Ai-M62-32S Specification

Version V1.0.0

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.0.0	2023.03.23	First Edition	NanNan Yuan	Ning Guan

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1. Product overview

Ai-M62-32S is a Wi-Fi 6 + BLE5.3 module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The module is equipped with BL616 chip as the core processor, supports Wi-Fi 802.11b/g/n/ax protocol and BLE protocol, and supports Thread protocol. The BL616 system includes a low-power 32-bit RISC-V CPU with floating-point unit, DSP unit, cache and memory, with a maximum dominant frequency of 320M.

The Ai-M62-32S module has rich peripheral interfaces, including Audio Codec, USB2.0, SDU, SD/MMC(SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPDC, ACOMP, GPIO, etc. It can be widely used in audio and video multimedia, Internet of Things (IoT), mobile devices, wearable electronic devices, smart homes and other fields.

The Ai-M62-32S module Sec Eng module supports AES/SHA/PKA/TRNG and other functions, supports image encryption and signature startup, and meets various security application requirements in the Internet of Things field.

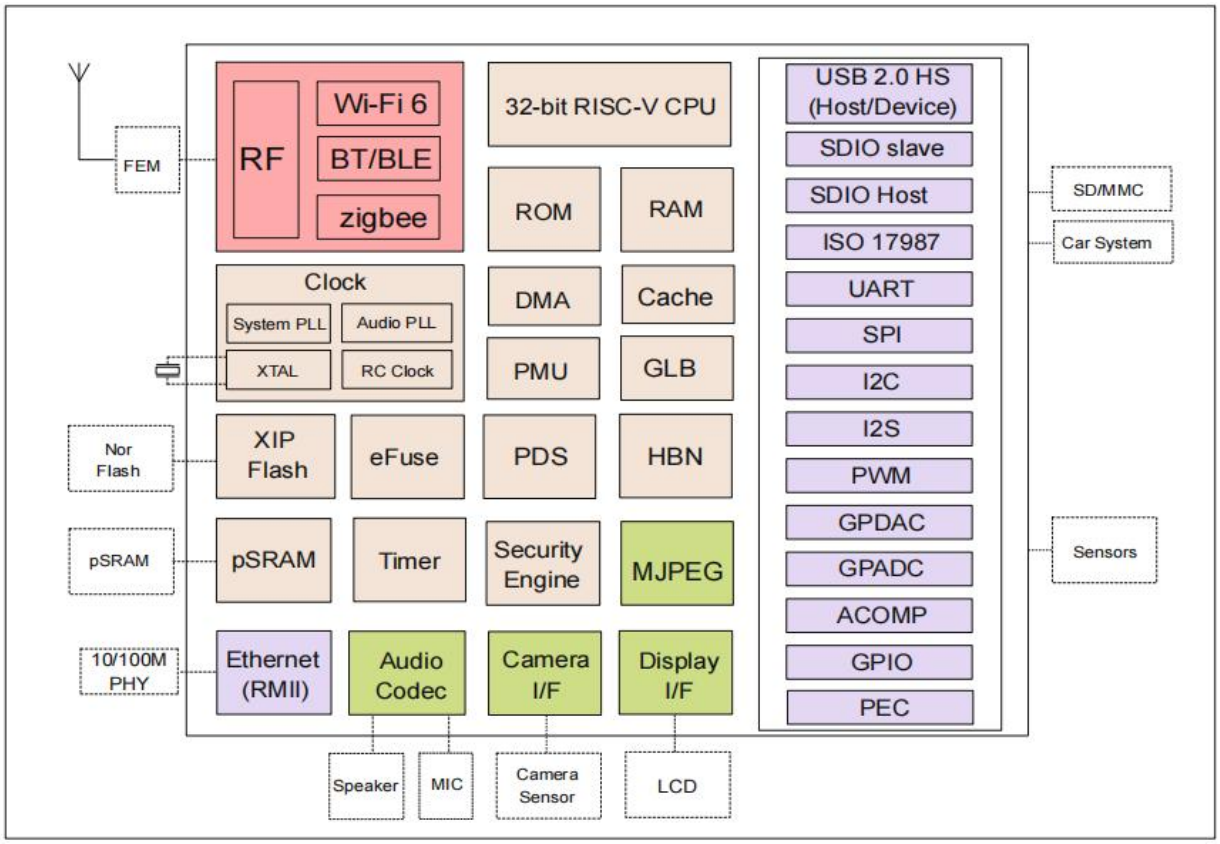

Figure 1 Main chip architecture diagram

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1.1. Characteristics

- SMD-38 package
- Supports 2.4GHz operating frequency band
- Support IEEE 802.11 B/g/n/ax
- Support BLE5.3
- Support Thread
- Support Wi-Fi/BLE/Thread coexistence
- Wi-Fi security support WPS/WEP/WPA/WPA2/WPA3
- Supports 20/40MHz bandwidth, 1T1R, maximum rate 229.4 Mbps
- Support STA, SoftAP, STA + SoftAP and sniffer modes
- 32-bit RISC-V CPU with FPU and DSP, with a maximum dominant frequency of 320M
- 532KB SRAM,128KB ROM,4Kb eFuse
- Support Audio Codec, USB2.0, SDU, SD/MMC(SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPDC, ACOMP, GPIO, etc.
- Integrated RF Balun, PA/LNA
- Support for safe startup and safe debugging
- Support XIP QSPI On-The-Fly AES decryption (OTFAD)
