Taixin **802.11ah TX-AH-Rx00P** series module technical specifications

Zhuhai Taixin Semiconductor
Co., Limited

3rd Floor, Building 11, Science and Technology Innovation Park, No. 1, Gangwan, High-tech Zone, Zhuhai City

Revision history

date	Version	describe	Revised by
2023-5-23	V5.7	Modify the description of the number of supported nodes;	WE
2023-5-19	V5.6	Added picture of module with shielding cover; Modify the description of the SPI interface and add pull-up instructions; Modify the tolerance of module size;	WE
2023-4-3	V5.5	Modify STA low-power wake-up instructions; Modify the description of AP low power consumption;	WE
2023-2-22	V5.4	Modify the frequency band range of 700P;	WE
2022-11-14	V5.3	Add 900P pictures;	WE
2022-10-28	V5.2	Modify the description of AP low power consumption; Added temperature description; Add description of SNIFFER; Note: Added description of the 700M frequency point being affected by 5G interference;	WE
2022-10-15	V5.1	Update reflow soldering curve;	WE
2022-9-27	V5.0	Update the module pictures to V1.3;	WE
2022-9-23	V4.9	Modify the pin description of SPI1;	WE
2022-9-8	V4.8	Instructions for increasing maximum transmit power;	WE
2022-7-30	V4.7	Added description of Mode key;	WE
2022-7-14	V4.6	Added description of dual antennas; Modify the reference circuit of the power supply; Modify the reference circuit of UART;	WE
2022-7-5	V4.5	Correct clerical errors; Added description of automatic relay mode;	WE
2022-6-23	V4.4	Modify the description of 1.3V IO;	WE
2022-6-20	V4.3	Update the module pictures to V1.2; Add pictures of network bridge/development board/test box;	WE
2022-5-19	V4.2	Updated module power supply instructions;	WE
2022-4-12	V4.1	Update module certification status;	WE
2022-3-23	V4.0	Updated description of TCP/UDP peak traffic;	WE

2021-11-22	V3.3	Add description of ADKEY; The SDIO/USB interface adds a pairing button;	WE
2021-10-28	V3.2	Add description of mechanisms such as CCA;	WE
2021-8-31	V3.1	Modify the module size diagram;	WE
2021-8-13	V3.0	Modify the reference schematic diagram of UART;	WE
2021-7-22	V2.7	Add description of roaming function;	WE
2021-7-9	V2.5	Added RF Layout considerations; Add Features: AP low power consumption, relay, multicast; modify low	WE
2021-4-25	V2.2	power consumption current value; Modify the low-power reference circuit;	WE
2021-3-29	V2.1	Modify the reference circuit of Ethernet PHY	WE
2021-3-16	V1.9	Updated scenario development and testing chapters	WE
2021-3-10	V1.8	Modify the RF supply current	WE
2021-3-9	V1.7	Add development and testing sections	WE
2021-2-25	V1.6	Modify SPI interface description	WE
2021-2-5	V1.5	Modify low-power circuit reference design	WE
2020-12-7	V1.0	Create;	WE

Table of contents

1Product Overview

As an optimized Wi-Fi solution for IoT devices, the TX-AH-Rx00Pxx series modules (later (referred to as TX-AH-Rx00P) is an industry-leading Wi-Fi module that complies with the IEEE 802.11ah standard.

TX-AH-Rx00P integrates 802.11ah SOC TXW83xx. This chip can work in the 730M~950M frequency band and provides better 2.4GHz and 5GHz Wi-Fi have longer transmission distances under the same transmission power. The module can work with a channel width of 1/2/4/8MHz and can provide physical throughput from 150 Kbps to 32.5Mbps, thus supporting applications from low-rate sensors to multiple high-rate surveillance cameras.

The TX-AH-Rx00P module uses channel conflict assessment (CCA) and carrier sense multiple access/collision detection (CSMA_CD) mechanisms to avoid channel access. Automatic frequency selection, automatic power control and other means are used to optimize network transmission performance.

