Change History of Revision

Version	Date	Contents of Revision Change	Compilation	Verify
V1.0	2019.10.29	Initial release	Xie Yiji	

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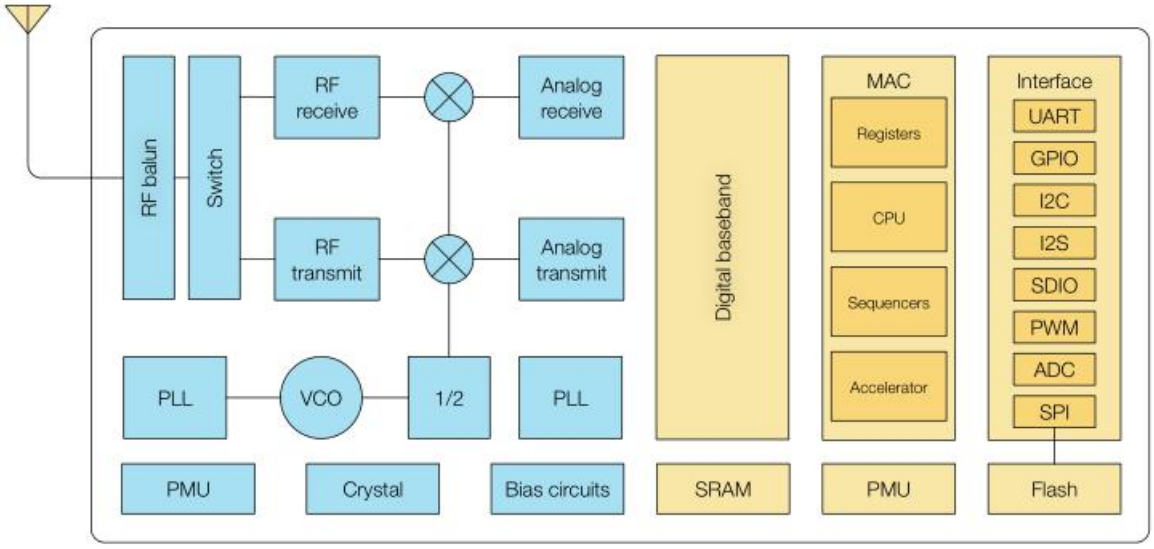
1.Product overview

The ESP-07S WiFi module was developed by Ai-Thinker Technology. The core processor of the module ESP8266 integrates the industry-leading Tensilica L106 ultra-low-power 32-bit micro MCU in a smaller package with 16-bit reduced mode. The main frequency supports 80 MHz and 160 MHz, supports RTOS, and integrates Wi-Fi MAC / BB / RF / PA / LNA.

The ESP-07S WiFi module supports the standard IEEE802.11 b/g/n protocol, a complete TCP/IP protocol stack. Users can use this module to add networking capabilities to existing devices or to build separate network controllers.

The ESP8266 is a high-performance wireless SOC that offers maximum utility at the lowest cost and unlimited possibilities for embedding WiFi functionality into other systems.



ESP8266 has a complete and self-contained Wi-Fi network function, which can be used independently or run as a slave on other host MCUs. When ESP8266 is applied independently, it can be started directly from external flash. The built-in cache memory helps improve system performance and optimizes the storage system.

Another case is that ESP8266 can be used as a Wi-Fi adapter only through SPI / SDIO interface or UART interface, and can be applied to any microcontroller-based design.

ESP8266's powerful on-chip processing and storage capabilities make it possible to integrate sensors and other application-specific equipment through the GPIO port, greatly reducing the cost of early development.

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Features

- Complete 802.11b / g / n Wi-Fi SoC module
- The core is Tensilica L106 low power 32-bit MCU, frequency supports 80 MHz and 160 MHz, supports RTOS
- Built-in 10-bit high-precision ADC
- Support UART / GPIO / ADC / PWM / SPI / I2C interface
- SMD-16 package for easy welding
- Integrated Wi-Fi MAC / BB / RF / PA / LNA
- Support multiple sleep modes, deep sleep current as low as 20uA
- UART baud speed up to 4Mbps
- Embedded Lwip protocol stack
- Support STA / AP / STA + AP operation mode
- Smart Config (APP) / AirKiss (WeChat) support for Android and IOS
- Support serial local upgrade and remote firmware upgrade (FOTA)
- General AT commands can be used easy and quickly
- Support for second development, integration of Windows、Linux development environment