- Support TrustZone
- Support AES-CBC/CCM/GCM/XTS mode
- Support MD5, SHA-1/224/256/384/512
- TRNG (True Random Number Generator) is supported
- Support PKA (Public Key Accelerator) for RSA/ECC
- BLE-enabled Wi-Fi fast connection
- Universal AT command can be used quickly.
- Supports secondary development and integrates Windows and Linux development environments

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2. Main parameters

Table 1 Description of Main Parameters

Model	Ai-M62-32S
Package	SMD-38
Size	25.5*18.0*3.1(±0.2)mm
Antenna	Onboard antenna/IPEX seat
Frequency	2400~2483.5MHz
Operating temperature	-40 ℃ ~ 85 ℃
Storage temperature	-40℃ ~ 125℃, < 90%RH
Power supply	The power supply voltage is 2.97V ~ 3.6V, and the power supply current is ≥ 500mA.
Interface	Audio Codec, USB2.0, SDU, SD/MMC(SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPDC, ACOMP, GPIO, etc.
IO	18
UART rate	Default 115200 bps
Security	WPS/WEP/WPA/WPA2/WPA3
Flash	Default 4MByte, Support expansion

2.1. Electrostatic requirements

Ai-M62-32S are electrostatic sensitive equipment, special precautions need to be taken when handling.

Figure 2 ESD preventive measures

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2.2. Electrical characteristics

Table 2 Table of Electrical Characteristics

Parameters		Conditio	Min.	Typical value	Max.	Unit
Supply voltage		VDD	2.97	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. Wi-Fi radio frequency performance

Description	Typical value			Unit
Spectrum range	2400~2483.5MHz			MHz
Output power				
Mode	**Min.**	**Typical**	**Max.**	**Unit**
11ax mode HE40,PA output power	-	16	-	dBm
11ax mode HE20,PA output power	-	17	-	dBm
11n mode HT40,PA output power	-	19	-	dBm
11n mode HT20,PA output power	-	19	-	dBm
In 11g mode, PA output power	-	19	-	dBm
In 11b mode, PA output power	-	22	-	dBm
Receiving sensitivity				
Mode	**Min.**	**Typical**	**Max.**	**Unit**
11b,1 Mbps	-	-98	-	dBm
11b,11 Mbps	-	-90	-	dBm
11g,6 Mbps	-	-93	-	dBm
11g,54 Mbps	-	-76	-	dBm
11n,HT20 (MCS7)	-			