The TX-AH-Rx00P can be connected to the application processor through USB, SDIO, SPI, UART and other interfaces, and can be used in many fields such as wireless security, drone image transmission, smart home and smart grid. In addition, TX-AH-Rx00P also provides RMII interface to implement a low-cost solution for single-module wireless bridge.

In terms of low power consumption, TX-AH-Rx00P provides STA keep-alive power consumption as low as 200uA. The module also supports AP low power consumption, enter The power consumption of AP in low power mode does not exceed 5mA.

In terms of networking, the module supports relay mode to expand coverage. The module supports roaming mode, STA can Roam between different APs. The module supports multicast mode and is suitable for data multicast working scenarios. In terms of antennas, it supports single antenna and dual antennas. Dual antennas are an option, and the antenna selection is automatically switched according to the signal.

The internal structure and external connection diagram of the chip/module are shown in Figure 1-1.

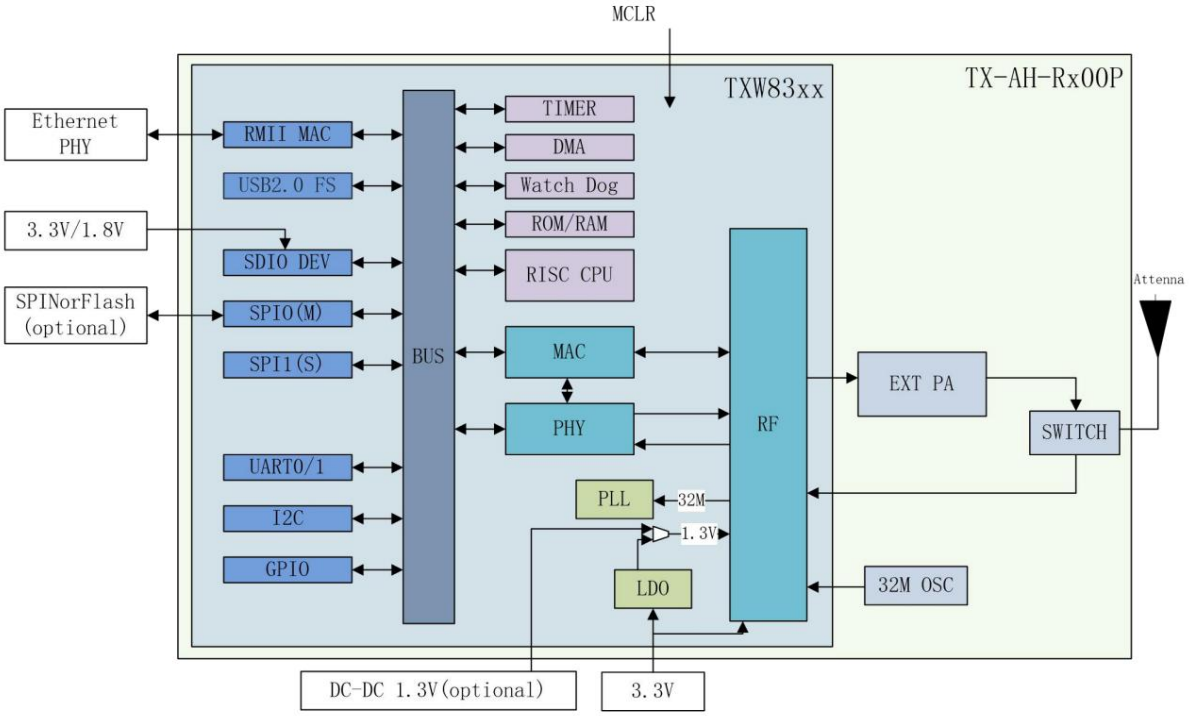


Figure 1-1. Chip/module internal structure and external connection diagram

The appearance of the module is shown in Figure 1-2 , 1-2(a) is TX-AH-R900PNR, 1-2(b) is TX-AH-R900P, both without shielding cover; 1-2(c) It is TX-AH-R900PNR-860M-S, with shielding cover.

