



AB-02 SPECIFICATION

Version V1.0

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Document development / revision / revocation resume

Version	Date	Develop / revise content	Maker	Verify
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1.INTRODUCTION

AB-02 is a general-purpose Bluetooth module designed by Ensign Technology for the Internet of Things.

widely. It can be used for other smart appliances such as smart lights, smart sockets, smart air conditioners.

The core used by this module is Rota AB1611 chip, which has the characteristics of rich peripherals and low power consumption. The processor is a 32-Bit Andes architecture. The clock frequency can be adjusted from 16MHz to 72MHz. The built-in 512Kbyte programmable Flash and 64Kbyte SRAM, 16-Bit 16kHz ADC can be used for audio data acquisition.

The AB-02 module complies with BT 5.0 and SIG Mesh specifications. It can form a Mesh network directly through a smartphone, and can also be connected to smart speakers such as Tmall Genie and Xiaoai classmates. It is suitable for a variety of smart home application scenarios.

Features

- 32-bit MCU, main frequency 16MHz – 72MHz adjustable
- 512 Kbyte on-chip programmable flash
- 64 Kbyte SRAM on one side
- Compliant with BT 5.0 protocol specifications
- Compliant with SIG Mesh protocol specifications
- Maximum transmit power can reach 10dBm
- It can be connected with smart speakers such as Tmall Elf and Xiao Ai

Main Specification

List 1 specification

Model Name	AB-02
Packaging	SMD-34
Size	27.0*13.0*2.6(±0.2)MM
Output power	10±2dBm
Sensitivity	-94dBm
Consumption (typical)	BTx current @10dBm 20.99mA CTx current @10dBm 20.99 mA BRx current @1Mbps (10dBm) 9.4mA CRx current @1Mbps (10dBm) 9.5mA Standby 3.61mA Sleep 3.3uA
Work Temperature	-40 °C ~ 85 °C
Storage Temperature	-40 °C ~ 125 °C , < 90%RH
Voltage	2.7V ~ 3.6V
IO Quantity	24
Certification	SRRC

Firmware development

The AB-02 module does not support the customer's own secondary development of the firmware. If the customer has secondary development needs, please contact us Custom Development.

At the same time, we will provide some standard universal firmware for customers to choose, which currently includes the following

firmware:AB-02_SIGMesh_CTL_Vxx.bin(standard SIGMesh Cold and warm light)

AB-02_SIGMesh_HSL_Vxx.bin(standard SIGMesh RGB light)

AB-02_AliMesh_CTL_Vxx.bin(Docking Tmall Genie)

AB-02_AliMesh_HSL_Vxx.bin(Docking with Tmall Genie's RGB lights)

In the later stage, we will develop more general firmware for customers to choose according to market demand.

2. SPECIFICATION

Electrical characteristics

Absolute Maximum Rating (*Any exceeding the following absolute maximum ratings may cause damage to AB1611*)

Item	Min	Max	Unit
I / O power supply voltage(VCCIO)	-0.3	3.6	V
Work Temperature	-40	+85	°C
Storage Temperature	-40	+125	°C

Recommended operating conditions

Item	Min	Typical	Max	Unit
Voltage (VBAT)	2.7	3.3	3.6	V
Analog voltage (VCCANA)		1.5		V
RF voltage (VCCRF)		1.7/1.9		V
I/O voltage (VCCIO)	1.7		3.6	V

