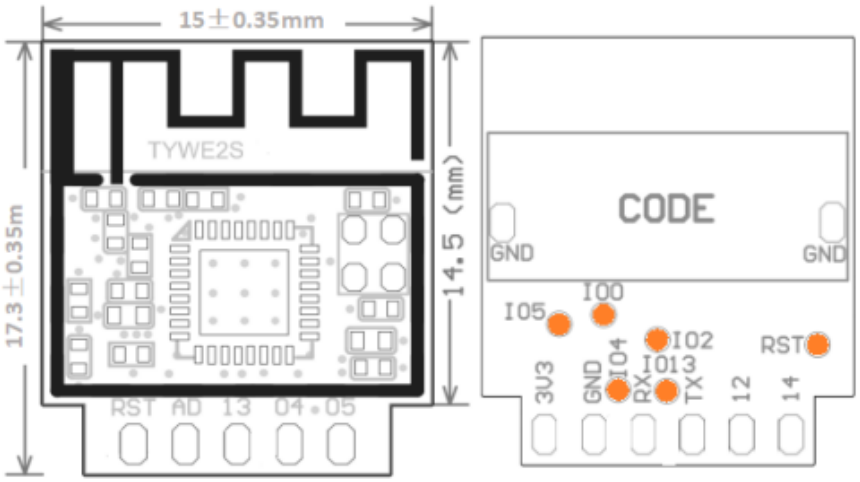


Figure 1. TYWE2S dimensions and pin locations

3.2 Pin Definitions

Standard pin assignment:

Pin	Symbol	I/O Type	Function
1	RST	I/O	Hardware reset pin (active low; internal pull-up resistor)
2	AD	AI	ADC input; 10-bit SAR ADC

Pin	Symbol	I/O Type	Function
3	13	I/O	GPIO13, corresponding to IC MTCK (Pin 12)
4	04	I/O	GPIO04, corresponding to IC GPIO4 (Pin 16)
5	05	I/O	GPIO05, corresponding to IC GPIO5 (Pin 24)
6	3V3	P	Module power-supply pin (3.3 V)
7	GND	P	Power ground
8	RX	I/O	UART0_RXD (used for internal module log output)
9	TX	I/O	UART0_TXD (used for internal module log output)
10	12	I/O	GPIO12, corresponding to IC MTDI (Pin 10)
11	14	I/O	GPIO14, corresponding to IC MTMS (Pin 9)

Notes:

- P indicates a power pin, I/O indicates an input/output pin, and AI indicates an analog input pin.
- RST is only the hardware reset pin of the module; it does not erase Wi-Fi provisioning information.
- The AD pin can only be used as an ADC input and cannot be used as a general-purpose I/O. Leave it floating when unused. When used as an ADC input, its permitted input-voltage range is 0-1.0 V.
- UART0 is the user serial port. It outputs information while the module is powering up; this output may be ignored by the user.

3.3 Test Point Definitions

Test-point assignment:

Pin	Symbol	I/O Type	Function
12	IO4	I/O	GPIO04, corresponding to IC GPIO4 (Pin 16)
13	IO13	I/O	GPIO13, corresponding to IC MTCK (Pin 12)
14	IO2	I/O	UART1_TXD (module information output port)
15	RST	I/O	Reset pin
16	IO5	I/O	GPIO05, corresponding to IC GPIO5 (Pin 24)
17	IO0	I/O	IO0 participates in module boot. When left floating, the module enters its normal operating state.

Notes:

- I/O indicates an input/output pin.
- With IO0 left floating, the module operates normally. When IO0 is held low, the module enters firmware download mode.
- Use of the test points is not recommended.

4 Electrical Characteristics

4.1 Absolute Maximum Ratings

Parameter	Description	Min.	Max.	Unit
Ts	Storage temperature	-40	125	°C
VDD	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

4.2 Operating Conditions

Parameter	Description	Min.	Typ.	Max.	Unit
Ta	Operating temperature	-20	-	85	°C
VCC	Operating voltage	3.0	3.3	3.6	V
VIL	I/O low-level input	-0.3	-	VCC x 0.25	V
VIH	I/O high-level input	VCC x 0.75	-	VCC	V
VOL	I/O low-level output	-	-	VCC x 0.1	V
VOH	I/O high-level output	VCC x 0.8	-	VCC	V
Imax	I/O drive current	-	-	12	mA