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Parameters

Figure 1 Main Parameter

Model	ESP-07S
Package	SMD-16
Size	17*16*3(±0.2)MM
Antenna	IPEX
Frequency Range	2400 ~ 2483.5MHz
Operating Temperature	-40 ℃ ~ 105 ℃
Storage Environment	-40 ℃ ~ 125 ℃ , < 90%RH
Power supply range	Voltage: 3.0V ~ 3.6V, Current>500mA
Interface	UART/GPIO/ADC/PWM/SPI/I2C
IO	9
UART Baut	Support 110 ~ 4608000 bps , default:115200 bps
Security	WEP/WPA-PSK/WPA2-PSK
SPI Flash	Default: 32Mbit
Certification	FCC、CE、REACH、RoHs、SRRC

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2.Electrical parameter

Electrical Characteristics

Parameter		Symbol	Min	Typ	Max	Unit
Storage temperature		VDD	3.0	3.3	3.6	V
I/O	V_{IL}/V_{IH}	-	-0.3/0.75VIO	-	0.25VIO/3.6	V
	V_{OL}/V_{OH}	-	N/0.8VIO	-	0.1VIO/N	V
	I_{MAX}	-	-	-	12	mA

Radio Performance

Description	Typ	Unit
Operating frequency	2400 - 2483.5	MHz
Output Power		
11n mode, PA output power	13±2	dBm
11g mode, PA output power	14±2	dBm
11b mode, PA output power	16±2	dBm
Sensitivity		
CCK, 1 Mbps	<=-90	dBm
CCK, 11 Mbps	<=-85	dBm
6 Mbps (1/2 BPSK)	<=-88	dBm
54 Mbps (3/4 64-QAM)	<=-70	dBm
HT20 (MCS7)	<=-67	dBm

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Power Consumption

The following power consumption data were obtained from the tests with a 3.3V power supply and a voltage stabilizer, in 25°C ambient temperature.

- All measurements are done at the antenna interface without the SAW filter.
- All data are based on 90% duty cycle and measured in continuous transmission mode.

Mode	Min	Typ	Max	Unit
Tx 802.11b, CCK 11Mbps, POUT=+17dBm	-	170	-	mA
Tx 802.11g, OFDM 54Mbps, POUT =+15dBm	-	140	-	mA
Tx 802.11n, MCS7, POUT =+13dBm	-	120	-	mA
Rx 802.11b,1024 bytes packet length, -80dBm	-	50	-	mA
Rx 802.11g,1024 bytes packet length, -70dBm	-	56	-	mA
Rx 802.11n,1024 bytes packet length, -65dBm	-	56	-	mA
Modem-Sleep①	-	20	-	mA
Light-Sleep②	-	2	-	mA
Deep-Sleep③	-	20	-	uA
Power Off	-	0.5	-	uA

Note:

- Modem-sleep is used when such applications as PWM or I2S require the CPU to be working. In cases where Wi-Fi connectivity is maintained and data transmission is not required, the Wi-Fi Modem circuit can be shut down to save power, according to 802.11 standards(such as U-APSD). For example, in DTIM3, when ESP8266EX sleeps for 300ms and wakes up for 3ms to receive Beacon packages from AP, the overall average current consumption is about 20mA.
- During Light-Sleep, the CPU may be suspended in applications like Wi-Fi switch. Without data transmission, the Wi-Fi Modem circuit can be turned off and CPU suspended to save power according to the 802.11 standard (U-APSD).
  E.g. in DTIM3, to maintain a sleep 300ms-wake 3ms cycle to receive AP's Beacon packages, the current is about 0.9mA.
- Deep-Sleep does not require Wi-Fi connection to be maintained. For application with long time lags between data transmission, e.g. a temperature sensor that checks the temperature every 100s ,sleep 300s and waking up to connect to the AP (taking about 0.3~1s), the overall average current is less than 1mA.