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6.4. Antenna field pattern

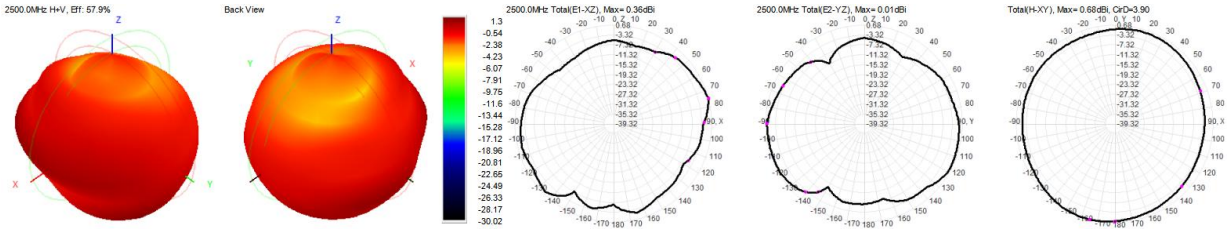

Figure 10 antenna field diagram

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7. Design guidance

7.1. Application guidance circuit

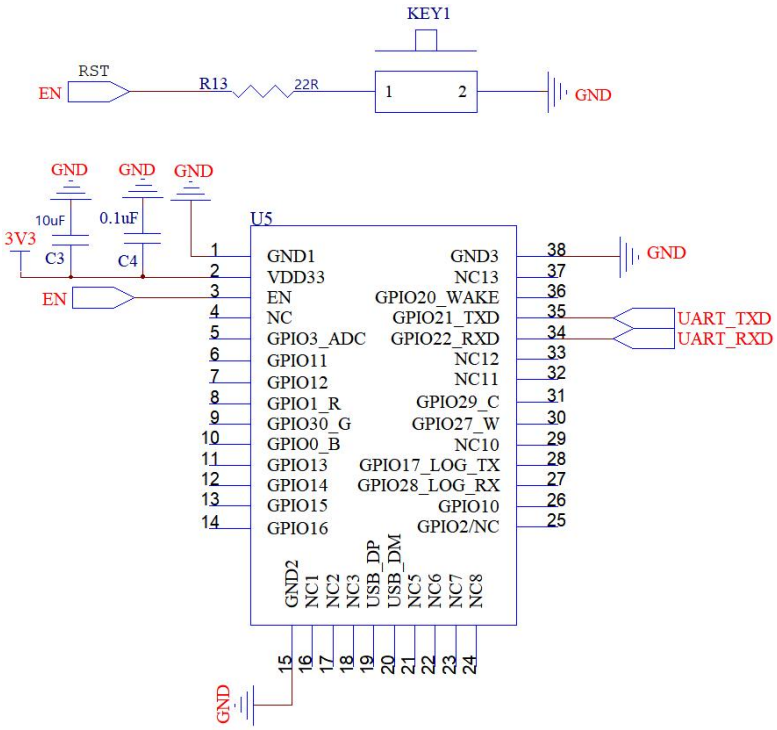

Figure 11 Application Guidance Circuit

- IO2 is the module start control pin, which is in normal working mode at low level and in firmware burning mode at high level. The default low level inside the chip.
- GPIO2/NC, not available by default
- GPIO10/GPIO11/GPIO12/GPIO13/GPIO14/GPIO15, available by default. These IO ports are shared with the internal Flash of the module. If the module with external Flash is customized, it cannot be used. For use, please contact Ai-Thinker.
- GPIO16/GPIO17, available by default. These IO ports are shared with the PIN pin of the 32.768KHz crystal oscillator inside the module. If the module of the internal patch 32.768KHz crystal oscillator is customized, the IO is in NC state.

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7.2. Recommended PCB package size

