Rd-03_V2 Specification

Version V2.0.0

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V2.0.0	2025.03.12	First Edition	Xihuan Lv	Ning Guan

Content

1. Product Overview

Rd-03_V2 is a radar module developed by Shenzhen Ai-Thinker Technology Co., LTD.equipped with S1KM0000 chip, high-performance 24GHz one-one-receive antenna and peripheral circuits. S1KM0000 is an integrated microcontroller millimeter wave sensor SoC based on FMCW radar transceiver technology. FMCW FM continuous wave is used to detect the target in the set space. Combined with radar signal processing, high sensitivity motion detection and fretting detection are realized.

Rd-03_V2 module has a maximum sensing distance of 7m to the moving human body, and can sense whether there is a moving or fretting human body in the area to achieve real-time detection results. Visual configuration tools are provided to easily configure sensing range, sensing sensitivity of different intervals and unmanned delay time. At the same time, it can automatically generate detection thresholds, reduce manual debugging, improve detection accuracy, simplify installation process, and facilitate large-scale deployment.

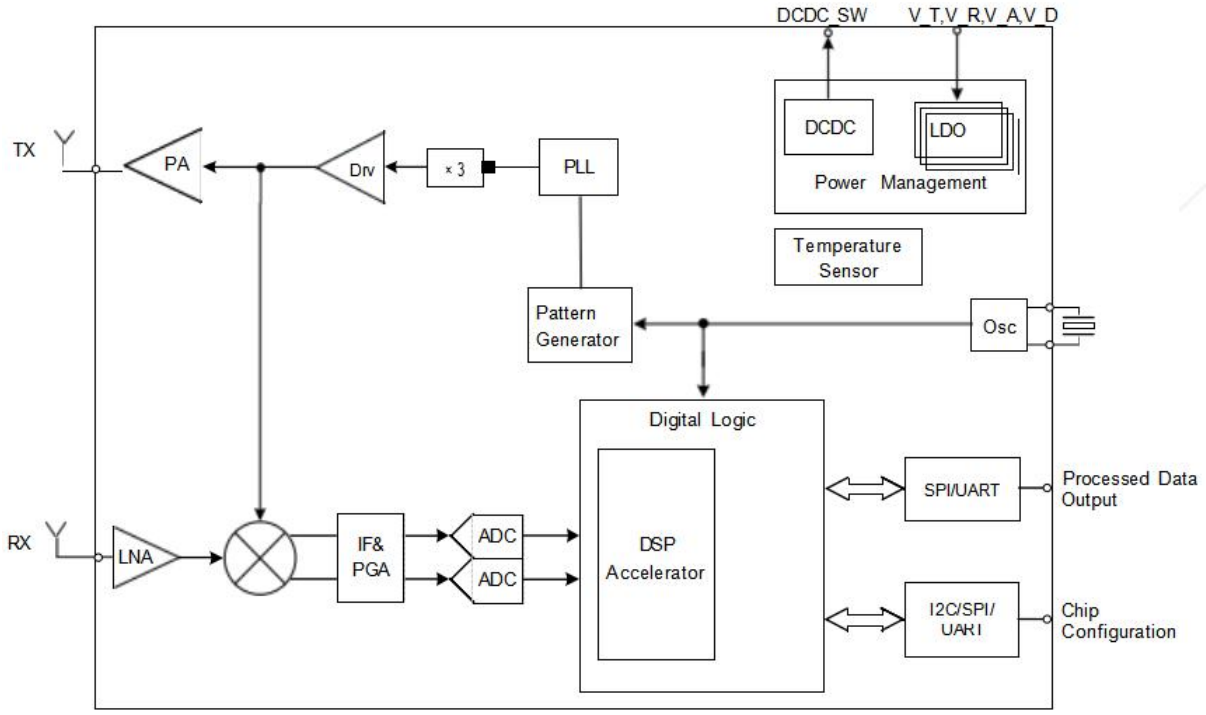


Figure 1 S3KM1110 architecture diagram

1.1. Characteristic

- DIP package, standard 2.54mm pin, compatible with 2.0mm pins
- Radar support 24 GHz ISM frequency band
- The radar antenna supports 1 receive and 1 transmit, antenna beam narrow, high resolution, frequency bandwidth, strong anti-interference
- The radar's max sensing range is up to 7 meters
- Radar angle is big, range of ±60 degrees
- Radar range and accurate recognition, support induction range, shielding range outside interference
- Ultra-small size：20*20mm, Plug and play, real-time reporting of detection results
- The intelligent adjustment of radar parameters can be realized through the serial port, which is convenient and fast
- Support various installation methods such as ceiling and wall
- Supports automatic generation of detection thresholds
- Support UART