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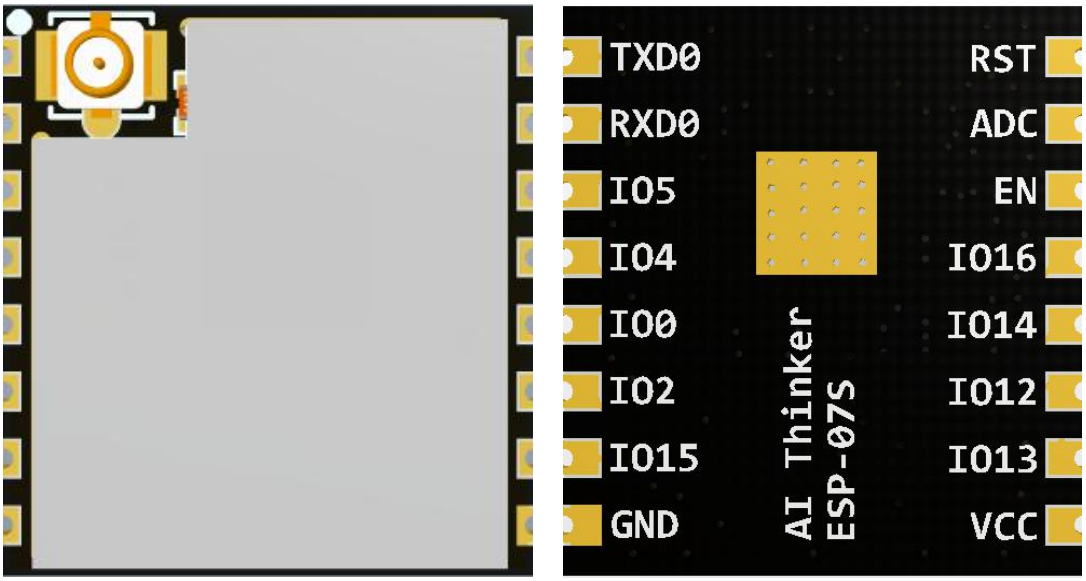
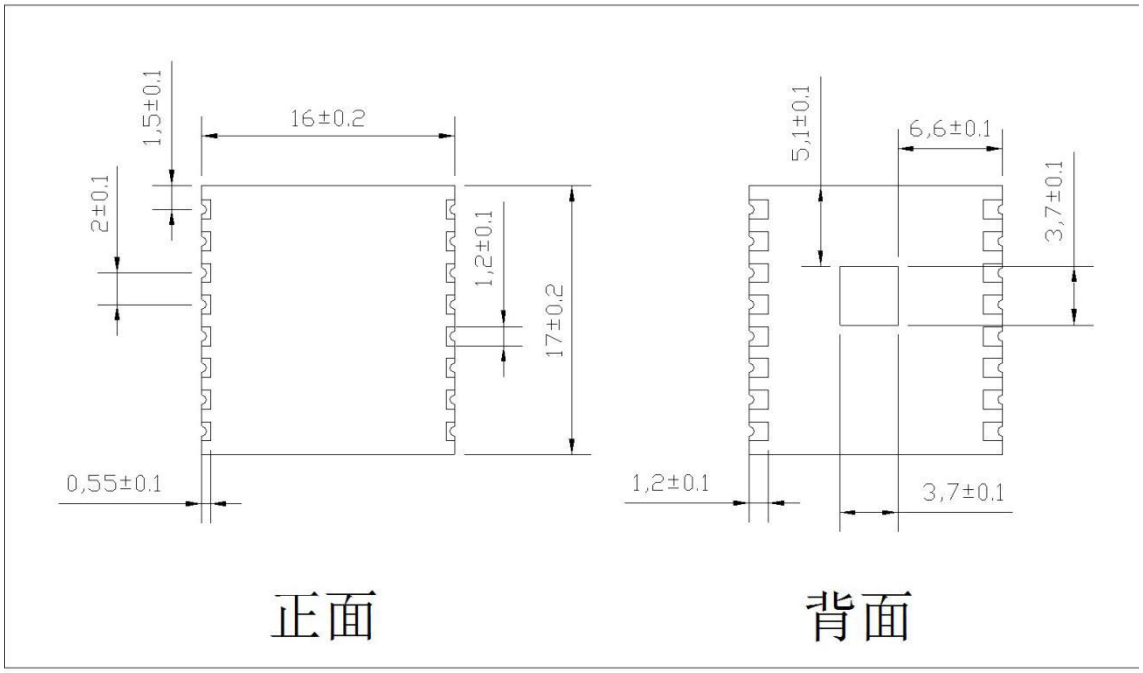
3.Appearance size





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4.Pin definition

ESP-07s has 16 interfaces，Refer to figure 2.1，table 2.2 is definition of interfaces.

