Ai-WS1-CBE Specification

Version V1.0.1

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.0.0	2024.10.24	First Edition	Nannan Yuan	Ning Guan
V1.0.1	2026.03.06	Update the wireless protocol description and remove the WiFi function	Ning Guan	Hong Xu

Content

1. Product overview

Ai-WS1-CBE is a BLE5.2+SLE1.0 module developed by Ai-Thinker Co., LTD. The module is equipped with Hi3873E chip as the core processor, supporting BLE protocol and SLE protocol. Hi3873E built-in high-performance self-developed 32bit CPU, up to 240MHz main frequency.

Hi3873E chip integrates a high-performance 32bit microprocessor and a security processing engine. Provide UART and GPIO interfaces, while supporting USB2.0 interface, the highest speed of 480Mbps; As a slave machine, the chip is built to the host MCU through USB interface to run.

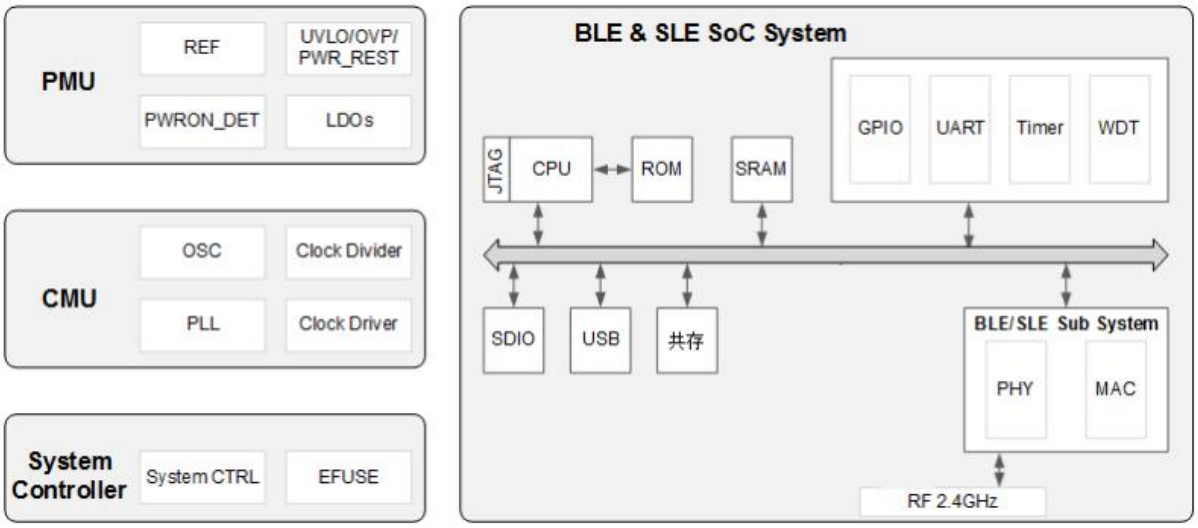


Figure 1 Main chip architecture diagram

1.1. Characteristics

- SMD-44 package
- Support 2.4GHz operating frequency band
- Support BLE4.0/4.1/4.2/5.0/5.1/5.2
- Support SLE1.0
- Support UART、USB2.0 and GPIO etc.
- Radio Frequency Integrated Balun、PA/LNA

2. Main parameter

Table 1 Description of Main Parameters

Model	Ai-WS1-CBE
Package	SMD-44
Size	12.0*12.0*2.4(±0.2)mm
Antenna	Stamp perforating machine
Frequency	2400 ~ 2483.5MHz
Operating temperature	-40℃~ 85℃
Storage temperature	-40℃~ 125℃, < 90%RH
Power supply	The power supply voltage is 3V to 3.6V, and the power supply current is ≥500mA
Interface	UART、USB2.0 and GPIO etc.
IO	12
Flash	Without Flash

2.1. Electrostatic requirements

Ai-WS1-CBE is an electrostatic sensitive device, and special precautions should be taken when handling it.