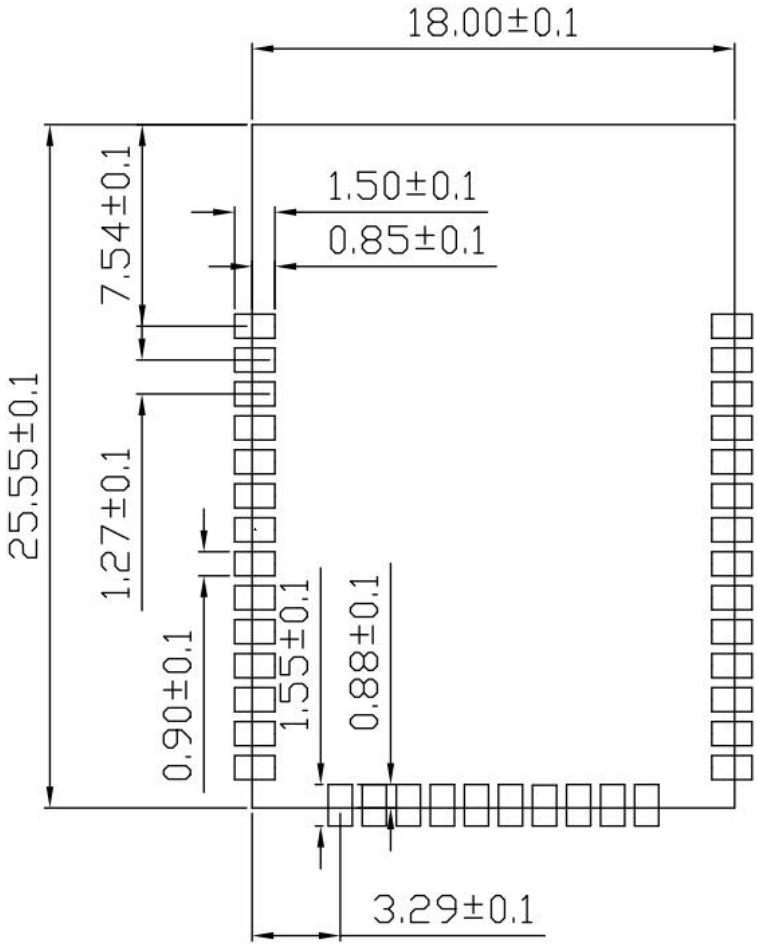

Figure 12 Recommended PCB Package Size

7.3. Antenna layout requirements

- In the installation position on the motherboard, the following 2 methods are recommended:

Scheme 1: Place the module on the edge of the main board, and the antenna area extends out of the edge of the main board.

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

- In order to meet the performance of the on-board antenna, it is forbidden to place metal parts around the antenna, away from high-frequency devices.

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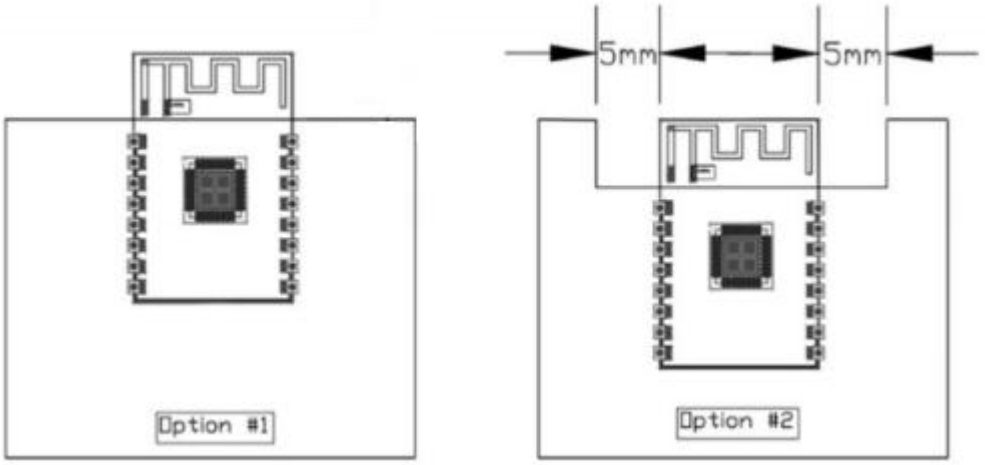

Figure 13 schematic diagram of antenna layout

7.4. Power supply

- Recommended 3.3V voltage, peak current above 500mA.
- LDO is recommended for power supply; If DC-DC is used, it is recommended that the ripple be controlled within 30mV.
- The DC-DC power supply circuit suggests to reserve the position of the dynamic response capacitor, which can optimize the output ripple when the load changes greatly.
- It is recommended to add ESD devices to the 3.3V power interface.