- 3.3V/5V power supply, support 3.0~3.6V/4.5~5.5V wide voltage range; default version is 3.3V
- Typical application scenarios

✓ Human sensor light control

✓ Human body induction wake-up of advertising screen and other equipment

✓ life safety protection

✓ Smart Appliances

✓ Smart Security

✓ Smart lighting

✓ New energy charging/parking monitoring facilities

2. Main parameters

Table 1 Main parameters

Model	Rd-03_V2
Package	DIP-5
Size	20.0*20.0(±0.2)mm
Antenna	On-board antenna
Frequency	24G ~24.25GHz
Operation temperature	-40℃ ~ 85℃
Storage environment	-40℃ ~ 125℃, < 90%RH
Power supply	Support voltage 3.0V ~ 3.6V, power supply current ≥200mA
Interfaces	UART
UART rate	Default 115200 bps

2.1. Static electricity requirements

Rd-03_V2 is an electrostatic sensitive equipment, special precautions should be taken during handling.

Figure 2 ESD anti-static diagram

2.2. Electrical characteristics

Table 2 Electrical Characteristics Table

Parameter		Condition	Min.	Typical value	Max.	Unit
Power supply		VDD	3.0	3.3	3.6	V
			4.5	5(optional)	5.5	V
I/O	VIL	-	0	-	0.8	V
	VIH	-	2.3	-	VDD	V
	VOL	-	0	-	0.45	V
	VOH	-	2.45	-	VDD	V

2.3. Radar sensing range

Table 3 Radar induced range

Installation	Min.	Typical	Max.	Unit
Wall hanging mode (±60 。range)	-	7	10	m
Ceiling method (3m hanging height), circular projection radius	-	5	-	m

Notice：

- The above sensing distance is measured based on the open space ofAnxinke, for reference only.
- The radar sensing distance is greatly affected by surrounding walls, ceilings, large-sized objects, and installation methods. The actual measurement data of the installation environment shall prevail.

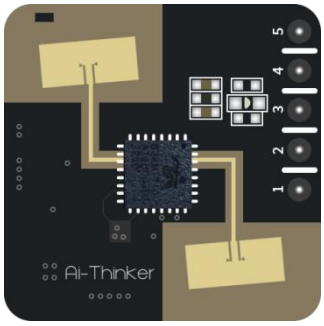
2.4. Power

The following power consumption data is based on a 3.3V power supply and an ambient temperature of 25 ° C

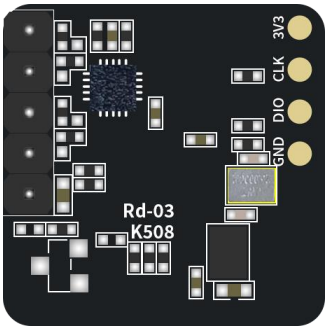
Table 4 Power Consumption Table

Model	Min.	AVG	Max.	Unit
working status	-	50	-	mA

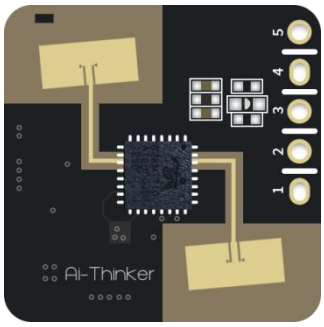
3. Appearance size



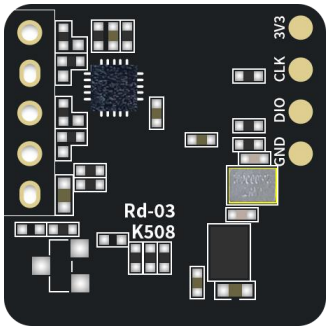
Front (with stitch plate)



Back (with stitch plate)