RF specification

Output power

Item	Min	Typical	Max	Unit
Average power	-	10	-	dBm

In-band scattering	$\geq 3\text{MHz}$	-	-	3	db
	+2MHz	-	-	-30	dBm
	-2MHz	-	-	-20	dBm
	$\leq -3\text{MHz}$	-	-	-30	dBm
Modulation characteristics	$\Delta f_{1\text{avg}}$	225	-	275	KHz
	Percent of $\Delta f_{2\text{max}} > 185\text{kHz}$	99.9	-	100	%
	$\Delta f_{2\text{avg}} / \Delta f_{1\text{avg}}$	-	1	-	
Center frequency deviation, F_n ($n=0,1,2,\dots,k$)		-150	-	+150	KHz
Frequency offset, $ F_0-F_n $ ($n=0,1,2,\dots,k$)		-50	-	+50	KHz
Initial frequency offset, $ F_1-F_0 $		-20	-	+20	KHz
Maximum frequency offset rate, $ F_n-F_{n-5} $ ($n=6,7,8,\dots,k$)		-20	-	+20	KHz/ 50us
Harmonics (cable mode)		-	-51.34	-	dBm

Receiving sensitivity

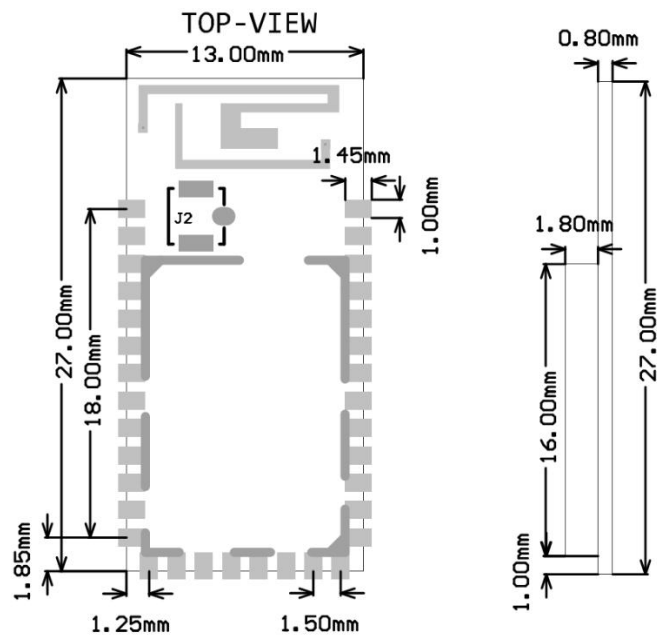
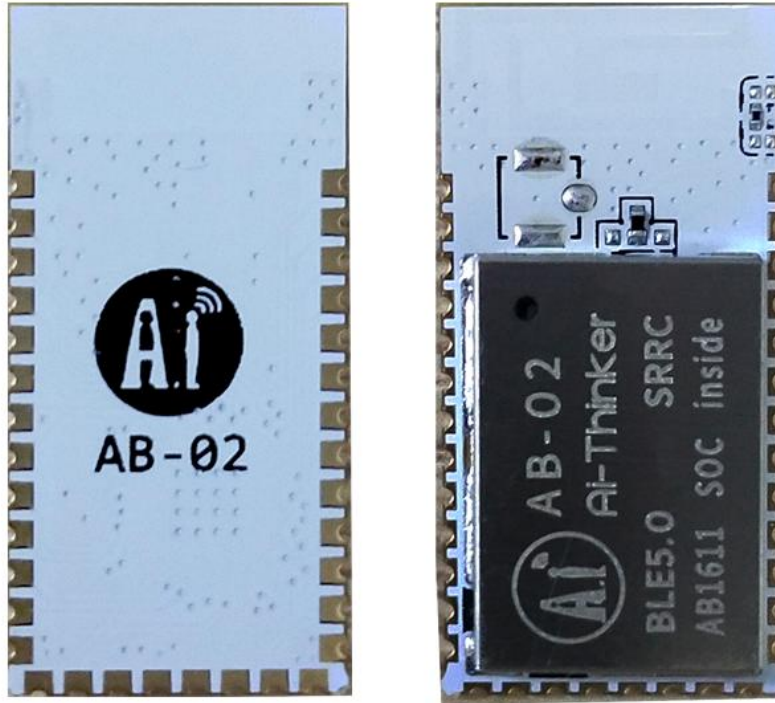
Item	Min	Typical	Max	Unit	
Sensitivity	-	-94	-	dBm	
Maximum input level	-	-10	-	dBm	
Co-channel interference, C/I	-	-	21	db	
Adjacent channel interference, C/I	$F = F_0+1\text{MHz}$	-	-	3	db
	$F = F_0-1\text{MHz}$	-	-	-30	db
	$F = F_0+2\text{MHz}$	-	-	-20	db
	$F = F_0-2\text{MHz}$ (image+1)	-	-	-30	db
	$F = F_0+3\text{MHz}$	-	-	-27	db