Figure 2 ESD preventive measures

2.2. Electrical characteristics

Table 2 Table of Electrical Characteristics

Parameters		Conditio	Min.	Typical value	Max.	Unit
Supply voltage		VDD	3	3.3	3.6	V
I/O	VIL	-	-	-	0.3*VDDIO	V
	VIH	-	0.7*VDDIO	-	-	V
	VOL	-	-	0.1*VDDIO	-	V
	VOH	-	-	0.9*VDDIO	-	V
	IMAX	-	-	-	15	mA

2.3. BLE RF performance

Table 3 BLE RF Performance Table

Typical value	Typical value			Typica
Spectrum range	2400 ~ 2483.5MHz			MHz
Output power				
Rate mode	**Min.**	**Typical value**	**Max.**	**Unit**
1Mbps	-	15	19	dBm
2Mbps	-	15	19	dBm
Receiving sensitivity				
Rate mode	**Min.**	**Typical value**	**Max.**	**Unit**
1Mbps sensitivity @30.8%PER second	-	-99	-	dBm
2Mbps sensitivity @30.8%PER second	-	-97	-	dBm

2.4. SLE RF performance

Table 4 RF performance of SLE

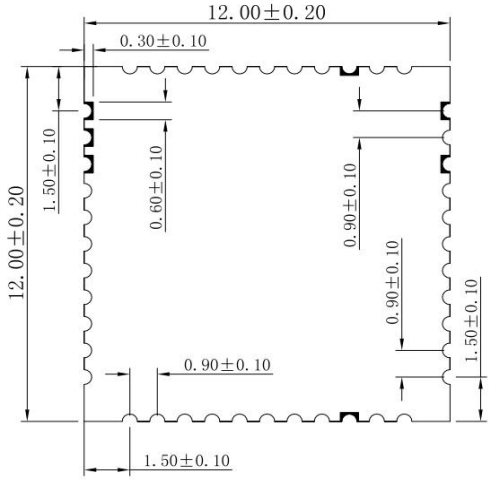
Description	Typical value			Unit
Spectrum range	2400 ~ 2483.5MHz			MHz
Output power				
Rate mode	**Min.**	**Typical value**	**Max.**	**Unit**
1Mbps	-	15	19	dBm
2Mbps	-	15	19	dBm
Receiving sensitivity				
Rate mode	**Min.**	**Typical value**	**Max.**	**Unit**
1Mbps sensitivity @30.8%PER	-	-99	-	dBm
2Mbps sensitivity @30.8%PER	-	-97	-	dBm

3. Appearance size

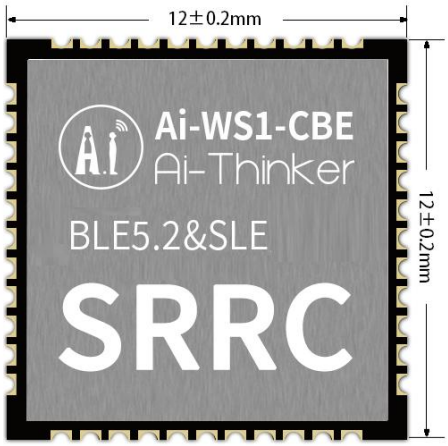
Front

Back

Figure 3 appearance diagram(Rendering diagram is for reference only, subject to actual objects)