4.3 RF Power Consumption

State	Mode	Rate	RF Condition	Typ.	Unit
Transmit	11b	11 Mbps	+17 dBm	220	mA
Transmit	11g	54 Mbps	+15 dBm	110	mA
Transmit	11n	MCS0	+14 dBm	120	mA
Transmit	11n	MCS7	+13 dBm	100	mA
Receive	11b	11 Mbps	Continuous receive	76	mA
Receive	11g	54 Mbps	Continuous receive	76	mA
Receive	11n	MCS0	Continuous receive	76	mA

4.4 Operating Power Consumption

Operating Mode	Operating State, TA = 25°C	Average	Peak (typ.)	Unit
Fast pairing	Module is in fast-pairing mode; Wi-Fi indicator flashes rapidly	80	151	mA
AP pairing	Module is in AP-pairing mode; Wi-Fi indicator flashes slowly	90	451	mA
Network-connected idle	Module is connected and idle; Wi-Fi indicator remains on	58.5	411	mA
Disconnected	Module is operating without a network connection; Wi-Fi indicator remains off	80	430	mA

Note: The peak duration is approximately 5 us. The values above may vary depending on the firmware functions.

5 RF Characteristics

5.1 Basic RF Characteristics

Parameter	Details
Operating frequency	2.412-2.484 GHz
Wi-Fi standard	IEEE 802.11b/g/n (Channels 1-14)
Data rate	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: HT20, MCS0-MCS7
Antenna type	PCB antenna; antenna gain 2.0 dBi (default)

5.2 Transmit Performance

Parameter	Min.	Typ.	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
Frequency error	-20	-	20	ppm

Parameter	Min.	Typ.	Max.	Unit
EVM @ 802.11b CCK 11 Mbps mode, 17.5 dBm	-	-16	-	dB
EVM @ 802.11g OFDM 54 Mbps mode, 15.0 dBm	-	-30	-	dB
EVM @ 802.11n OFDM MCS7 mode, 14.0 dBm	-	-31	-	dB

5.3 Receive Performance

Parameter	Min.	Typ.	Max.	Unit
PER < 8%; RX sensitivity; 802.11b CCK mode, 1M	-	-91	-	dBm
PER < 10%; RX sensitivity; 802.11g OFDM mode, 54M	-	-75	-	dBm
PER < 10%; RX sensitivity; 802.11n OFDM mode, MCS7	-	-72	-	dBm

6 Antenna Information

6.1 Antenna Type

Only the onboard PCB antenna connection is available.

6.2 Reducing Antenna Interference

When the onboard PCB antenna is used, keep the antenna section of the Wi-Fi module at least 15 mm away from other metal parts to optimize Wi-Fi performance. Do not route traces or pour copper in the antenna area of the user's PCB, as doing so may degrade antenna performance. The key layout requirements are: make sure there is no substrate dielectric directly above or below the printed antenna, and keep surrounding copper away from the printed antenna. These measures maximize the antenna's radiation performance.