	F = F0-3MHz (image)	-	-	-9	db
Intermodulation		-50	-	-	dB m
blockade	30-2000 MHz	-30	-	-	dB m
	2003-2399 MHz	-35	-	-	dB m
	2484-2997 MHz	-35	-	-	dB m
	3000-12750 MHz	-30	-	-	dB m
PER report Integrity		-	50	-	%

Antenna specification

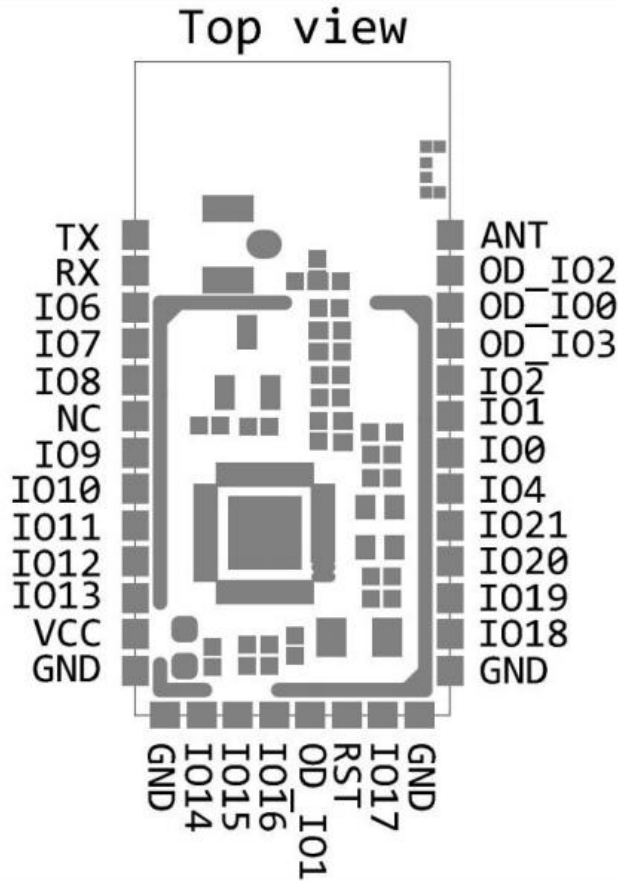
Frequency range	2402MHz	2450MHz	2480MHz	Unit
Simth	64.947	45.809	35.176	Ω
RL	-16.856	-19.656	-13.835	dB
SWR	1.3368	1.2322	1.5105	

3.DIMENSION



4. PIN DEFINITION

The AB-02 module has a total of 34 interfaces. As the pin diagram, the pin function definition table is the interface definition.