Front

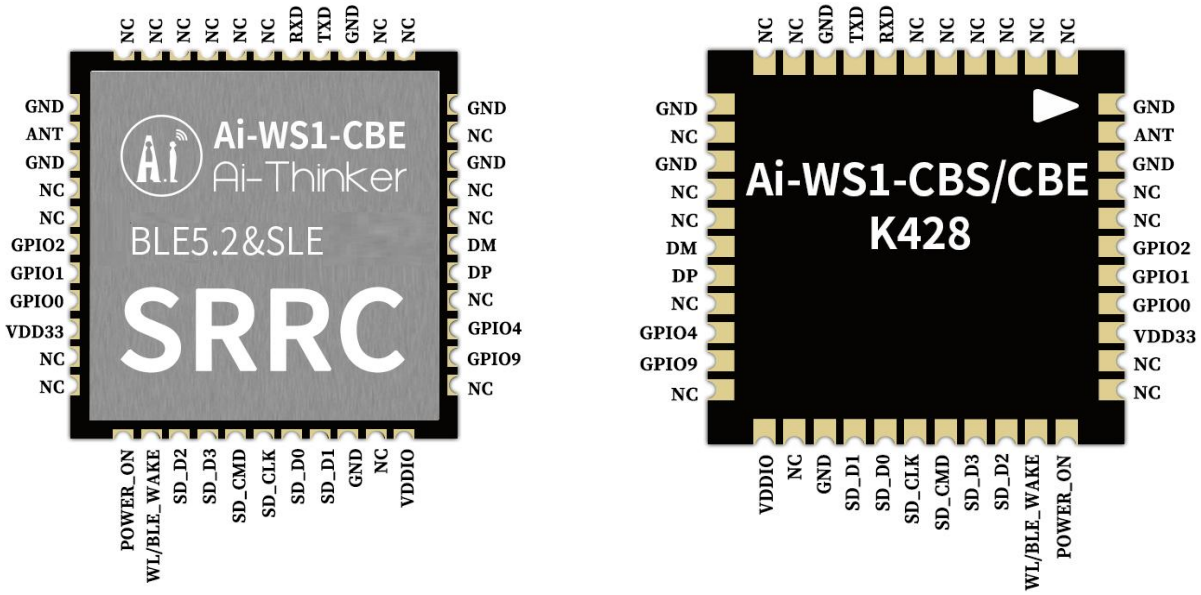


Back

Figure 4 dimension diagram（Unit：mm）

4. Pin definition

Ai-WS1-CBE module is connected to a total of 44 pins, such as pin schematic, pin function definition table is the interface definition.



Front

Back

Figure 5 pin diagram

Table5 Pin Function Definition Table

No.	Name	Functional description
1	GND	Ground
2	ANT	Rf output pin
3	GND	Ground
4	NC	Hang out
5	NC	Hang out
6	GPIO02	GPIO2
7	GPIO01	GPIO1
8	GPIO0	GPIO0
9	VDD33	3.3V power supply; The recommended output current of the external power supply is more than 500mA
10	NC	Hang out
11	NC	Hang out
12	Power_on	Boot pin
13	WL/BLE_WAKE	Wi-Fi& Bluetooth wake-up pins
14	SD_D2	SDIO_DATA_2/GPIO08
15	SD_D3	SDIO_DATA_3/GPIO07
16	SD_CMD	SDIO_DATA_CMD/GPIO06
17	SD_CLK	SDIO_DATA_CLK/GPIO14
18	SD_D0	SDIO_DATA_0/GPIO13
19	SD_D1	NC/Hang out
20	GND	Ground
21	NC	Hang out
22	VDDIO	3.3V and 1.8V inputs are supported
23	NC	Hang out
24	GPIO09	GPIO9
25	GPIO04	GPIO4

26	NC	Hang out
27	DP	USB_DP
28	DM	USB_DM
29	NC	Hang out
30	NC	Hang out
31	GND	Ground
32	NC	Hang out
33	GND	Ground
34	NC	Hang out
35	NC	Hang out
36	GND	Ground
37	TXD	TXD/GPIO03
38	RXD	RXD/GPIO11
39	NC	Hang out
40	NC	Hang out
41	NC	Hang out
42	NC	Hang out
43	NC	Hang out
44	NC	Hang out