Figure 2.1 ESP-07S Pin diagram

Table 2.2 Pin function definition

No.	Name	Function
1	RST	Reset, active low
2	ADC	A/D conversion，Input voltage range0~1V，the value range is 0~1024.
3	EN	Chip Enabled Pin, Active High
4	IO16	Connect wit RST pin to wake up Deep Sleep
5	IO14	HSPI_CLK/IR_T/I2C_CLK/I2SI_WS
6	IO12	HSPI_MISO
7	IO13	HSPI_MOSI/UART0_CTS
8	VCC	3.3V； output current of external power supply is recommended over 500mA
9	GND	Ground
10	IO15	HSPI_CS/U0_RTS/I2SO_BCK
11	IO2	U1_TXD/I2C_SDA/I2SO_WS

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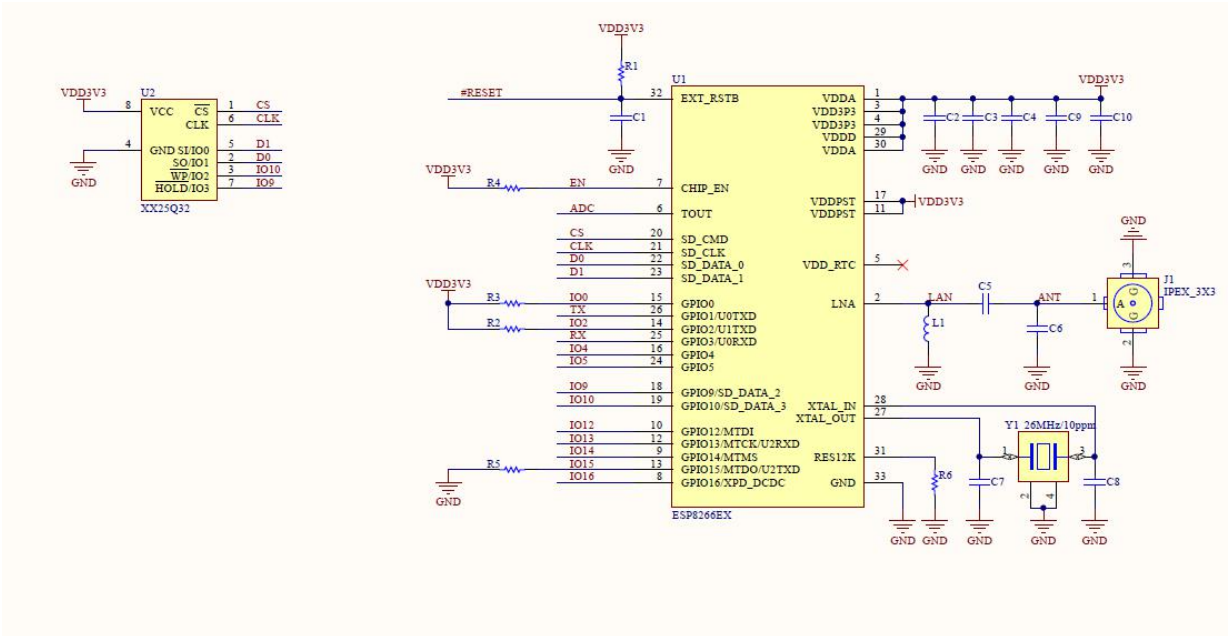
12	IO0	GPIO0; download mode:external pull low, running mode: floating or external pull high
13	IO4	GPIO4
14	IO5	IR_R
15	RX	RX receive
16	TX	TX transmit

Table Description of the ESP series module boot mode

Mode	CH_PD(EN)	RST	GPIO15	GPIO0	GPIO2	TXD0
Download mode	High	High	Low	Low	High	High
Running mode	High	High	Low	High	High	High

Note：Some of the pins inside the module had been pulled up or pulled down，Please refer to the schematic diagram.