AB-02 Pin diagram

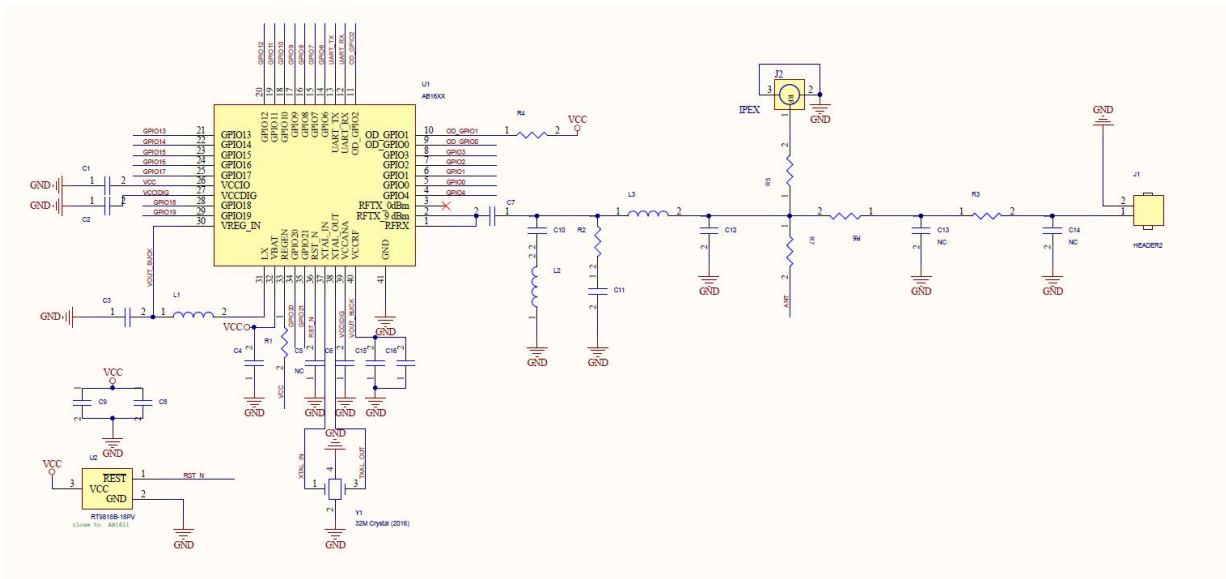
List Pin function definition

Pin No.	Name	Function description
1	TX	UART_TX
2	RX	UART_RX
3	IO6	GPIO6
4	IO7	GPIO7
5	IO8	GPIO8
6	NC	Blank
7	IO9	GPIO9
8	IO10	GPIO10

9	IO11	GPIO11
10	IO12	GPIO12
11	IO13	GPIO13
12	VCC	Power, 3.3V
13	GND	Ground
14	GND	Ground
15	IO14	GPIO14
16	IO15	GPIO15
17	IO16	GPIO16
18	OD_1	Open-drain mode GPIO
19	RST	Reset
20	IO17	GPIO17
21	GND	Ground
22	GND	Ground
23	IO18	GPIO18
24	IO19	GPIO19
25	IO20	GPIO20
26	IO21	GPIO21
27	IO4	GPIO4
28	IO0	GPIO0
29	IO1	GPIO1
30	IO2	GPIO2
31	OD_3	Open-drain mode GPIO
32	OD_0	Open-drain mode GPIO
33	OD_2	Open-drain mode GPIO
34	ANT	Antenna