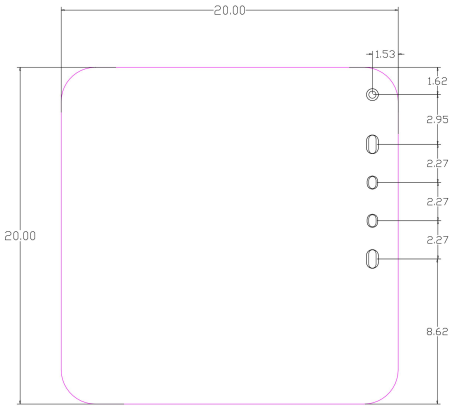


Front (without stitch plate)

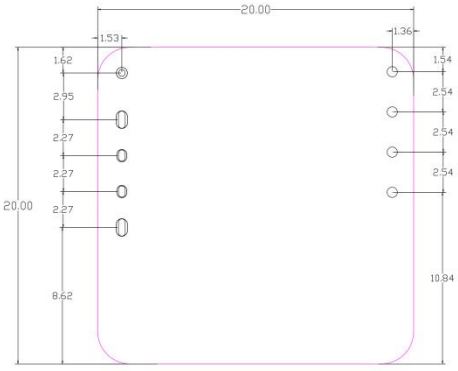


Back (without stitch plate)

Figure 3 Appearance diagram (rendering diagram is for reference only, subject to the actual object）



Front

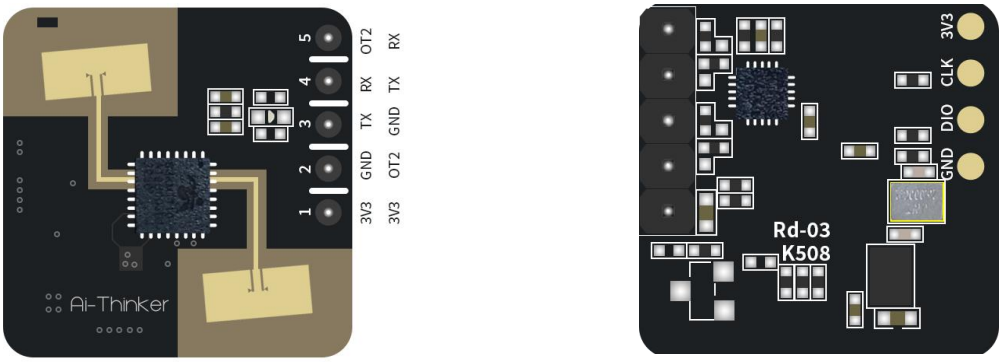


Back

Figure 4 Size chart

4. Pin definition

Rd-03_2Vconnects to a total of 5 interfaces, for example, the pin diagram, the pin function definition table is the interface definition.



Front Back

Figure 5 Pin diagram

Table 5 Definition table of pin functions

No.	Name	Function
1	3V3	Input power
2	GND	Ground
3	TX	UART_TX
4	RX	UART_RX
5	OT2	Detection result output, output high level when sensing, output low level when not sensing

No.	Name	Function
1	3V3	Input power
2	OT2	The detection result is output, the output level is high when induced, and the output level is low when not induced
3	GND	Ground
4	TX	UART_TX
5	RX	UART_RX