5.Schematics



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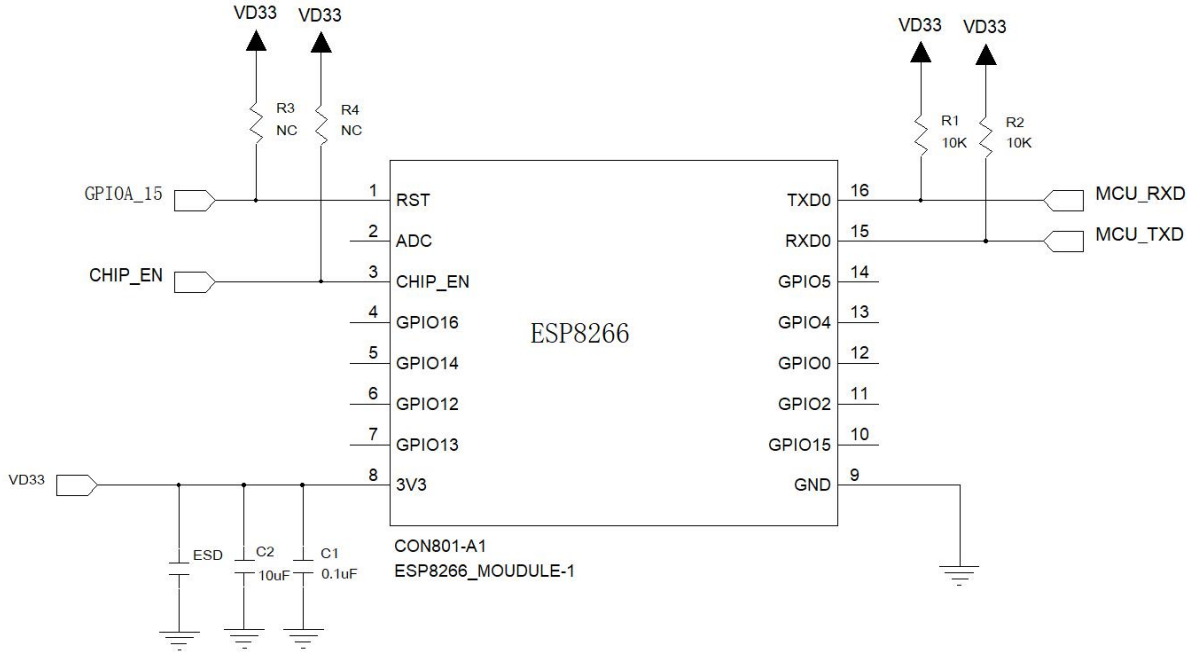
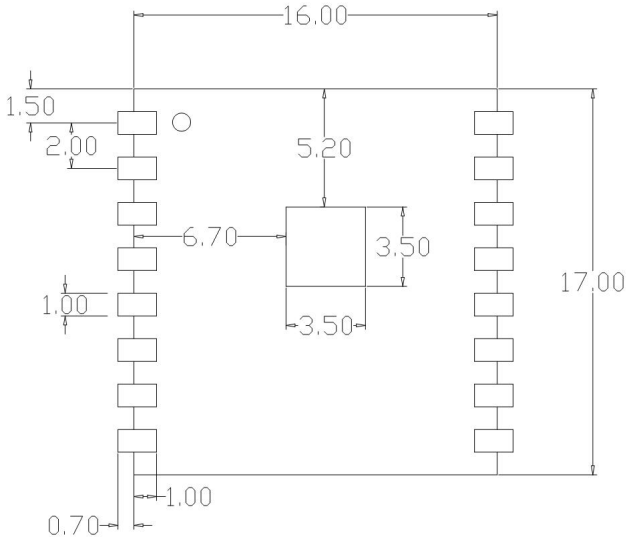
6.Design Guidance

1、Application Circuit



2、Recommended module package design size

Note: Below is the ESP-07S 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）、Installation position on the main board，advise for following two ways：

Option 1：The module is placed on the edge of the main board, and the antenna area is extended out of the edge of the main board.

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Option 2：Put the module on the edge of the motherboard, and the edge of the motherboard is hollowed out in the antenna position.

（2）、In order to meet the performance of the on-board antenna, metal parts are prohibited from being placed around the antenna.