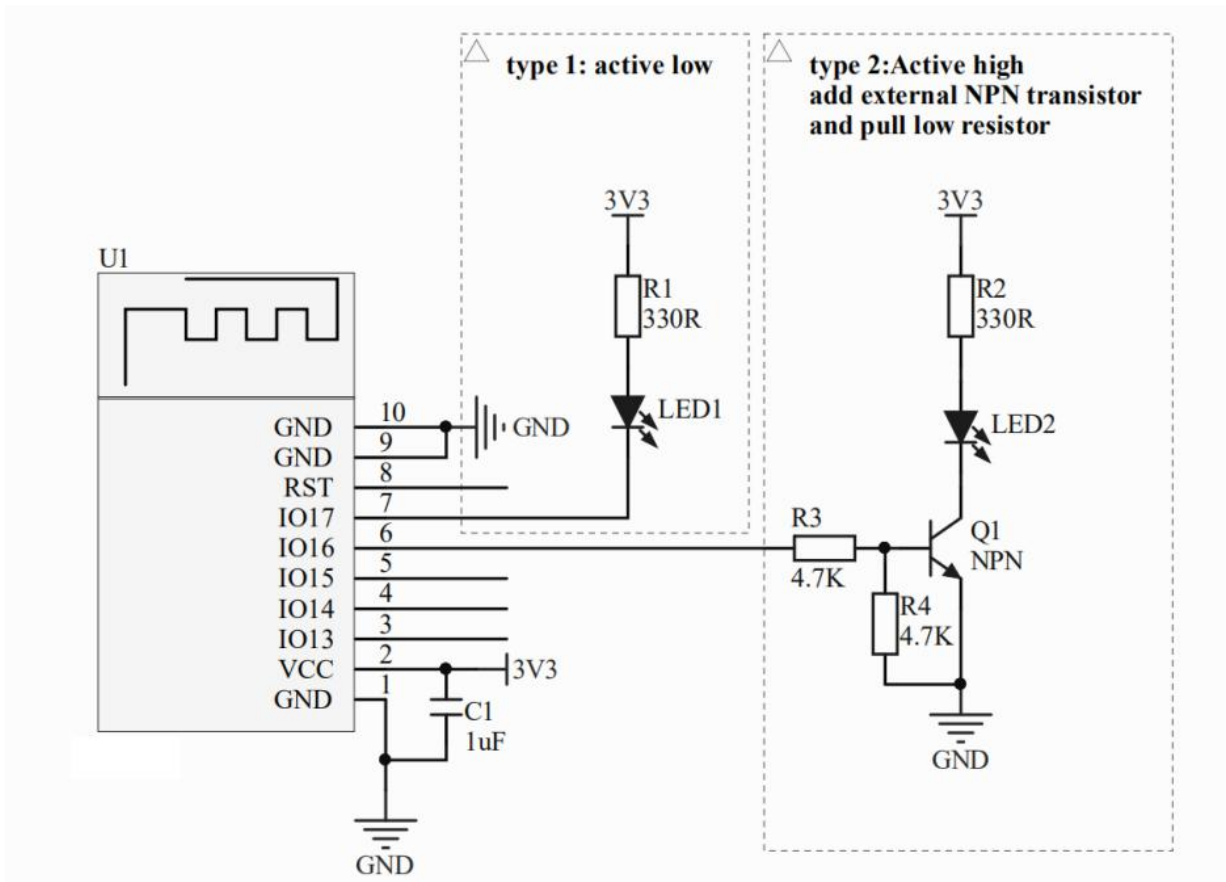
*The default IO * (such as IO0) is a weak pull-up inside the chip, and OD_ * (such as OD_0) is an open-drain mode IO*

5.SCHEMATIC



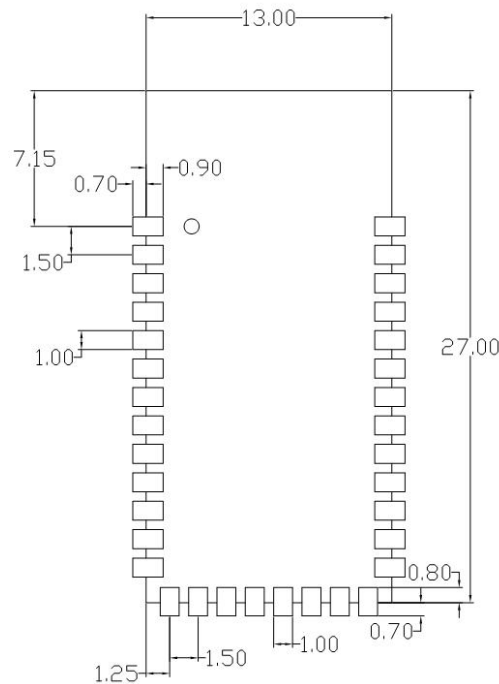
6.DESIGN GUIDE

1.Application circuit



2. Recommended module package design size

Note: Below is the AB-02 module package diagram, it is recommended to design the PCB board according to this diagram, so that the module can work normally on the PCB board; and pay attention to the design of the pad, the design of the pads on the PCB can not be offset from the corresponding pads of the module, and the expansion of the PCB pads relative to the module pads does not affect the use of the module.