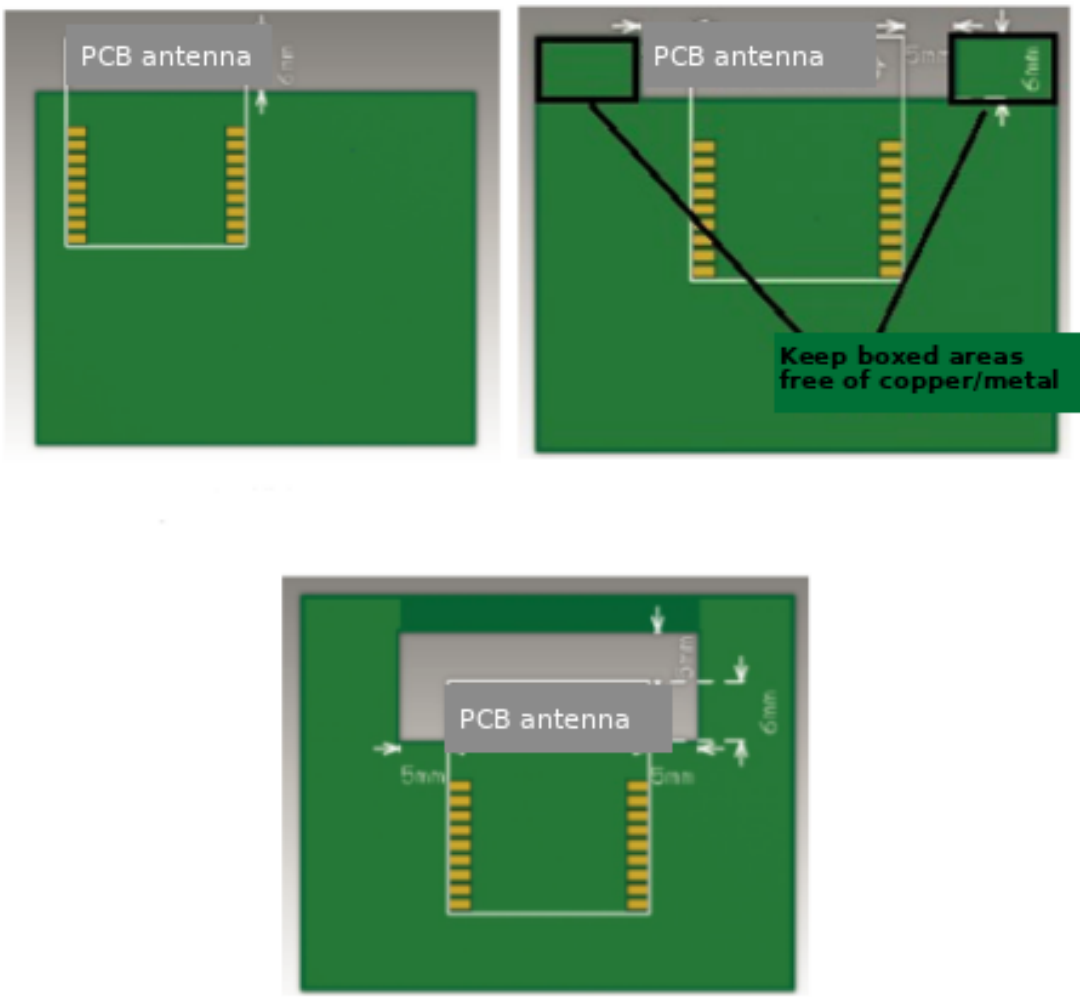


Figure 2. Recommended PCB layouts around the onboard antenna

6.3 Antenna Connector Specifications

This module currently has no antenna connector.

7 Package Information and Production Guidelines

7.1 Mechanical Dimensions

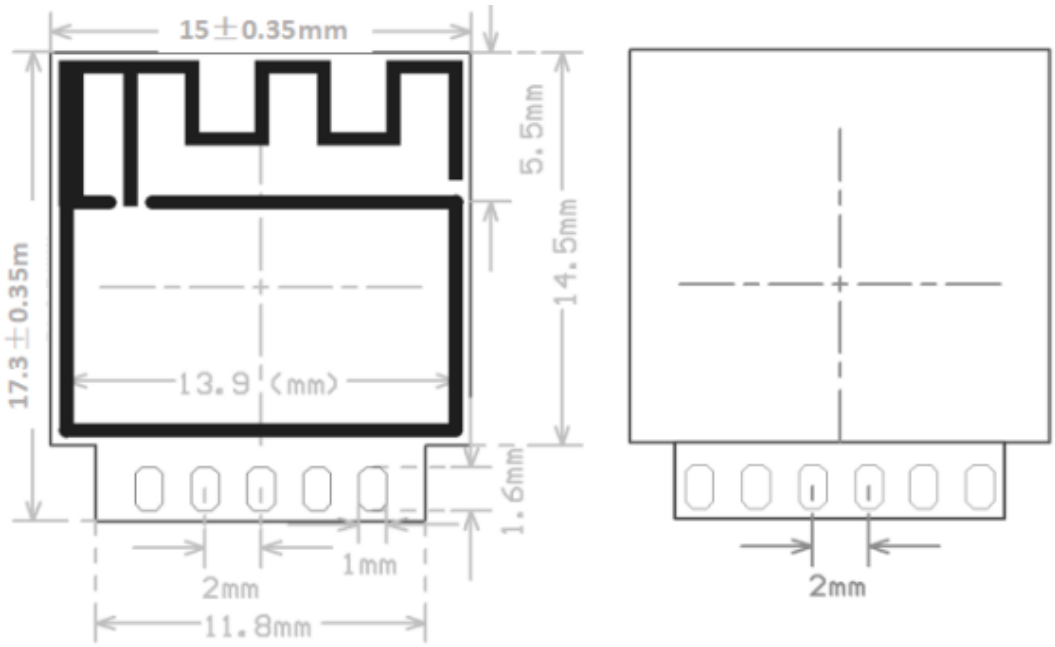


Figure 3. Top and bottom dimensions



Figure 4. Side dimensions

Note: The default dimensional tolerance is ±0.35 mm. If the customer has explicit requirements for critical dimensions, confirm them through discussion and specify them clearly in the product specification.