5. Schematic diagram

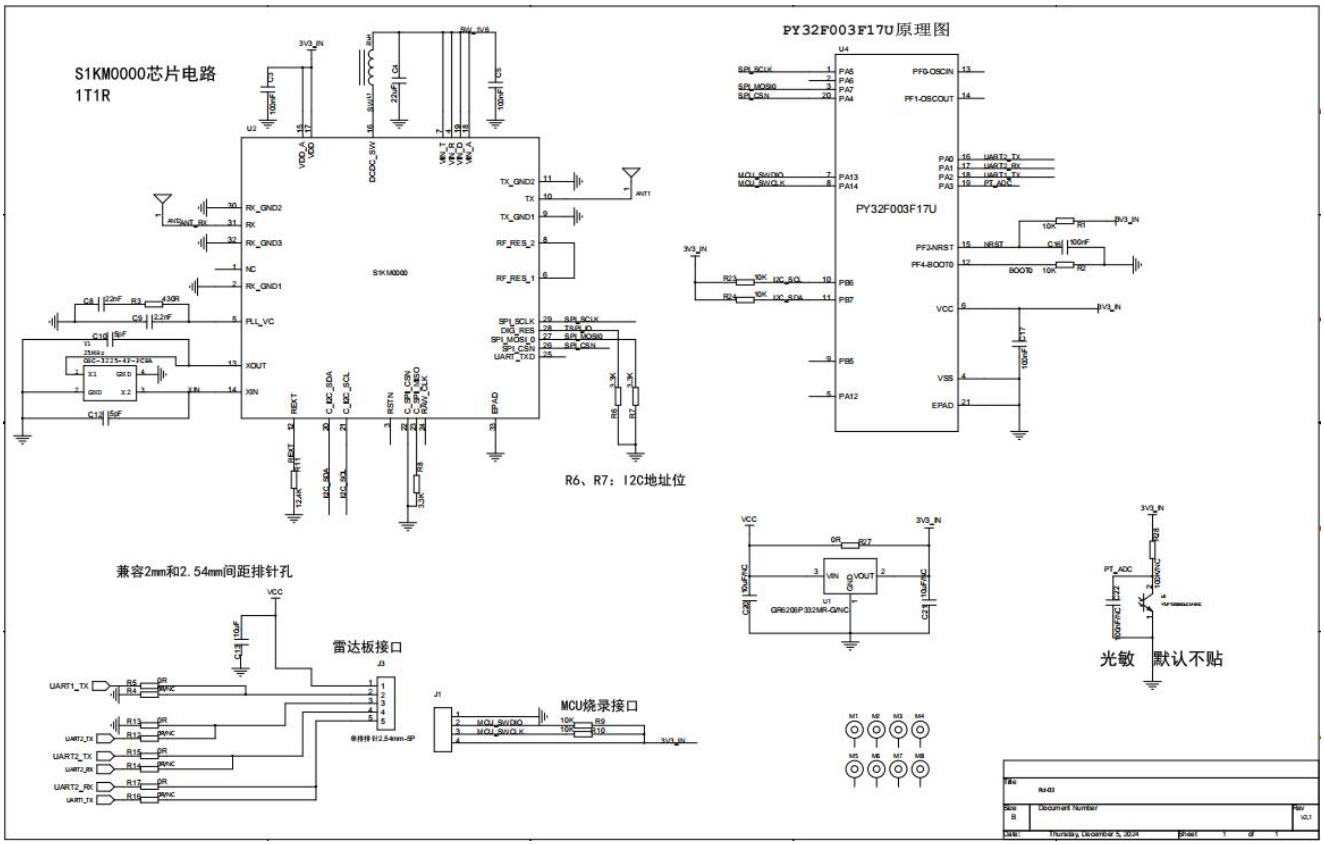


Figure 6 Schematic diagram

6. Design guidance

6.1. Application guide circuit

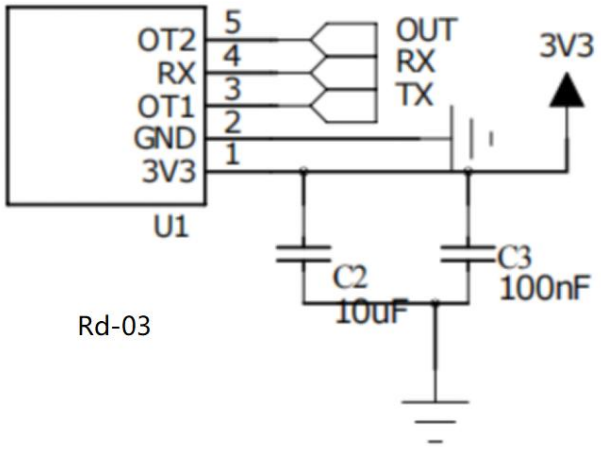


Figure 7 Application guide circuit

6.2. Recommended PCB package size

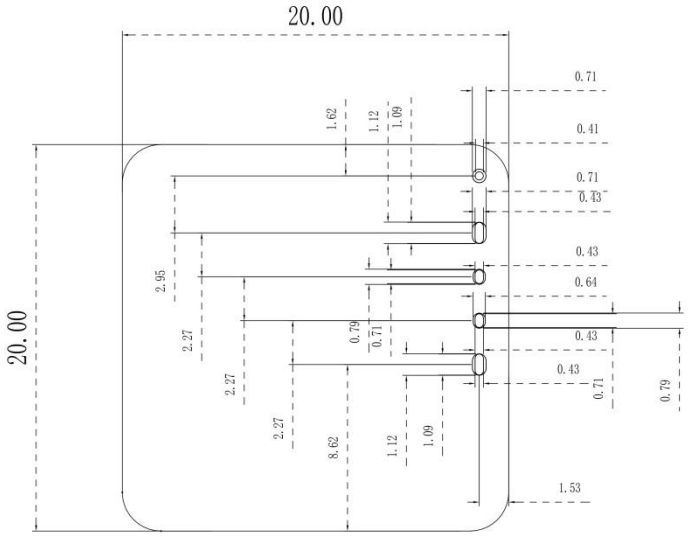


Figure 8 Recommended PCB package size（Unit:mm）

Note:

- Rd-03_V2 module is compatible with 2.0mm pins while using the standard 5-pin 2.54mm pitch pin interface
- If 2.0mm pins are used, 4+1Pin, 4+0Pin, and 3+0Pin are available

6.3. Precautions for radar installation

■ In motherboard installation position, it is recommended that the following several ways:

✓ As far as possible to ensure that the radar antenna is opposite to test area, and the antenna around open without sunscreen.

✓ Ensure that the radar installation position is firm, stable, shaking will influence the effect of detection of radar itself.

✓ Ensure that there won't be on the back of radar object movement or vibration. Due to the penetrating nature of radar waves, the antenna signal back lobe may detect moving objects on the back of the radar. A metal shield or metal backplane can be used to shield the radar back flap to weaken the influence of objects on the back of the radar.

✓ As target size, condition, different, such as RCS target distance accuracy will fluctuate; And the farthest distances fluctuate a little bit.

✓ When there are multiple 24GHz band radars, please do not beam away as far as possible to avoid possible mutual interference.

■ In order to meet the performance of on-board antenna, antenna surrounding prohibited, metal pieces, far away from the high frequency components.

■ The input voltage range of the power supply is 3.0V-3.6V, and the power ripple has no obvious frequency peak within 100 kHz. The user should consider the corresponding electromagnetic compatibility design such as ESD and lightning surge.

6.4. Installation environment requirements

This product needs to be installed in a suitable environment. If it is used in the following environments, the detection effect will be affected:

■ Induction of continuous movement in the area of nonhuman objects, such as animals, sustained oscillation of the curtain, is the outlet of the large strain of green plant, etc.

■ induction area exists the strong reflector of large area, strong reflector is of the radar antenna can cause interference.

■ When mounting the wall, need to consider the top of the indoor air conditioning, electric fan etc. External interference factors.