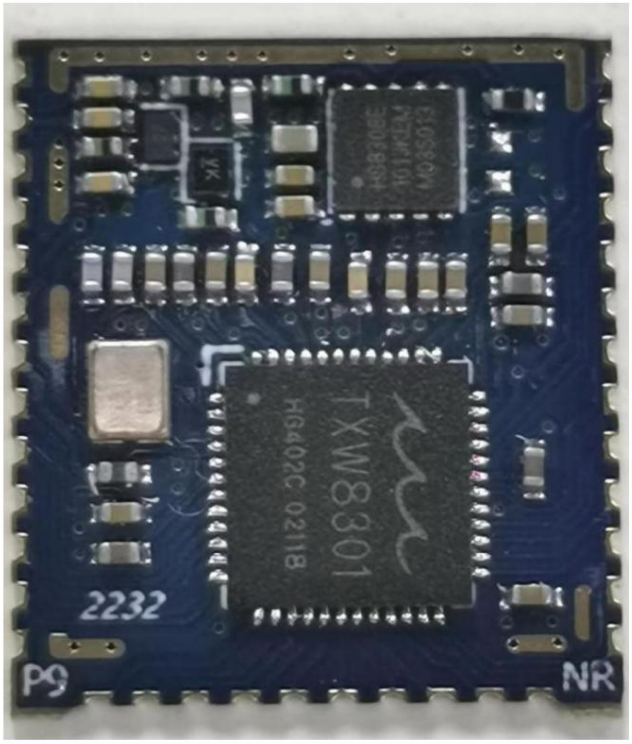


Figure **1-2(a). Appearance of TX-AH-Rx00Pxx** module (taking **TX-AH-R900PNR** as an example)

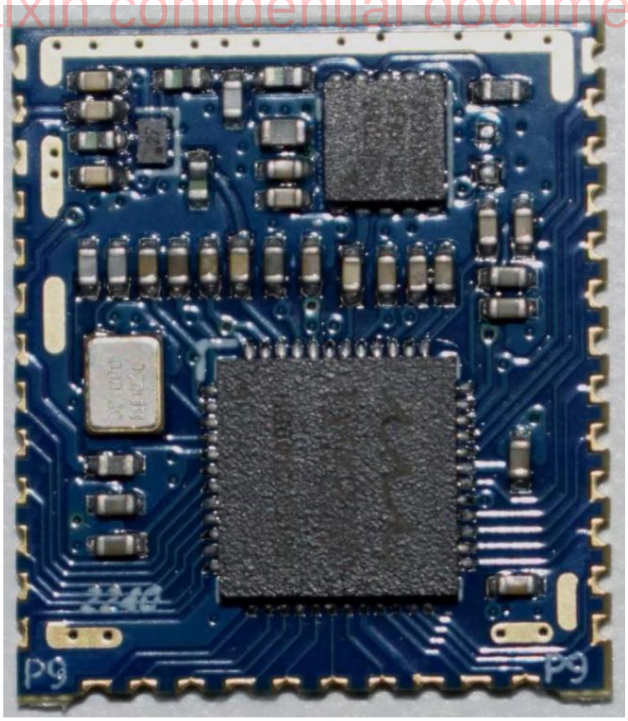


Figure **1-2(b). Appearance of TX-AH-Rx00Pxx** module (taking **TX-AH-R900P** as an example)

