VD-01 Specification

Version V1.1.0

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.1.0	2022.11.8	First Edition	JiYe Yang	NingGuan

Content

1. Product Overview

VD-01 is a voice module developed by Shenzhen Ai-Thinker Technology Co., LTD. The module is equipped with TG7560A chip as the core processor. TG7560A chip integrates ultra-low power NPU (neural processing unit), 32-bit RISC microcontroller, hardware VAD (voice activation detection) and rich interfaces, which can recognize voice keywords with ultra-low power and is easy to use.

VD-01 module supports 5V serial communication, and can be widely and quickly applied to smart home, all kinds of smart small household appliances, 86 boxes, toys, lamps and other products requiring voice control, providing customers with ultra-low cost offline voice recognition solutions.

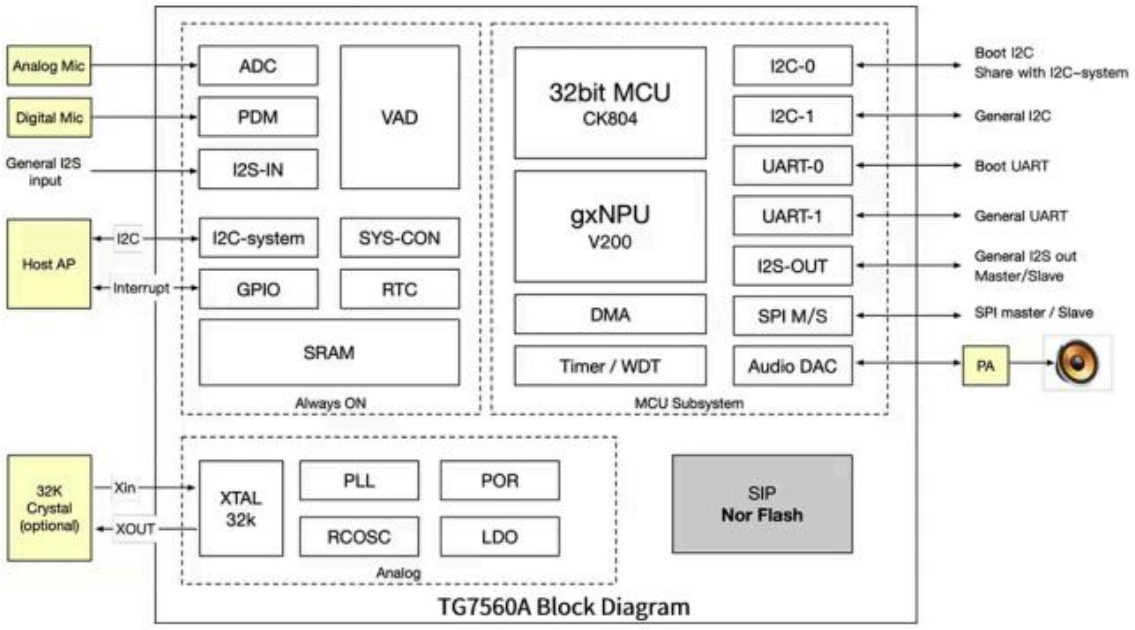


Figure 1 Main chip architecture diagram

1.1. Characteristic

- MCU
  - ✓ 32 bit RISC CPU, low power consumption frequency up to 50 MHZ
  - ✓ instruction cache 4 KB,data cache 8 KB
  - ✓ Support DSP and FPU acceleration unit
- NPU
  - ✓ ultra-low power consumption, high efficiency of neural processor gxNPU V200
  - ✓ support within DNN/CNN/LSTM popular models
- VAD
  - ✓ hardware voice activity detection, can pass information to detect human environmental noise in the spectrum
- Memory
  - ✓ hardware built-in 208 KB SRAM and 256 KB ~ 1 MB of Nor Flash
- Audio ADC
  - ✓ low-power audio ADC, signal to noise ratio of 65 dB
  - ✓ built-in programmable gain amplifier, support from 20 ~50 dB gain change, support 1 dB adjust step by step
- Audio interfaces
  - ✓ dual channel product data management (PDM) interface, support, from the pattern
  - ✓ I2S input, support TDM mode
  - ✓ two I2S output interface, the main client/from end can be configured
  - ✓ dual channel audio output DAC
- Communication interfaces
  - ✓ support dual serial port, serial communication support 5V
  - ✓ support I2C, SPI communication mode, the SPI clock frequency up to 50 MHZ