6.5. Installation mode and induction range

■ Hanging roof installation

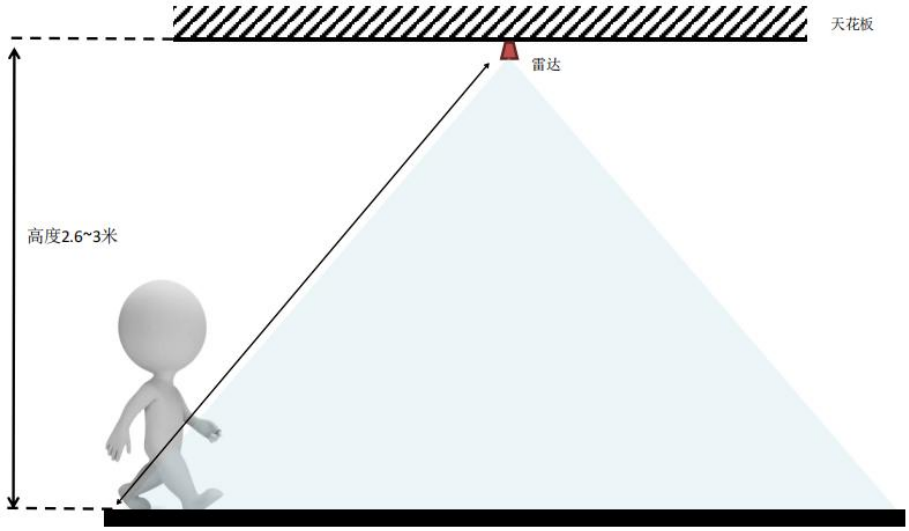


Figure 9 Schematic diagram of mounting the roof

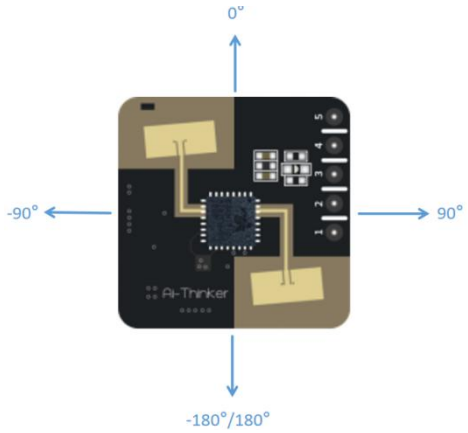


Figure 10 Schematic diagram of the direction of the ceiling

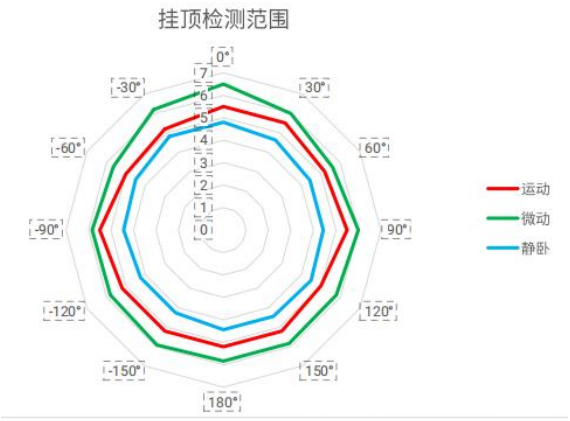


Figure 11 Radar map of the ceiling

■ Wall mounting mode

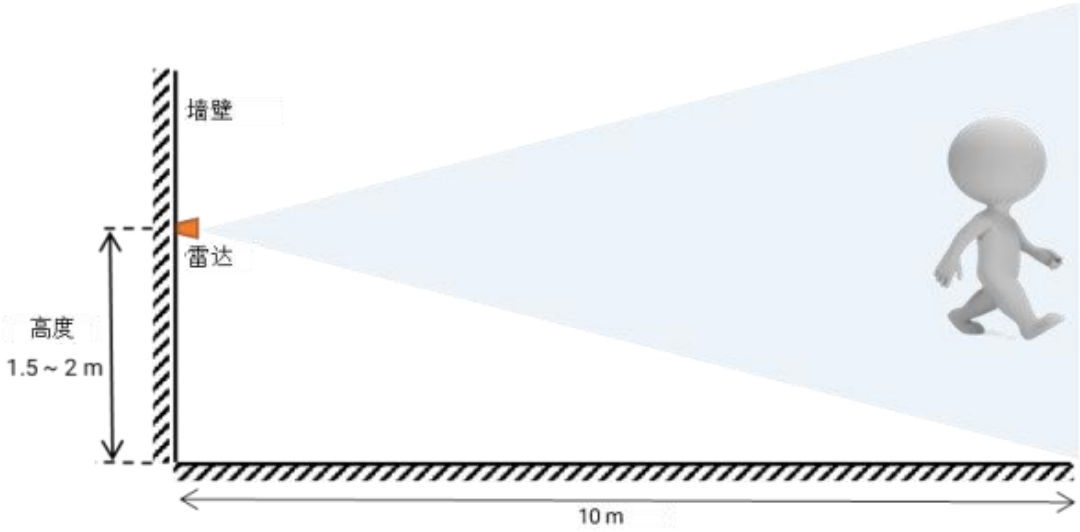


Figure 12 Schematic diagram of wall mounting

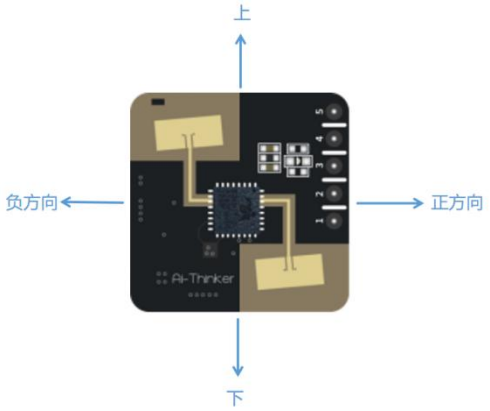


Figure 13 Schematic diagram of wall-mounting direction

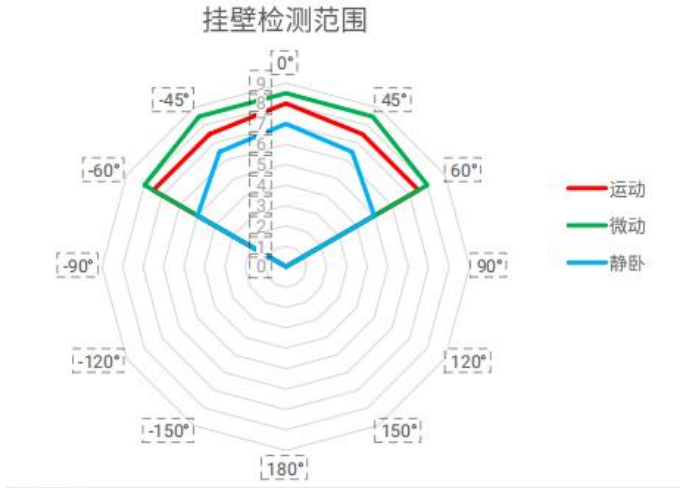


Figure 14 Wall-mounted radar char

6.6. Power Supply

- Recommended voltage is 3.3V and the peak current is above 200mA.
- Recommended to use LDO as power supply ; If using DC-DC, it is recommended to control ripple within 30mV.
- DC - DC power supply circuit suggested the reserved capacitance position, dynamic response can be large changes in load and optimize the output ripple.