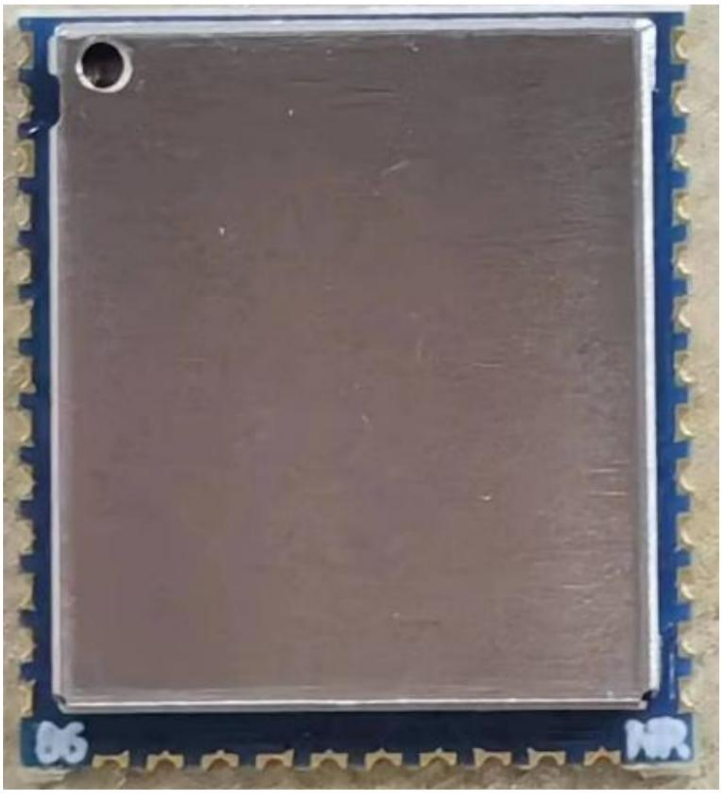


Figure **1-2(c). Appearance of TX-AH-Rx00Pxx** module (taking **TX-AH-R900PNR-860M-S** as an example)

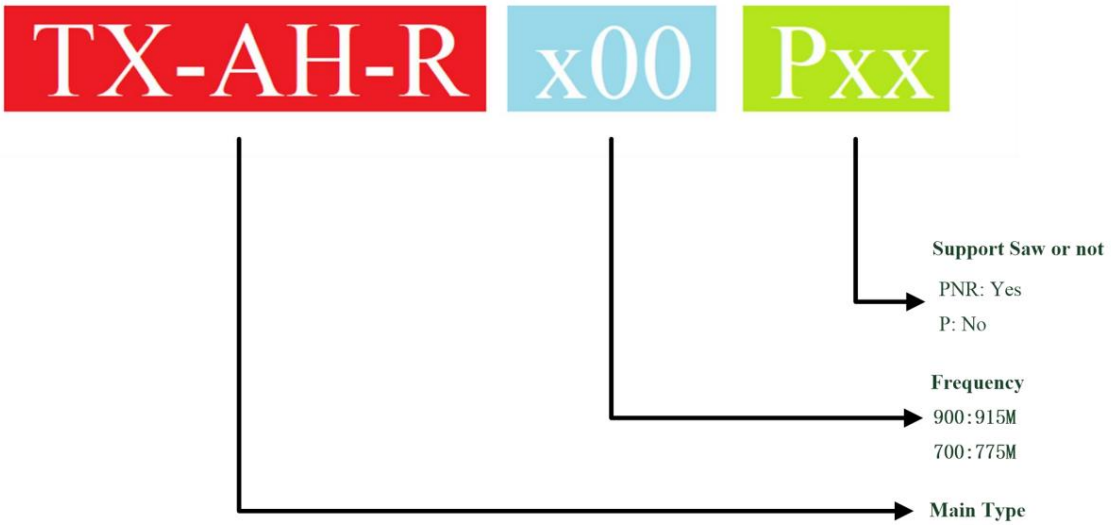
Note: The module PCB label is based on Taixin's inventory management needs. It may change in different batches. When there is no specification change involved, without further notice.