2. Main parameters

Table 1 Description of the main parameters

Model	VD-01
Package	Compatible socket /SMD-24/ row pin
Size	24.0*25.5*0.8(±0.2)mm
Operating temperature	-40℃ ~ 85℃
Storage temperature	-40℃ ~ 125℃, < 90%RH
Power supply	Support voltage 3.6V-5.25V, typical value 5V, supply current ⩾500mA
Interface	UART/GPIO/I2C/I2S/DAC/SPI
IO	10
UART rate	Default 115200 bps

2.1. Static electricity requirement

VD-01 is an electrostatic sensitive device. Therefore, you need to take special precautions when carrying it.

Figure 2 ESD preventive measures

2.2. Electrical characteristics

Table 2 Electrical characteristics table

Parameters	Min.	Typical value	Max.	Unit
Voltage Supply VCC	3.6	5	5.25	V
3V3OUT Output Voltage	-	3.3	-	V
IO Output High Level (VOH)	2.4	-	-	V
IO Output Low Level (VOL)	-	-	0.4V	V
IO Input High Level (VIH)	2.0	-	3.6	V
IO Input Low Level (VIL)	-0.3	-	0.8	V

2.3. Power

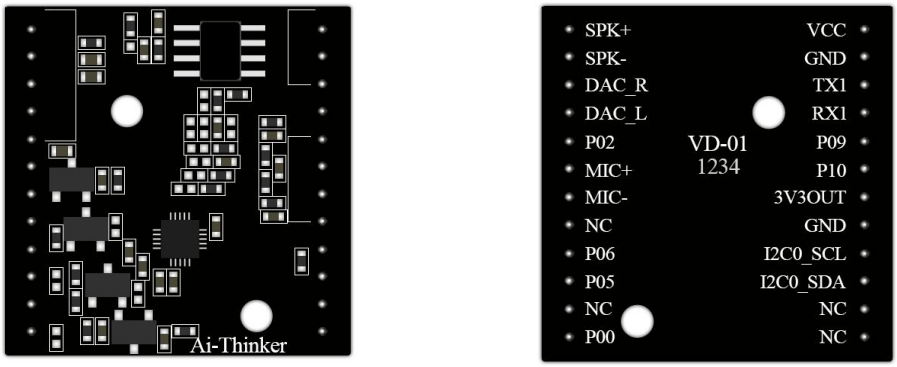
The following power consumption data is based on a 5V power supply and an ambient temperature of 25° C.

- under our configuration speakers and microphones measured active state of VD - 01 power consumption.

Table 3 Power consumption table

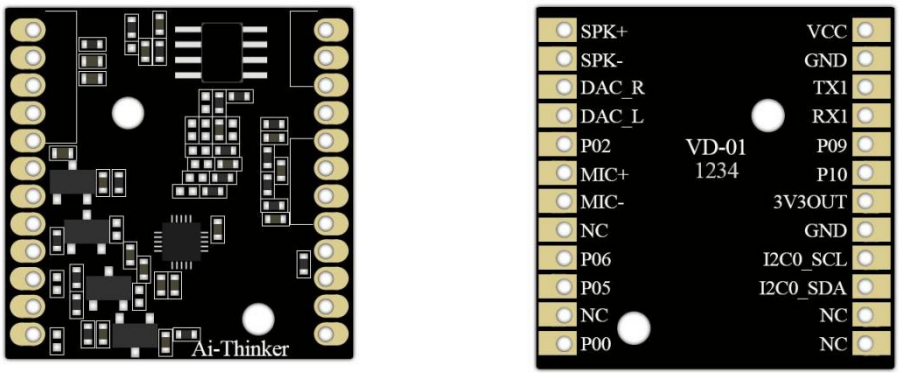
Mode	Min.	AVG	Max.	Unit
active（Broadcast in response）	5.2	59.1	138.4	mA
ready mode	5.2	5.4	5.6	mA