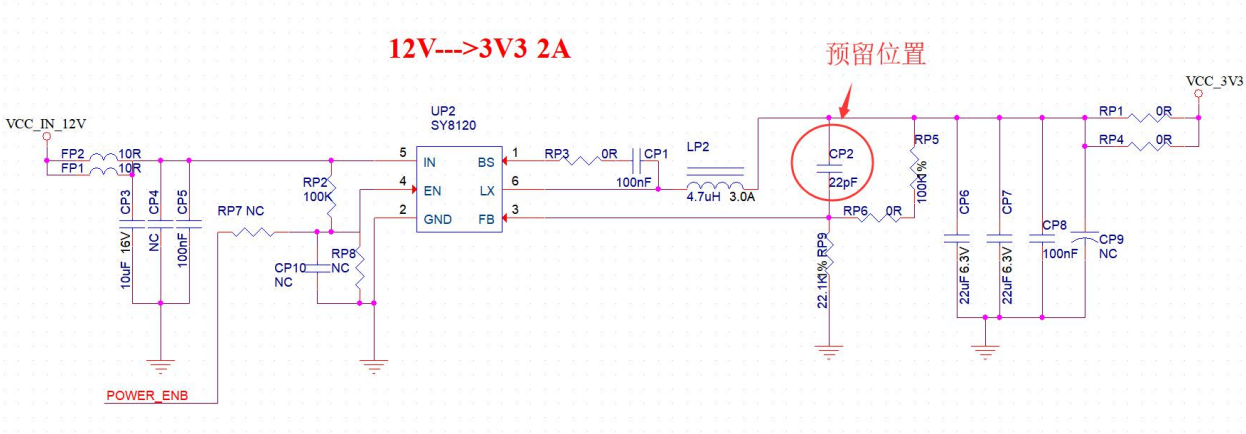
4、Power Supply

（1）、Recommended　voltage 3.3 V, Peak:Current over 500mA .

（2）、It is recommended to use the IDO power supply；If DC-DC is used, the ripple is controlled within 30 mV.

（3）、DC-DC power supply circuit is recommended to reserve the position of the dynamic response capacitor, and the output ripple can be optimized when the load change is large.

（4）、The power interface of 3.3V is suggest to increase ESD components.



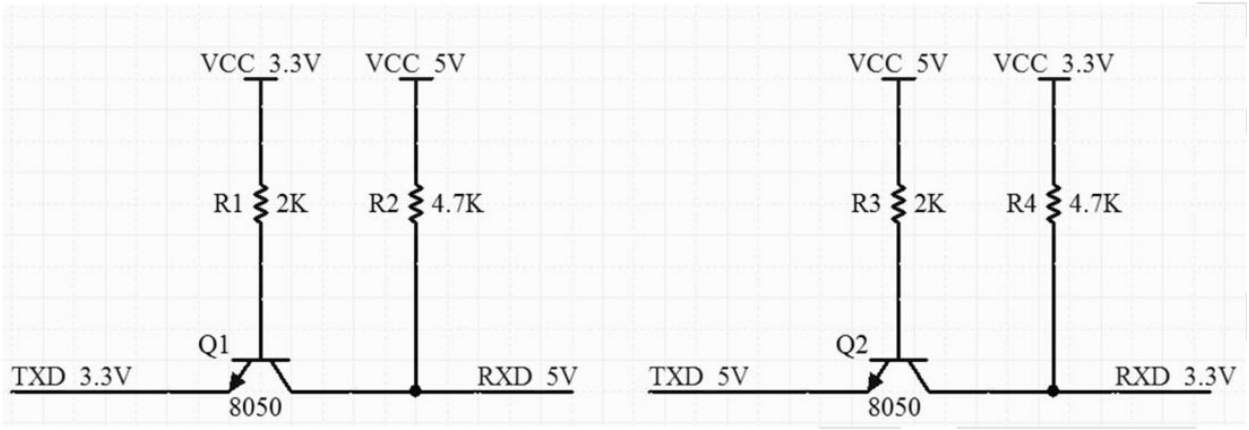
5、GPIO

（1）.There's a few GPIO port design outside the module，if require to use recommand the IO port to tadem the resistance for 10 to 100 ohmic.This can suppress overshoot，It's even more stable on both sides.It would help both EMI and ESD.

（2）.Special IO's pull up and down，should refer to the direction of use in Specification, here will affect the startup configuration of the module.

（3）.IO port of module is 3.3V,if master control and the IO level of module doesn't match,required to add Level swithing circuit.

（4）.If IO port connected to out-ring interface directly，pin or other etc，recommended to reserved ESD device near the terminal of IO circuit line .