Table **1-1. TX-AH-Rx00P** parameter list

	parameter	illustrate
Category Wireless Parameters Wi-Fi Protocol		802.11ah
	Frequency	Different subdivision specifications have different frequency points, please see Table 2-1
range hardware parameter data interface		SDIO/USB/SPI/RMII/UART/I2C
	VCC operating voltage	3.0V ~ 3.4V
	VCC supply current	Not less than 150mA
	RF operating voltage	3.0V ~ 3.4V
	RF power supply	Not less than 450mA
	current operating	-20 ÿ ~ 70 ÿ[1]
	temperature	-20 ÿ ~ 70 ÿ[1]
	storage	(17.00±0.40)mm×(15.00±0.25)mm×(2.40±0.20)mm
temperature package size software parameters		WPA2-PSK
	security	AES
	mechanism encryption type upgrade firmware	Over-the-air upgrade (OTA)/UART(Xmodem)
	HOST Wi-Fi Motion	Linux/RTOS/Non-OS Wi-Fi driver can be provided for HOST

[1] Temperature refers to the module surface temperature.

2 product model comparison



The TX-AH-Rx00P series modules have subdivided specifications as shown in Table 2-1. Please choose appropriately according to the needs of the solution.

Table **2-1. TX-AH-Rx00P** subdivision specifications

Module name	Front silk screen distinction	Certification status	Remark
TX-AH-R900P P9 in the lower left corner and P9 in the lower right corner can pass FCC/CE certification and support 860MHz ~ 928MHz			
TX-AH-R900PNR lower left corner P9, lower right corner NR can pass FCC certification			Support 902MHz ~ 928MHz with 915M Saw Improve reception performance
TX-AH-R900PNR-860M 86 in the lower left corner, NR in the lower right corner can pass CE certification			Support 859MHz~ 894MHz with 875M Saw Improve reception performance
TX-AH-R700P lower left corner P7, lower right corner P7			Support 790MHz~ 820MHz
TX-AH-R700PNR lower left corner P7, lower right corner NR			Support 760MHz~ 785MHz with 775M Saw Improve reception performance

Remark:

1. The differences between P series modules and early A series modules are:

(1) The silk screen in the lower left corner of the P series starts with P, and the silk screen in the lower left corner of the A series starts with R;

(2) PIN4/5 of the P series requires power supply, but not for the A series;

2. The module does not come with a shielding cover by default. If a shielding cover is required, please indicate it when placing an order. The module name with a shielding cover will have the suffix -S.

S stands for (Shield, shield).

3 pin description

The pin distribution of the TX-AH-Rx00P chip module is shown in Figure 3-1.