3. Appearance Dimensions



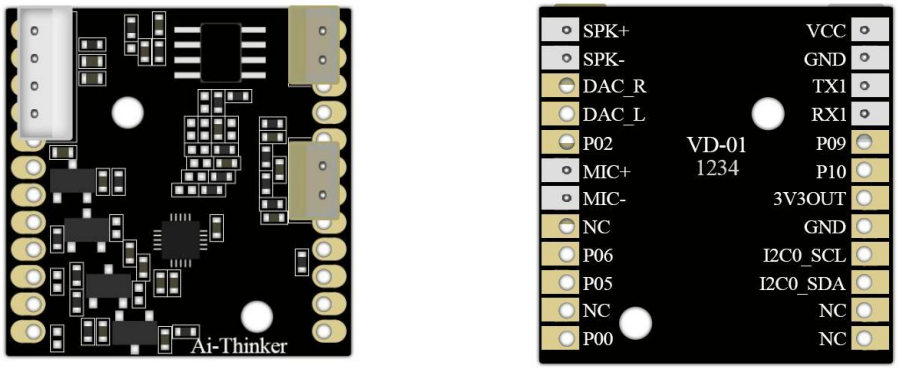
Front Back

Figure 3 Appearance of VD-01 (with pin rows)（pictures is for reference only,subject to physical objects）



Front Back

Figure 4 Appearance of VD-01 (SMD patch welding)（pictures is for reference only,subject to physical objects）



Front Back

Figure 5 Appearance of VD-01 (with socket) (pictures is for reference only,subject to physical objects)