Level switching circuit

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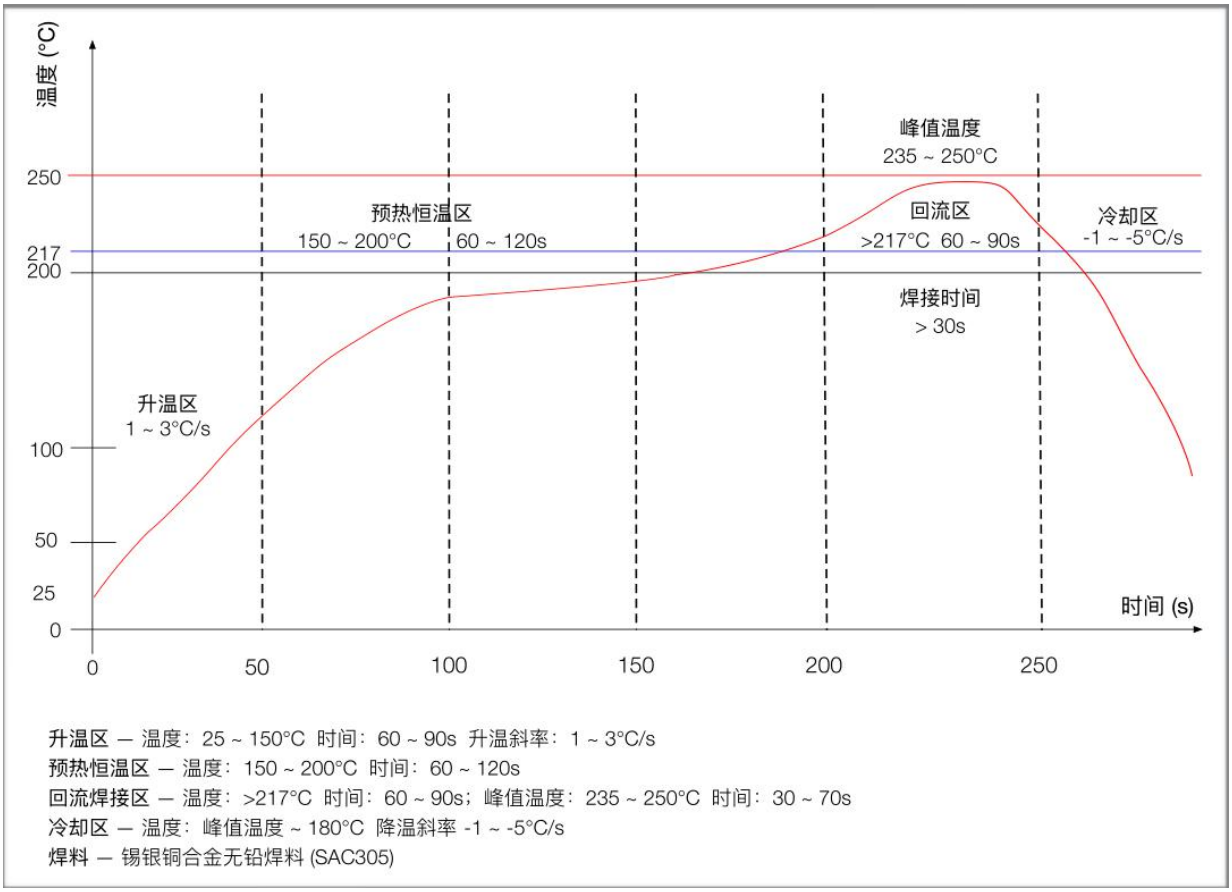
7.Reflow Welding Curve



升温区 — 温度：25 ~ 150°C 时间：60 ~ 90s 升温斜率：1 ~ 3°C/s
预热恒温区 — 温度：150 ~ 200°C 时间：60 ~ 120s
回流焊接区 — 温度：>217°C 时间：60 ~ 90s；峰值温度：235 ~ 250°C 时间：30 ~ 70s
冷却区 — 温度：峰值温度 ~ 180°C 降温斜率 -1 ~ -5°C/s
焊料 — 锡银铜合金无铅焊料 (SAC305)

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8.Package Information

As shown below,the packing of ESP-07S is a tray or tape (to be determined).

9.Contacts

Web：https://www.ai-thinker.com

Develop DOCS：https://docs.ai-thinker.com

Company forum：http://bbs.ai-thinker.com

Sampling purchasing：https://anxinke.taobao.com

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