7.2 Recommended PCB Footprint

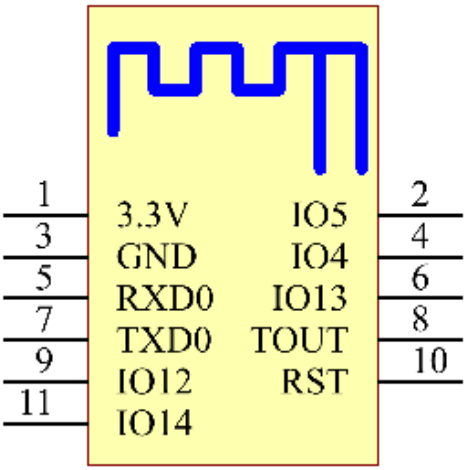


Figure 5. Pin assignment

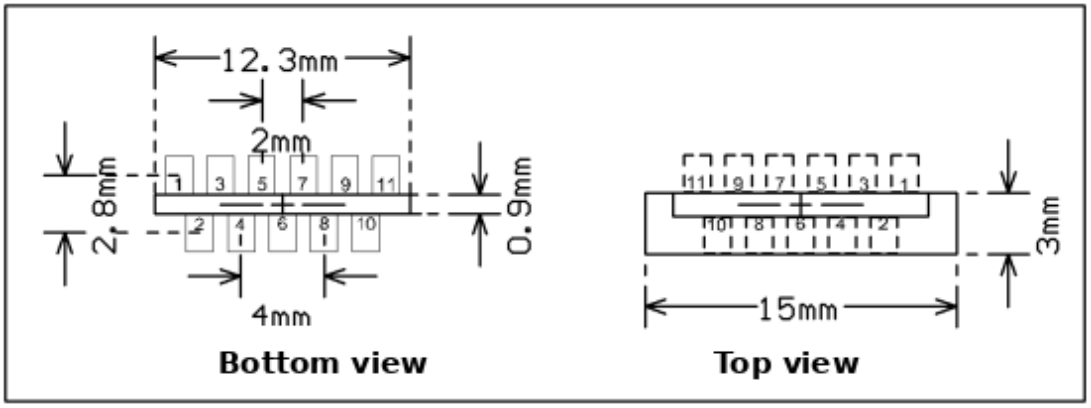


Figure 6. Recommended PCB land pattern

7.4 Recommended Soldering Temperature Profile

Set the oven temperature according to the recommended wave-soldering profile. The peak temperature is 260°C ± 5°C. The recommended wave-soldering profile is shown below:

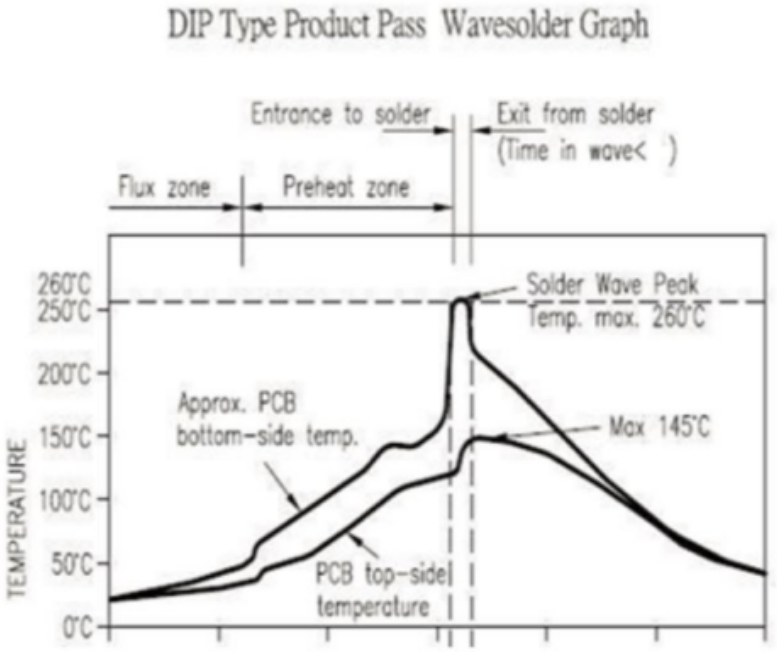


Figure 7. Wave-soldering temperature profile

Recommended soldering temperatures:

Wave-soldering Profile		Manual Soldering	
Preheating temperature	80-130°C	Soldering temperature	360°C ± 20°C