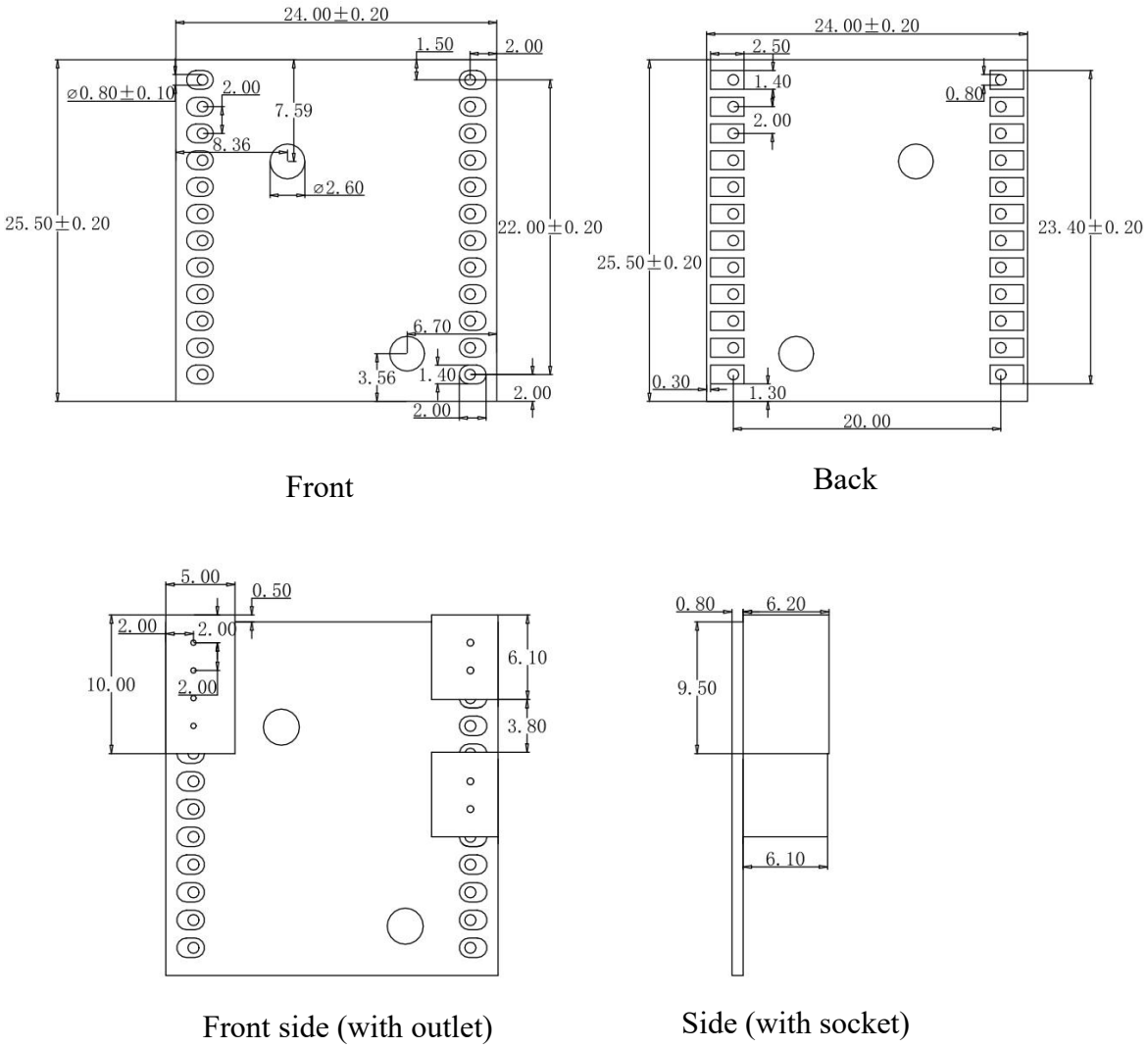


Figure 6 Size diagram

4. Pin Definition

VD-01 module is connected with a total of 24 pins, as shown in the pin schematic diagram, pin function definition table is the interface definition.