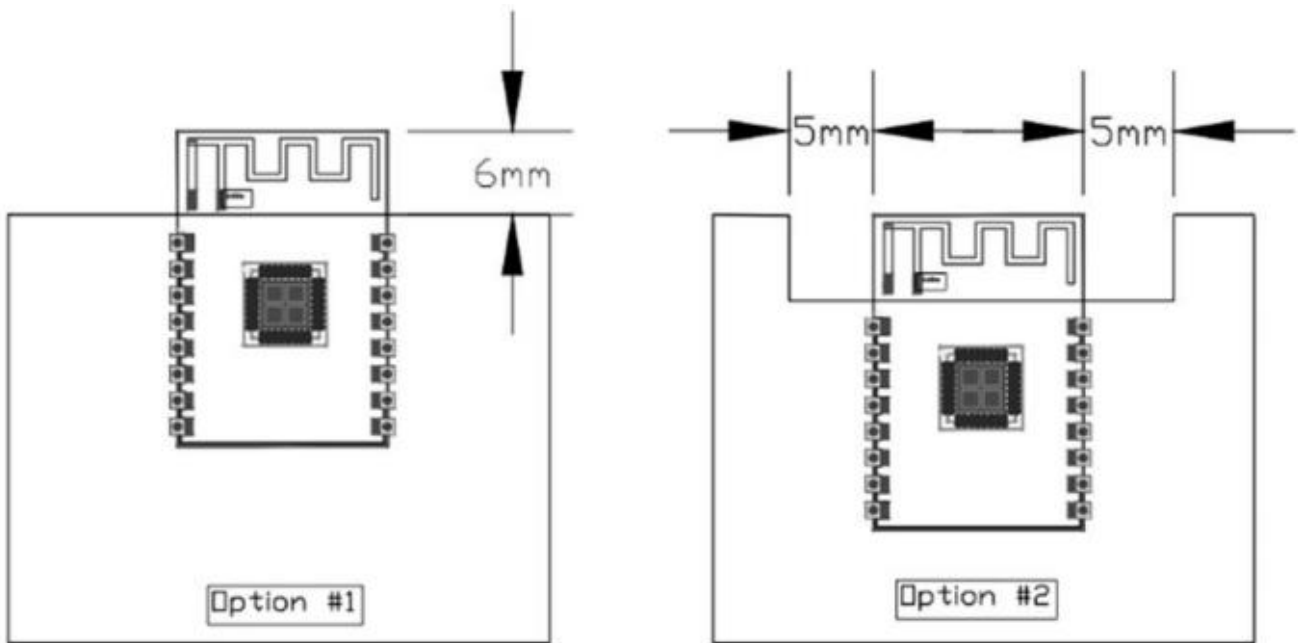
3. Antenna layout requirements

(1) For the installation position on the motherboard, the following two methods are recommended:

Solution 1: Place the module on the edge of the motherboard, and the antenna area extends beyond the edge of the motherboard.