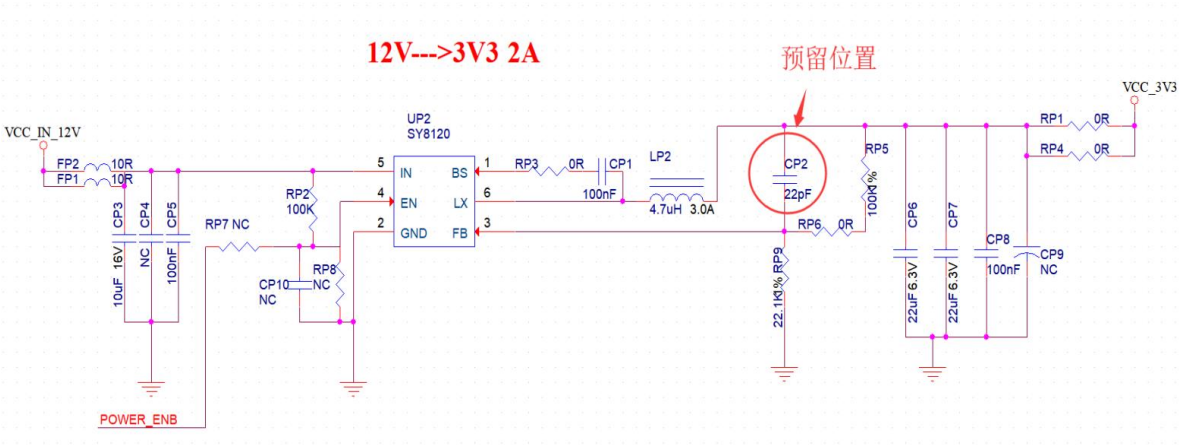

Figure 14 DC-DC step-down circuit diagram

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7.5. GPIO

- Some IO ports are led out from the periphery of the module. If you need to use a resistor of 10-100 ohms in series on the IO port. This can suppress overshoot and make the level on both sides more stable. It is helpful for both EMI and ESD.
- For the up and down of the special IO port, please refer to the instructions in the specification, which will affect the startup configuration of the module.
- The IO port of the module is 3.3V. If the level of the IO port of the main control and the module does not match, a level conversion circuit needs to be added.
- If the IO port is directly connected to the peripheral interface or terminals such as pins, it is recommended to reserve ESD devices at the IO port wiring close to the terminals.

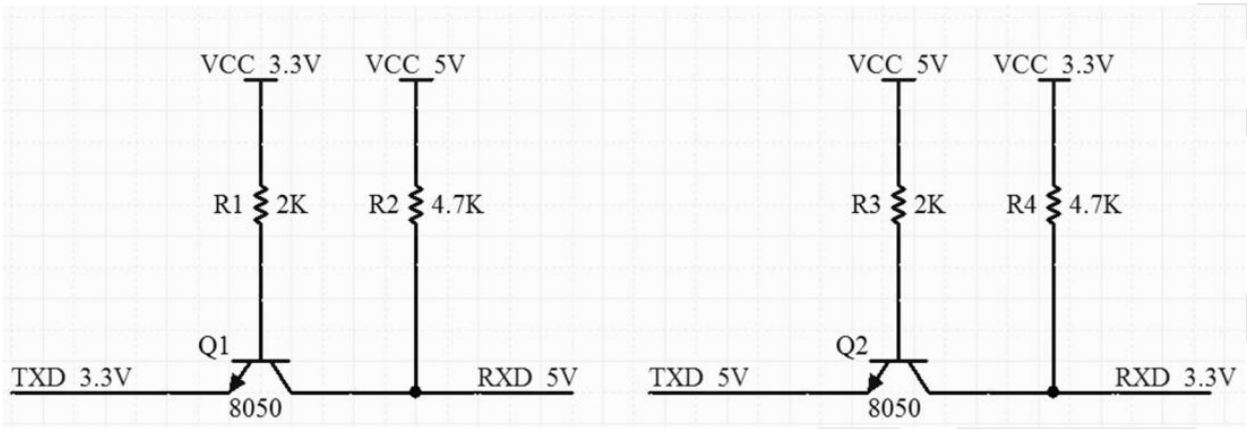

Figure 15 Level Shift Circuit

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8. Storage conditions

The product sealed in the moisture-proof bag should be stored in a non-condensing atmospheric environment of <40° C/90%RH.