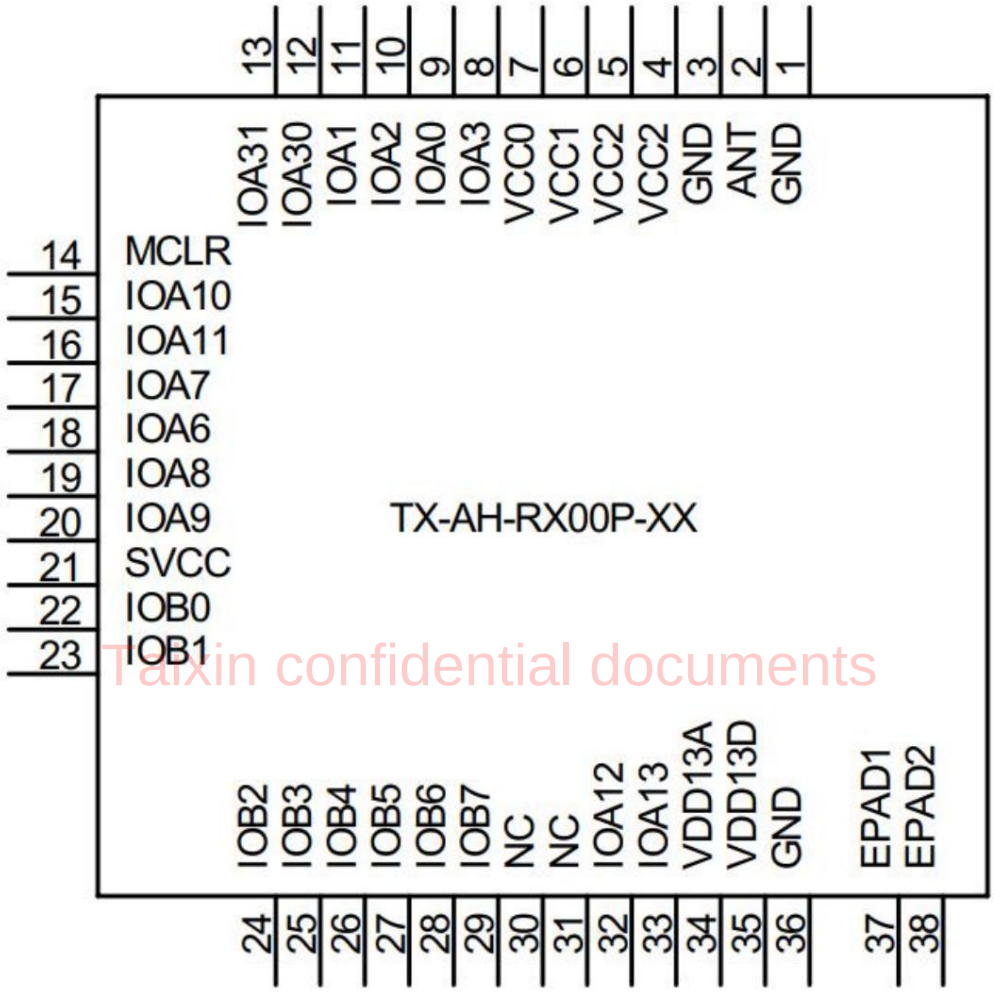


Figure **3-1. TX-AH-Rx00P** module pin distribution

TX-AH-Rx00P has a total of 38 pins (including 2 EPADs). The pin definitions are shown in Table 3-1.

Table **3-1. TX-AH-Rx00P** pin definition

serial number	Pin name function description	
1	GND	ground
2	ON	RF antenna
3	GND	ground
4	VCC2	RF power supply 2, nominal 3.3V, range 3.0-3.4V
5	VCC2	

6	VCC1	RF power supply 1, nominal 3.3V, range 3.0-3.4V, it is recommended to string magnetic beads
7	VCC0	Main control VCC power supply, nominal 3.3V, range 3.0-3.4V, it is recommended to string magnetic beads
8	IOA3	SPI0_MISO/GPIOA3, MISO connected to external NorFlash
9	IOA0	SPI0_CS/I2C_SCL/GPIOA0, connected to the CS of external NorFlash
10	IOA2	SPI0_MOSI/GPIOA2, connected to external NorFlash MOSI
11	IOA1	SPI0_CLK/I2C_SDA/GPIOA1, connected to the CLK of external NorFlash
12	IOA30	By default, Debug IO pin is used. After turning off this function, it can also be used for normal IO.
13	IOA31	By default, Debug Clock pin is used. After turning off this function, it can also be used for normal IO.
14	MCLR	reset/wake up
15	IOA10	SD_D2/SPI1_IO2/UART0_RX/RMII_MDIO/GPIOA10
16	IOA11	SD_D3/SPI1_IO3/SPI1_CS/UART0_TX/RMII_MDC/GPIOA11
17	IOA7	SD_CMD/SPI1_CLK/SPI1_MOSI/GPIOA7
18	IOA6	SD_CLK/SPI1_CS/SPI1_CLK/GPIOA6
19	IOA8	SD_D0/SPI1_IO0/SPI1_MISO/GPIOA8
20	IOA9	SD_D1/SPI1_IO1/SPI1_INTIO/GPIOA9
21	SVCC	SDIO power supply (1.8V/3.3V optional), connected to the power supply of SDIO Host; if used For IOA6~IOA11 to perform other functions, SVCC also needs power supply, which can be shared with VCC0;
22	IOB0	RMII_REF_CLKIN/MCU_WAKE_AH/GPIOB0
23	IOB1	GPIOB1
24	IOB2	RMII_RXD0/GPIOB2
25	IOB3	RMII_RXD1/GPIOB3
26	IOB4	RMII_TXD0/GPIOB4
27	IOB5	RMII_TXD1/GPIOB5
28	IOB6	RMII_CRS_DV/GPIOB6
29	IOB7	RMII_TX_EN/GPIOB7
30	NC	NC
31	NC	NC, keep floating, if an external PA is needed, it can be lead out as PA-EN, high effective;
32	IOA12	USB_DM/UART1_RX/ADKEY
33	IOA13	USB_DP/UART1_TX
34	VDD1V3A	1.3V power input; Note: 1.3V is powered from 3.3V to LDO by default inside the module. At this time, these two pins Need to float; In power-sensitive scenarios, 1.3V can be powered by an external DC-DC to save power consumption. In this case, these two Each pin needs to be connected to the 1.3V DC-DC output; the output current is recommended to be no less than 200mA.
35	VDD1V3D	
36	GND	ground
37	EPAD1	ground
38	EPAD2	ground