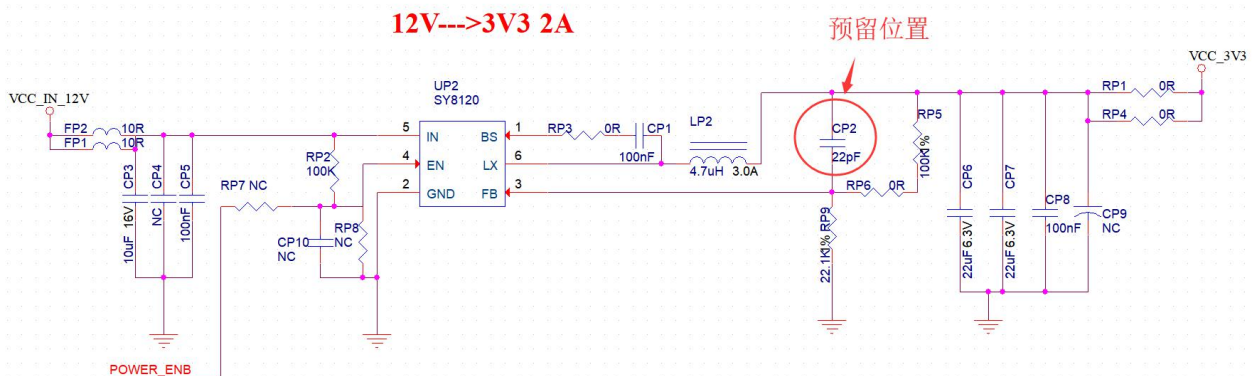
Solution 2: Place the module on the edge of the motherboard, and the edge of the motherboard hollows out an area at the antenna position.

(2) In order to meet the performance of the on-board antenna, it is prohibited to place high-frequency devices and metal parts around the antenna.



4. Power supply

- (1) Recommended 3.3V voltage and peak current above 100mA
- (2) It is recommended to use LDO power supply; if using DC-DC, it is recommended to control the ripple within 30mV.
- (3) The DC-DC power supply circuit is recommended to reserve the position of the dynamic response capacitor, which can optimize the output ripple when the load changes greatly.
- (4) 3.3V interface is recommended to add ESD devices.



5. USE of GPIO port

- (1) There are some GPIO ports on the periphery of the module. If you need to use a 10-100 ohm resistor in series with the IO port, it is recommended. This can suppress overshoot, and the levels on both sides are more stable. Used for both EMI and ESD.
- (2) The special IO port is pulled up and down, please refer to the instruction manual of the specification, this will affect the startup configuration of the module.

(3) The IO port of the module is 3.3V. If the IO level of the main control and the module does not match, a level conversion circuit needs to be added.

(4) If the IO port is directly connected to a peripheral interface, or a pin or other terminal, it is recommended to reserve an ESD device near the terminal of the IO trace.