5. Schematic diagram

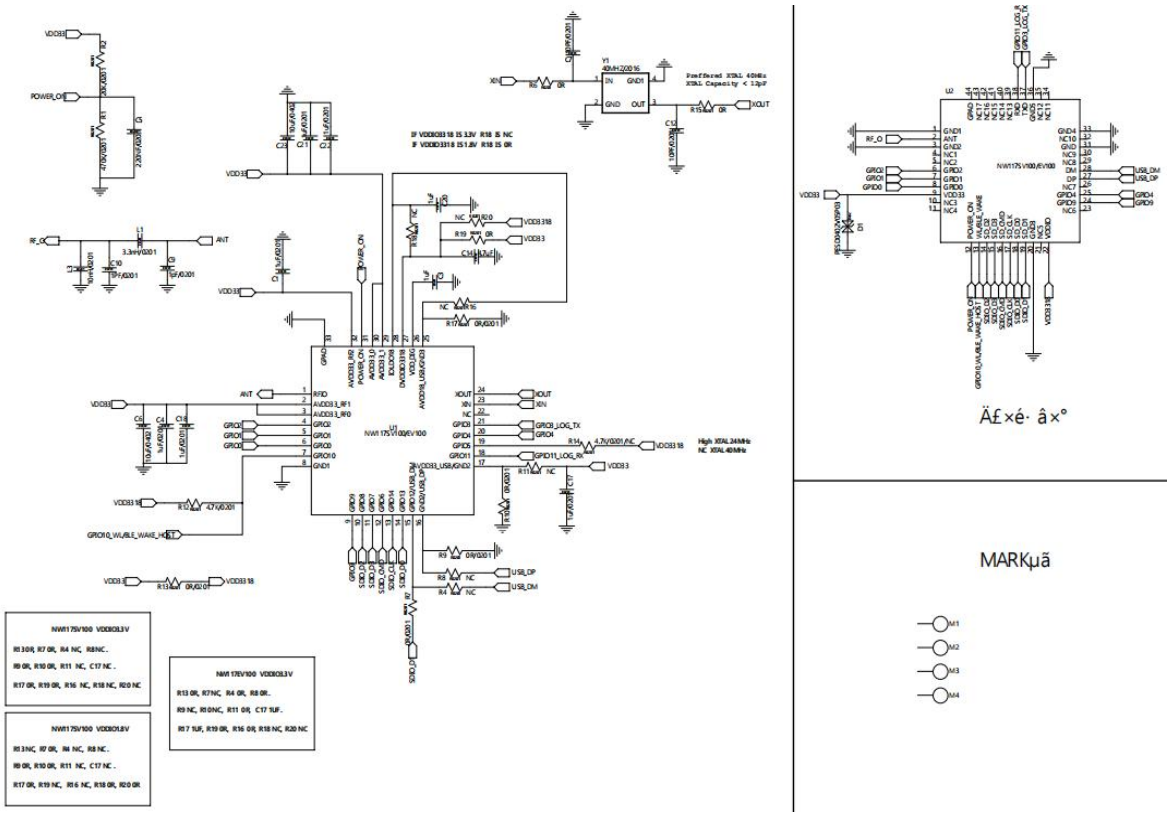


Figure 6 Schematic Diagram

5.1. Design guidance

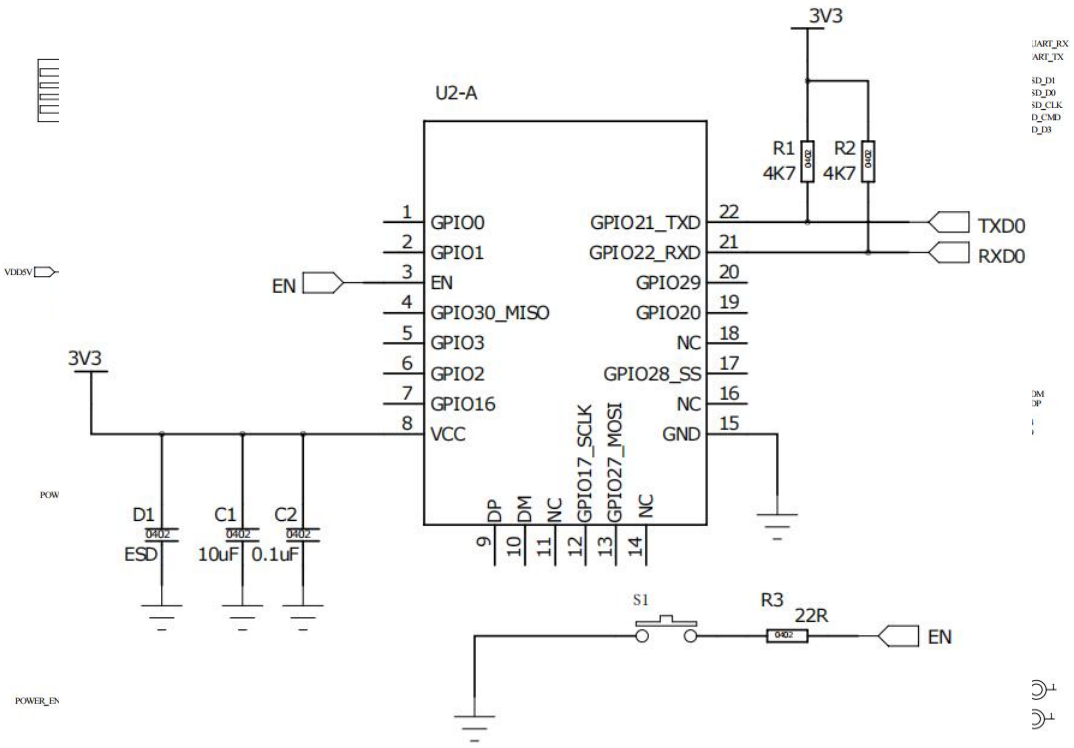


Figure 7 Application Guidance Circuit

5.2. Recommended PCB package size

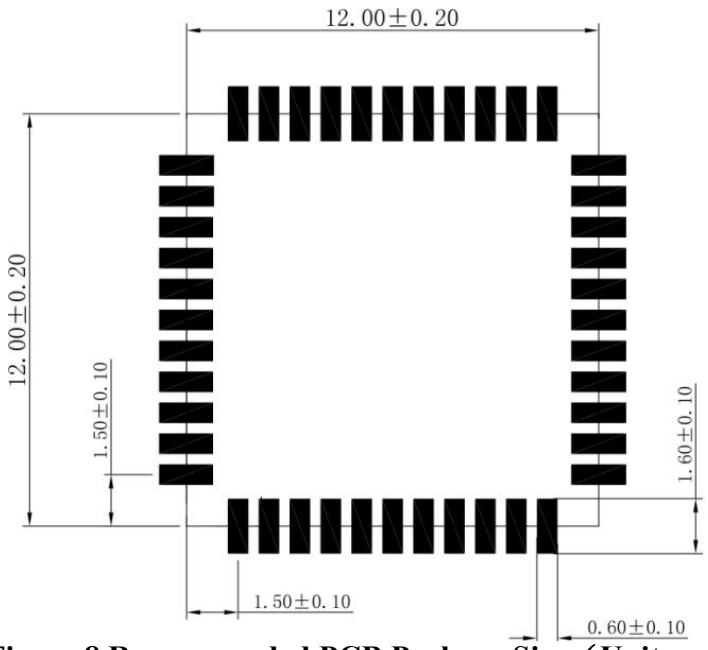


Figure 8 Recommended PCB Package Size（Unit：mm）

5.3. Power supply

- Recommended 3.3V voltage, peak current above 500mA.
- LDO power supply is recommended; If DC-DC is used, it is recommended to control the ripple within 30mV.
- It is recommended to reserve the position of dynamic response capacitors in DC-DC power supply circuits to optimize output ripple when the load changes greatly.
- ESD devices are recommended for the 3.3V power port.