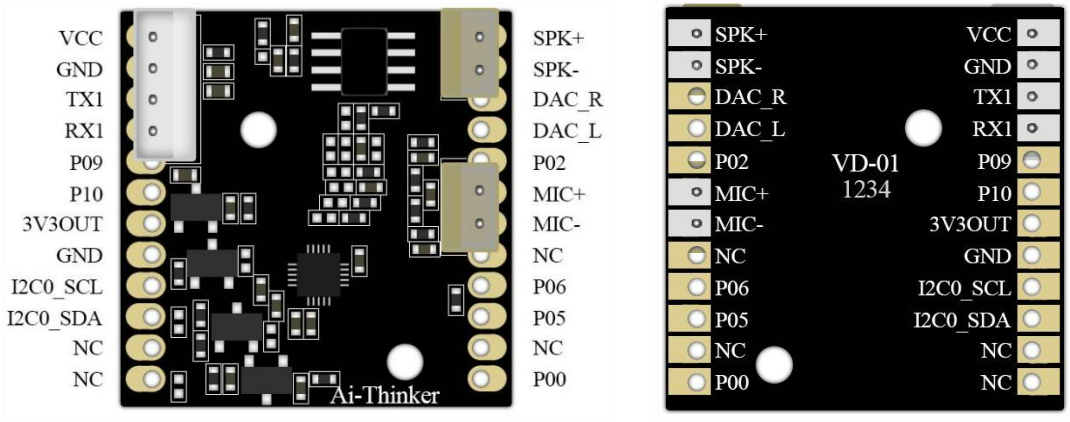


Figure 7 Schematic diagram of module pins

Table 4 Pin function definition table

No.	Name	Function
1	VCC	Power input, typical value 5V, power supply current ≥500mA
2	GND	Ground
3	TX1	UART1_TX(5V serial port communication is supported when 5V power is supplied)
4	RX1	UART1_RX(5V serial port communication is supported when 5V power is supplied)
5	P09	GPIO09/I2C1_SDA/SPI_CSn_M/SPI_CSn_S/UART1_CTS
6	P10	GPIO10/I2C1_SCL/SPI_MISO_M/SPI_MISO_S/UART1_RTS
7	3V3OUT	3.3V power output
8	GND	Ground
9	I2C0_SCL	GPIO04/I2C0_SCL/PDM_DATA
10	I2C0_SDA	GPIO03/I2C0_SDA/PDM_CLK_IN
11	NC	NC
12	NC	NC
13	P00	GPIO00/SPI_CSn_M/SPI_CSn_S
14	NC	NC
15	P05	GPIO05/UART0_TX (Supports 3V3 serial port communication)/I2C1_SDA/DAC_OUT_L
16	P06	GPIO06/UART0_RX(Supports 3V3 serial port communication)/I2C1_SCL/DAC_OUT_R
17	NC	NC
18	MIC-	MIC-imput
19	MIC+	MIC+imput
20	P02	GPIO02/EXT_CLK_IN
21	DAC_L	Reserved audio L channel output, this function is not supported
22	DAC_R	Reserved audio R channel output, this function is not supported
23	SPK-	SPK- 8Ω2W
24	SPK+	SPK+ 8Ω2W