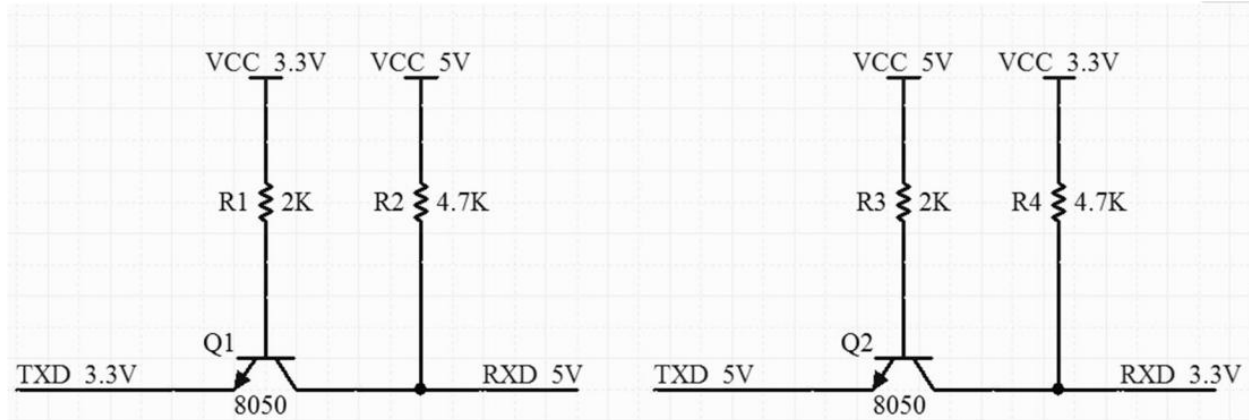
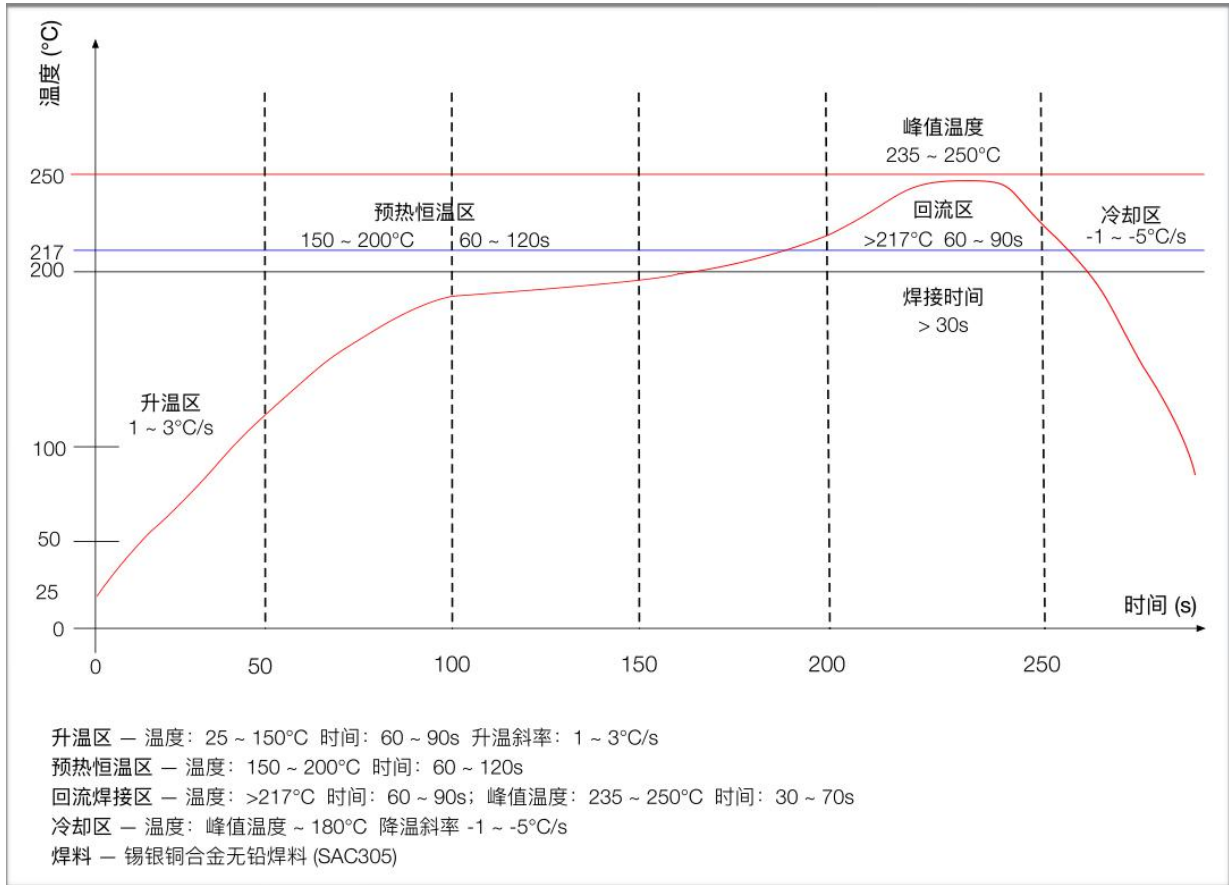


Figure Level-shifting circuit

7.REFLOW PROFILE



8.PACKAGING

As shown below, the packaging of AB-02 is taping.



9.CONTACT US

Company website: <https://www.ai-thinker.com>

Development DOCS: <https://docs.ai-thinker.com>

Official forum: <http://bbs.ai-thinker.com>

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