4Hardware function description

4.1 MCU

The TXW83xx chip has a built-in 32-bit high-performance RISC processor with a CPU clock speed up to 192MHz.

4.2 Storage description

4.2.1 SPI Nor FLASH

TX-AH-Rx00P does not have built-in SPI Nor Flash. If an external Nor Flash is required, please refer to the firmware boot method section.

The capacity of SPI Nor is not less than 8Mbit.

4.3 crystal oscillator

TX-AH-Rx00P uses 32M crystal oscillator.

4.4 Reset/wake up

The MCLR pin can implement two functions: reset or wake-up. When

not in deep sleep, you can reset the module by pulling MCLR low and then high; it is required that MCLR remains low.

The time is not less than 2ms;

When the AH module enters the deep sleep state, the wake-up function can be achieved by pulling MCLR low and then high; the MCLR low-level duration is required to be approximately 500uS.

4.5 ADKEY

IOA12 can be used as ADKEY, with a sampling bit width of 10 bits, and is used to sample low-speed signals, such as button voltage. Full scale is 1.1V.

4.6 Interface description

Table **4-1. TX-AH-Rx00P** interface description

Interface name	Pin	Function
SDIO interface (slave)	IOA6(SD_CLK)ÿ IOA7(SD_CMD)ÿ IOA8(SD_D0)ÿ IOA9(SD_D1)ÿ IOA10(SD_D2)ÿ IOA11(SD_D3)	description: Supports SDIO2.0 protocol, supports up to 50MHz clock, supports one or four lines, supports SDIO mode and SPI mode.
USB interface (slave)	IOA12(USB_DM)ÿ IOA13(USB_DP)	Supports USB2.0 FS protocol, typical interface communication rate is 5Mbps.
SPI0 interface (master)	IOA0(SPI0_CS)ÿ IOA1(SPI0_CLK)ÿ IOA2(SPI0_MOSI)ÿ IOA3(SPI0_MISO)	Supports external SPI Flash (supports NOR BOOT). It is not recommended to connect other external SPI devices.
SPI1 interface (slave)	IOA6(SPI1_CLK)ÿ IOA7(SPI1_MOSI)ÿ IOA8(SPI1_MISO)ÿ IOA9(SPI1_INTIO)ÿ IOA11(SPI1_CS)	Supports external SPI devices (NOR BOOT is not supported), multiplexed with SDIO pins (SDIO SPI mode)
RMII interface	IOB0(RMII_REF_CLKIN)ÿ IOB2(RMII_RXD0)ÿ IOB3(RMII_RXD1)ÿ IOB4(RMII_TXD0)ÿ IOB5(RMII_TXD1)ÿ IOB6(RMII_CRS_DV)ÿ IOB7(RMII_TX_EN), IOA10 (RMII_MDIO)ÿ IOA11(RMII_MDC)	MAC supports up to 100Mbps. IOA10/ IOA11 and UART0 pins are multiplexed. When UART0 is needed, RMII_MDIO/MDC can be moved to IOA7/IOA8.
UART0 interface	IOA10(UART0_RX)ÿ IOA11(UART0_TX)	Multiplexed with SDIO/SPI1 pin, available when using SDIO/SPI1 UART1ÿ
UART1 interface	IOA12(UART1_RX)ÿ IOA13(UART1_TX)	Multiplexed with USB pins, UART0 can be used when using USB.
I2C interface (master)	IOA0(I2C_SCL)ÿ IOA1(I2C_SDA) or IOA12(I2C_SCL)ÿ IOA13(I2C_SDA)	There are two pin out methods. The first one is multiplexed with the SPI0 pin. When using SPI0, you can use the second pin out; the second output pin is multiplexed with the USB/UART1 pin. When using USB/UART1, you can use the third pin out. A kind of pin.