5. Schematic

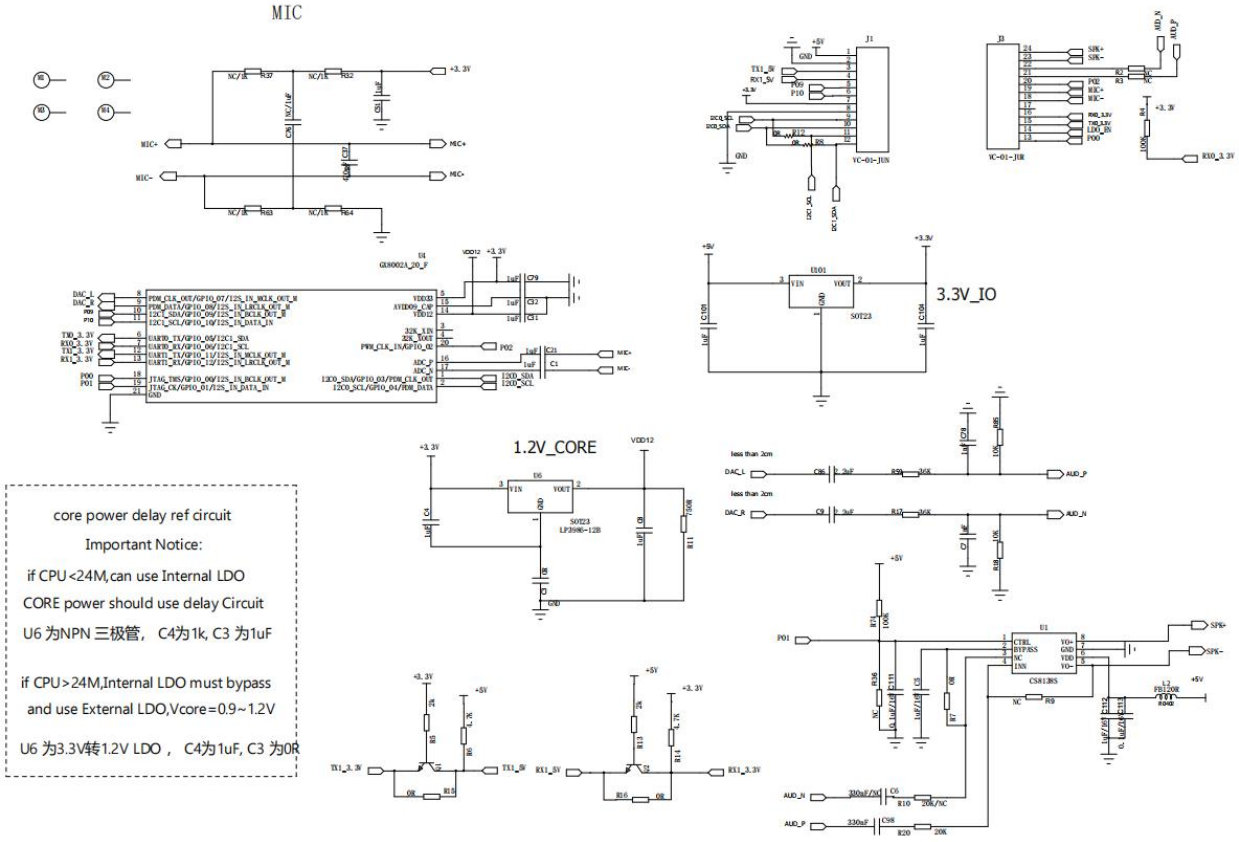


Figure 8 Module schematic

6. Design Guidance

6.1. Module application circuit

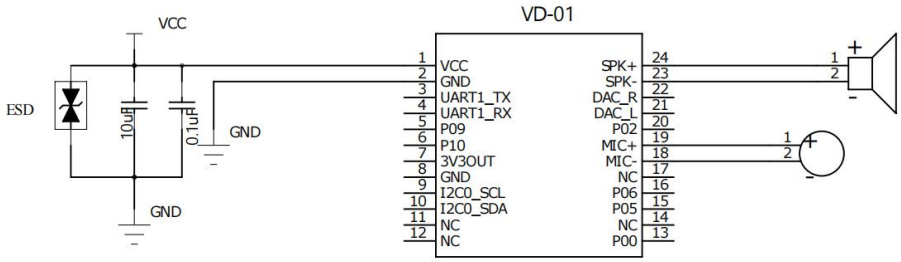


Figure 9 Application circuit diagram

6.2. Recommended PCB package size

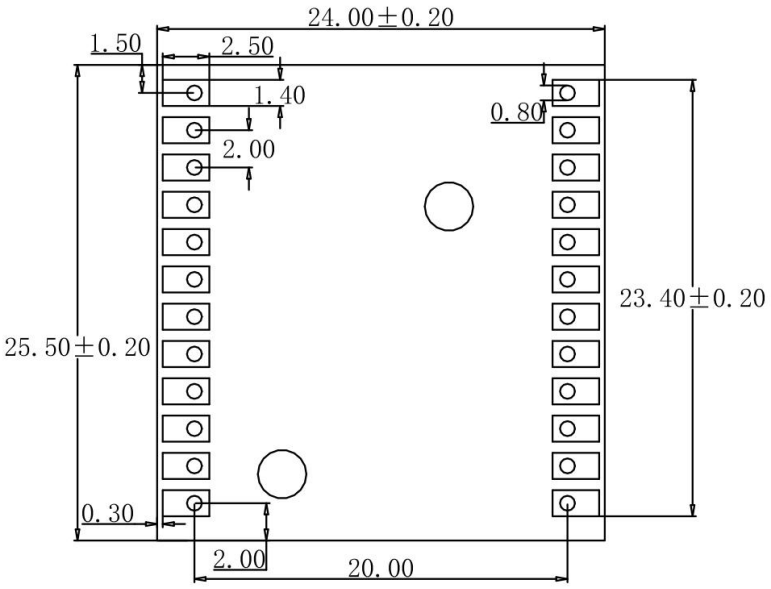


Figure 10 Recommended PCB package size

6.3. Power supply

- Recommend 5 V voltage, more than 500 mA peak current.
- It is recommended to use "power supply, If DC-DC is used, it is recommended that the ripple be controlled within 50mV.
- DC-DC power supply circuit suggested the reserved capacitance position, dynamic response can be large changes in load and optimize the output ripple.