The moisture sensitivity level MSL of the module is level 3.

After the vacuum bag is unpacked, 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.

9. Reflow Soldering Curve

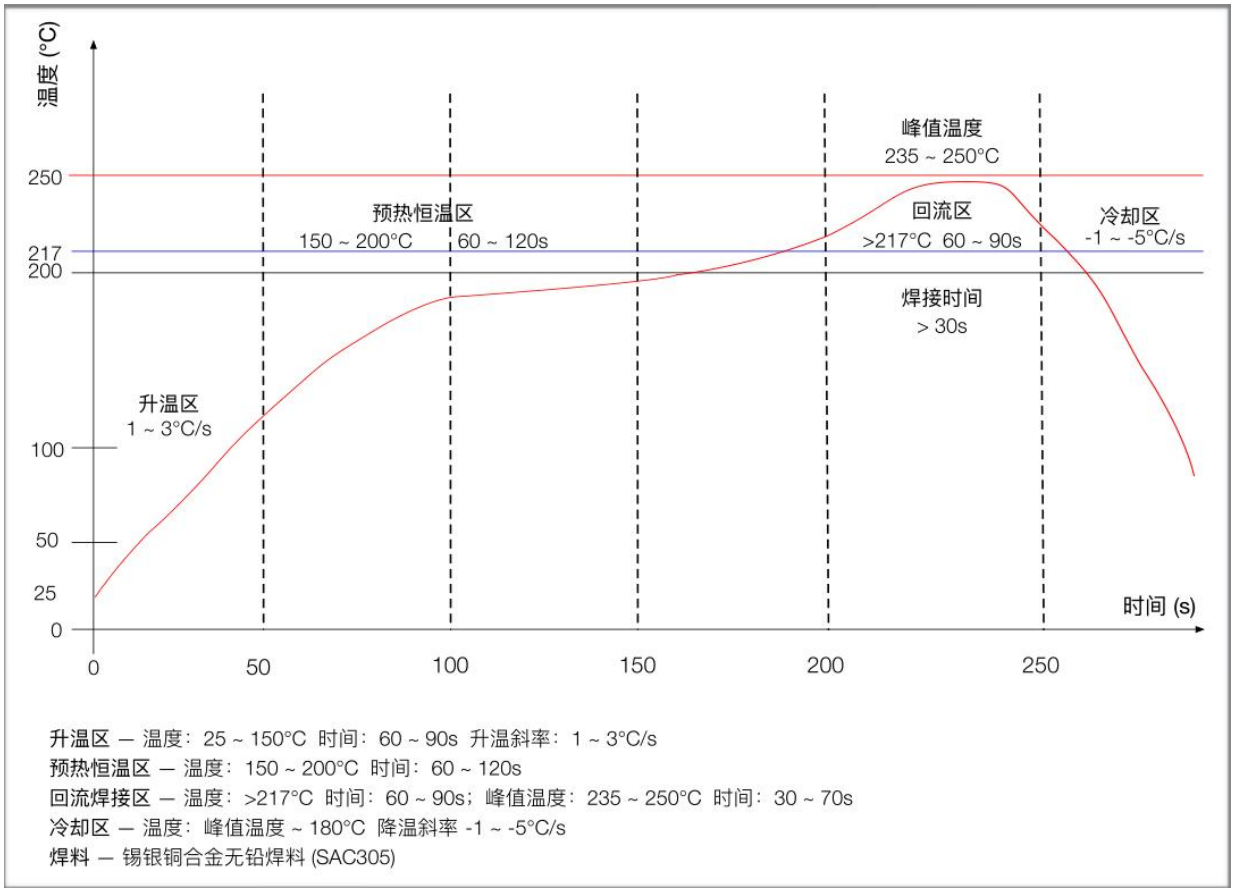

Figure 16 reflow soldering graph

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10.Product packaging information

The Ai-M62-32S module is packaged with braided tape, 800 pcs/disk. As shown in the following figure:

Figure 17 packing tape drawing

11.Contact us

Ai-Thinker official website　Office forum　Develop DOCS

LinkedIn　Tmall shop　Taobao shop　Alibaba shop

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WeChat mini program

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