- 3.3V power supply interface increases ESD device is recommended.

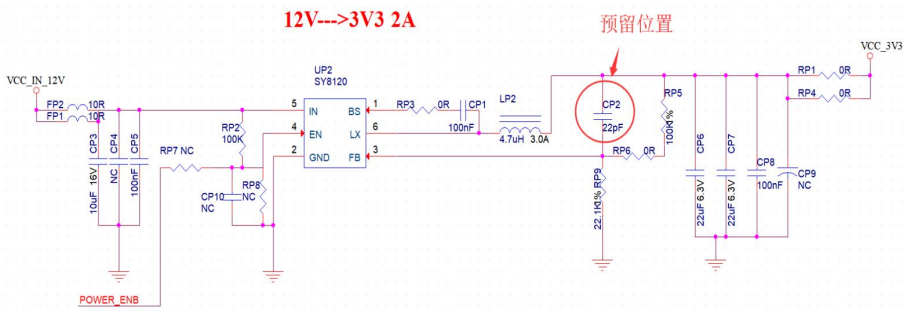


Figure 15 DC-DC step-down circuit diagra

6.7. GPIO

- Some IO ports are drawn from the periphery of the module. If necessary, it is recommended to use 10- 100 ohm resistors in series on the IO ports. It can suppress overshoot, so make level both sides more smoothly. It helps EMI and ESD.
- Special IO mouth pull up or down, need to refer to instructions on the use of the specification, here will affect the launch configuration module.
- Module IO port is 3.3 V if the master IO mouth level does not match with module, need to increase the level conversion circuit.
- If IO mouth directly connected to the peripheral interface, or terminal, such as row needles, and Suggestions on the IO mouth line near the terminal obligate ESD device.