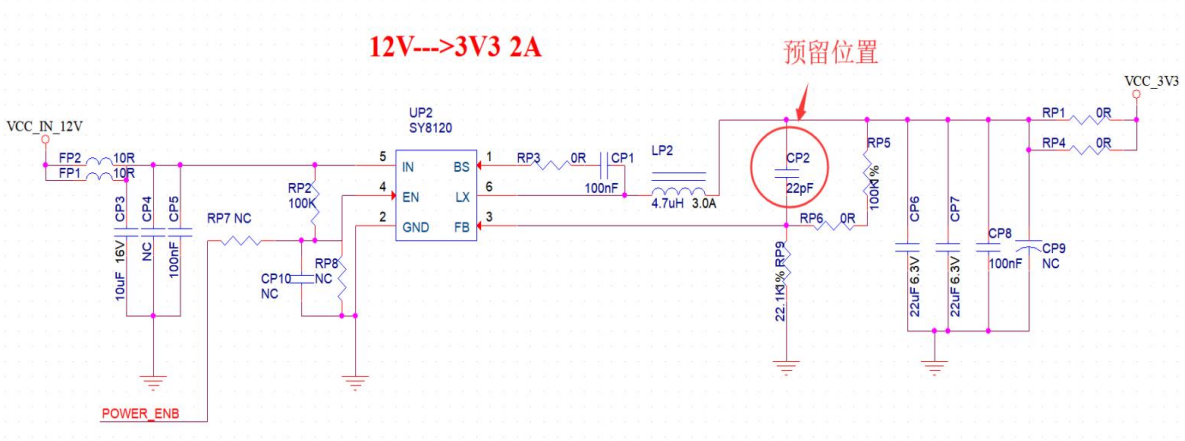


Figure9 DC-DC step-down circuit diagram

5.4. GPIO

- There are some I/O ports outside the module. If necessary, it is recommended to use 10-100 ohms in series resistance on the I/O port. This suppresses overshoot and makes both sides smoother. Helps with both EMI and ESD.
- For pulling up and down special I/O ports, see the usage instructions in the specifications. This affects the startup configuration of the module.
- Some IO ports of the module are 3.3V. If the level of the main control does not match that of the IO port of the module, a level switching circuit needs to be added.
- If the I/O port is directly connected to a peripheral port or a pin bar terminal, reserve an ESD device near the I/O port cable to the terminal.

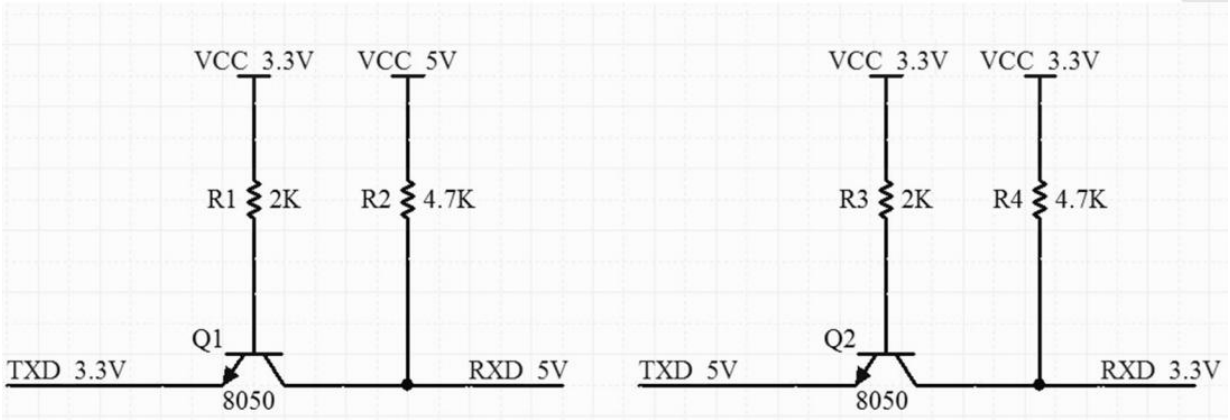


Figure 10 Level Shift Circuit

6. Storage conditions

Products sealed in moisture-proof bags should be stored in a non-condensing atmospheric environment of <40℃ /90%RH.

The module has a moisture sensitivity level MSL of level 3.