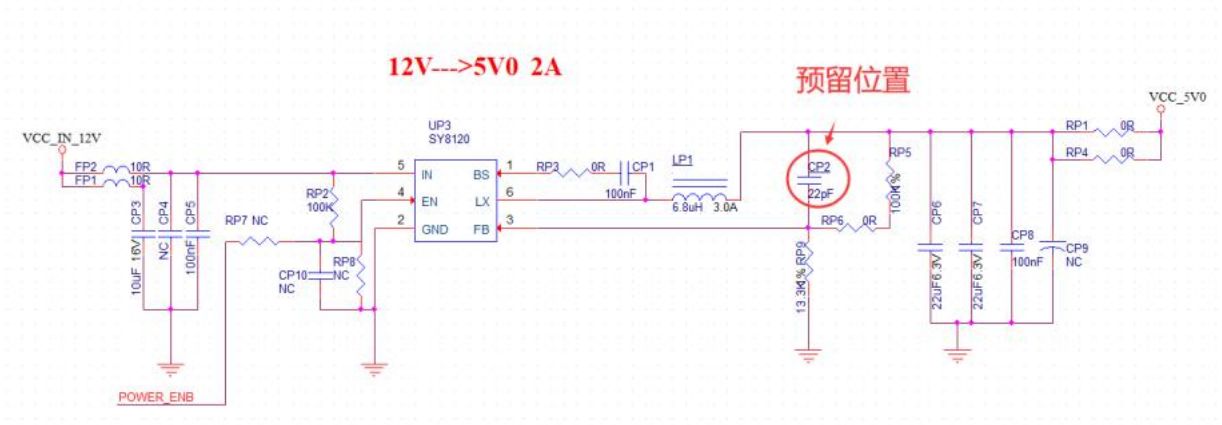


Figure 11 DC-DC step-down circuit

6.4. GPIO level conversion

- Module periphery raises some IO mouth, if you want to use advice on IO mouth series resistance of 10-100 ohms. This can inhibit overshoot and make both sides level more stable. 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.

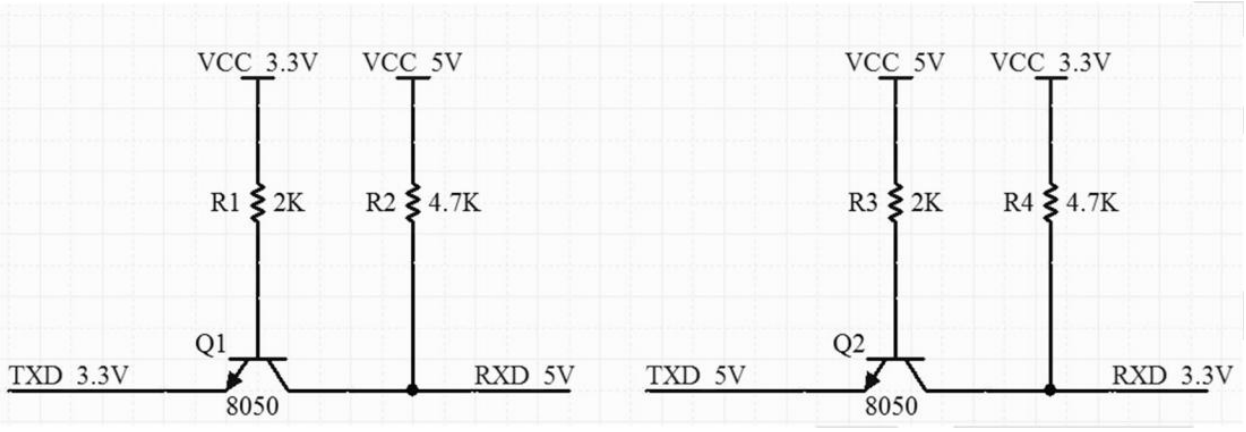


Figure 12 Level conversion circuit

7. Storage conditions

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

The module has a moisture sensitivity rating of MSL 3.