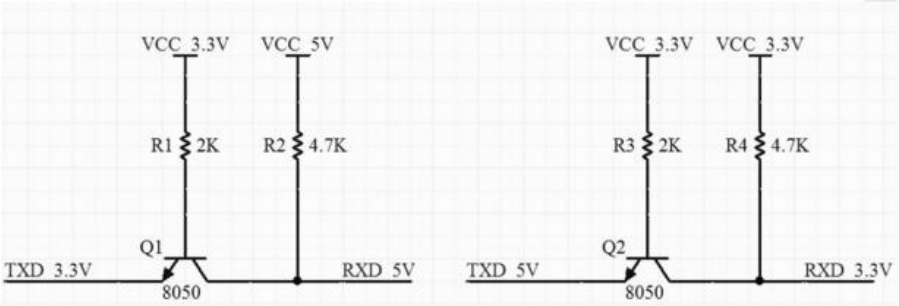


Figure 16 Level switching circuit

7. Storage conditions

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

The module's moisture sensitivity level MSL is level 3.

After the vacuum bag is unwrapped, 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.

8. Reflow welding curve diagram

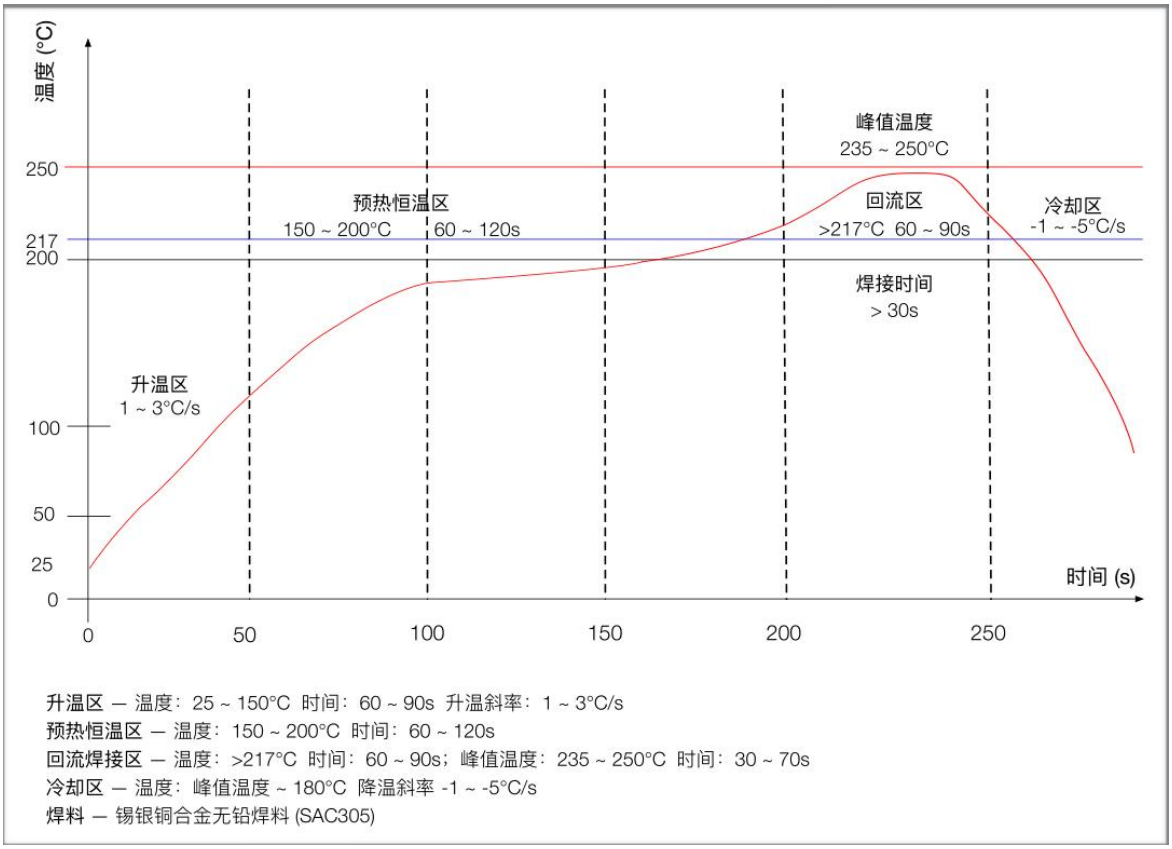


Figure 17 Reflow welding curve

9. Product package information

Rd-03_V2 module is packaged in tape at 200 pcs /reel. As shown in the figure below:

Figure 18 Packaging and taping diagram

10.Contact us

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