After the vacuum bag is unsealed, it must be used within 168 hours at 25±5℃/60%RH, otherwise it needs to be baked before it can be put on line again.

7. Reflow Soldering Curve

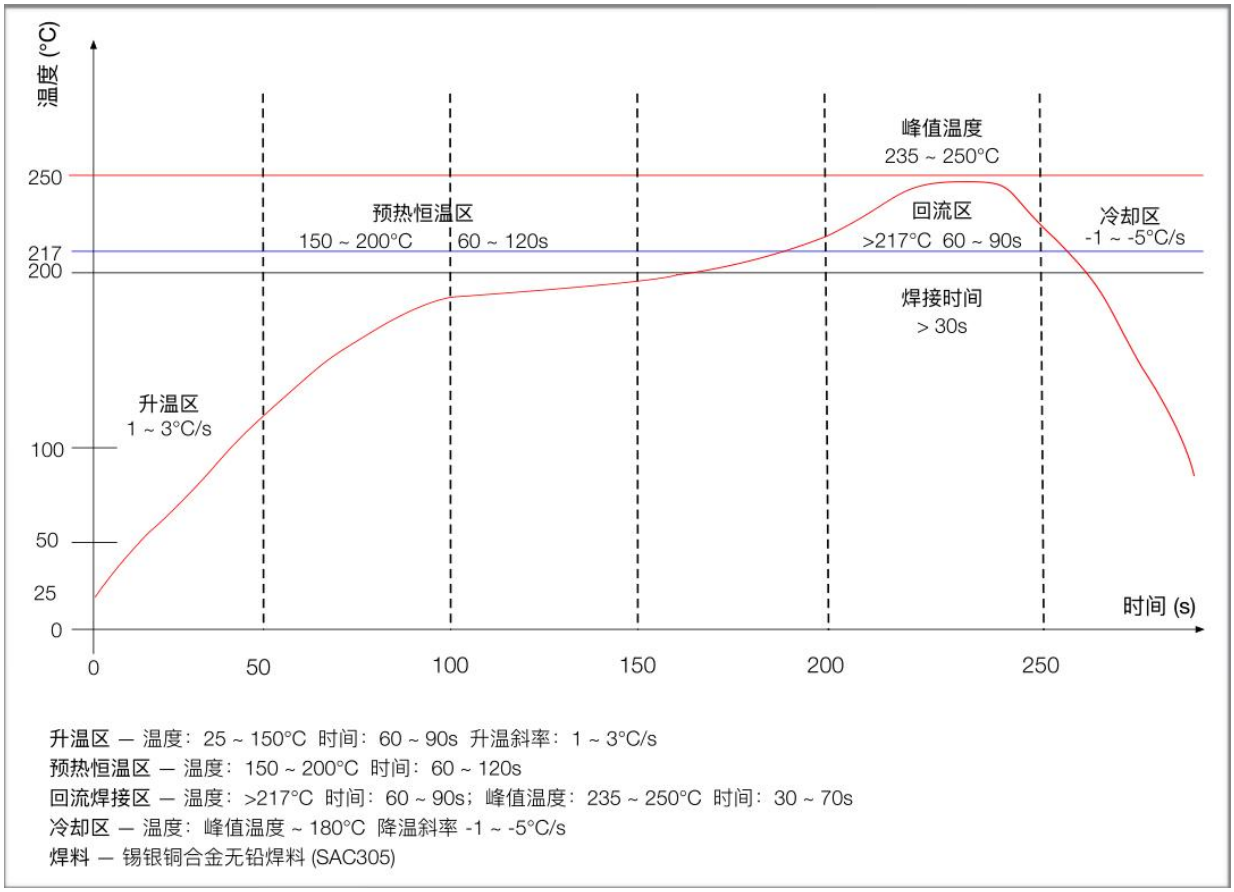


Figure 16 reflow soldering graph

8. Product packaging information

Ai-WS1-CBE module adopts braid packaging, 1400pcs/ disk. As shown in the picture below:

Figure 12 packing tape drawing

9. Contact us

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