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

8. Reflow welding curve diagram

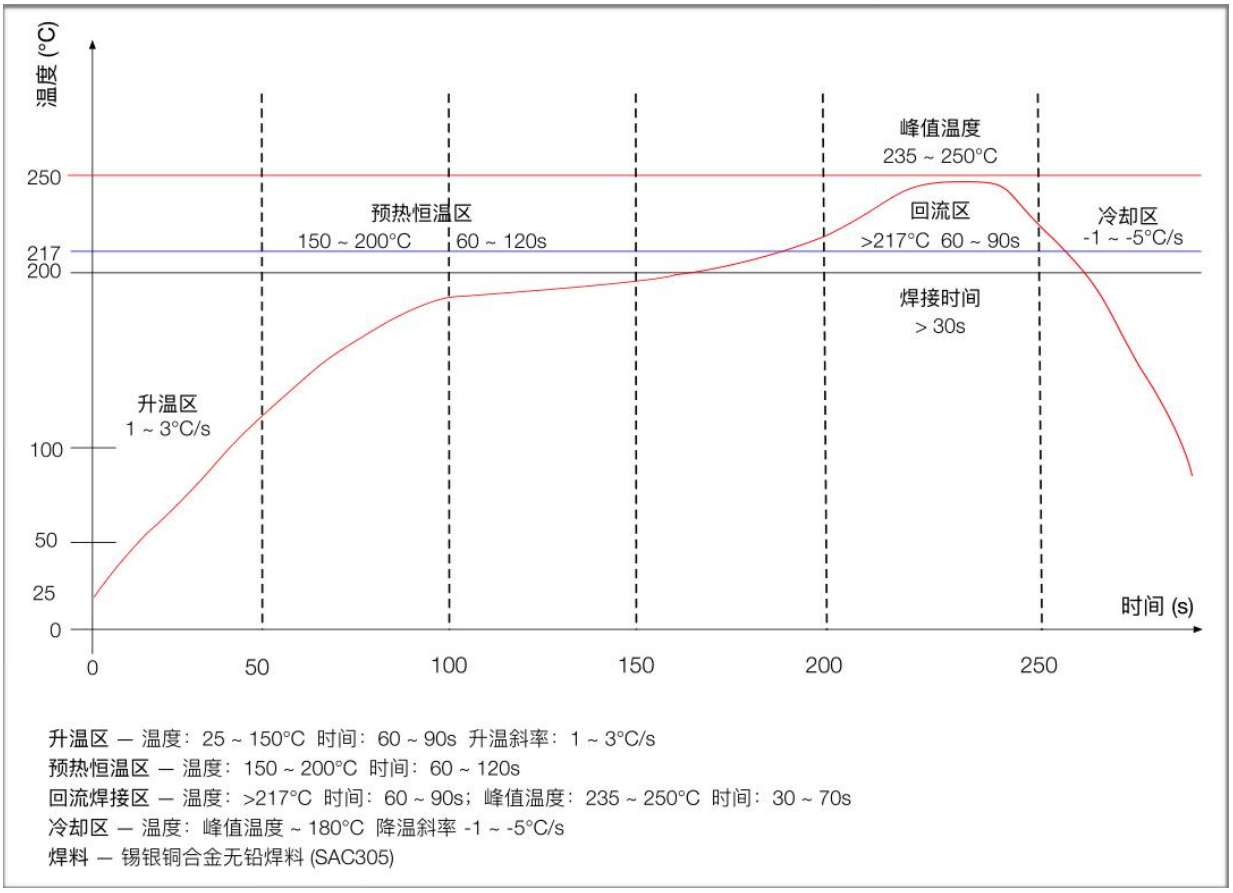


Figure 13 Reflow welding diagram

9. Product Packaging Information

Table 5 Packaging information table

Packing list	Pacakge	Quantity per packet (Electrostatic bag)	Quantity per packet (Sealed bag)
VD-01	Foam + electrostatic bag	1pcs	50pcs

10.Contact us

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