5Software function description

5.1 How the module works

The TX-AH-Rx00P module can work in two ways: module + application processor HOST, or single module.

5.2.1 Module+HOST method

In application scenarios such as wireless monitoring and UAV image transmission, TX-AH-Rx00P requires an external application processor (i.e. HOST) to implement image encoding/decoding and other functions. Operating systems that support HOST include Linux/RTOS (Rtthread/Liteos, etc.)/Non-OS, and drivers for the corresponding operating systems can be provided.

5.2.2 Single module method

In application scenarios such as wireless bridges, TX-AH-Rx00P is connected to the Ethernet PHY through the RMII interface to implement a one-to-one wireless bridge solution without the need for an external HOST.

If it is a 1-to-N bridge solution, if the AP has higher requirements for protocol processing performance, it may still need to install the application processor.

To implement protocol processing on the AP side, the processing can be differentiated according to the actual situation.

5.2 Firmware **boot** method

TX-AH-Rx00P supports several firmware loading methods: SDIO device boot/USB device boot/SPI NorFlash boot. When the module communicates with the HOST through SDIO/USB, you can consider using SDIO device boot or USB device boot. At this time, the module does not need to be plugged into SPI NorFlash. The disadvantage is that these two boot speeds are slower than SPI NorFlash boot. If the startup speed is required Relatively high, SPI NorFlash boot can be used.

When the module works alone, SPI NorFlash boot is required.

5.3 Networking method

The supported networking methods are as follows:

(1) AP-STA mode, basic star network, one AP connects to multiple STAs; the maximum number of STAs supported can be Through firmware configuration, the default firmware supports up to 8 STAs and can be configured to support up to 32 STAs (the firmware needs to be modified).

(2) AP-relay-STA mode, adding relay nodes to the basic star network to extend the distance, but the maximum traffic will be halved; currently only one level of relay is supported. (3) Roaming function

supports STA to roam between APs. STA will automatically select a stronger AP based on signal conditions. (4) Automatic relay mode, which combines roaming and relay, can realize a network where STA automatically relays. (5) Multicast mode, using multicast mode to transmit data, is suitable for scenarios where the amount of data is not too large but there are many nodes.

5.4 Low power mode

The module supports two low-power modes: STA low-power and AP low-power.

5.2.1 STA low power consumption

The low power consumption of STA requires an external 1.3v DC-DC to supply power to the module's 1.3v power supply PIN34/35. Can support keep-alive function, keep-alive DTIM time can be adjusted. If PIN4/5/6/7 of the module are all fixedly connected to 3.3V constant power supply, the power consumption can be as low as about 400uA when using DTIM10. If you want to obtain lower keep-alive current, you can power PIN4/5/6 and PIN7 separately, and power off PIN4/5/6 during sleep. At this time, the power consumption of DTIM10 can be as low as less than 200uA. For details, please refer to the low-power reference circuit in Section 7.9.

5.2.2 AP low power consumption

The AP's low power consumption requires an external 1.3v DC-DC to supply power to the module's 1.3v power supply PIN34/35; the module's PIN4/5/6/7 are all fixedly connected to 3.3V for constant power supply. If the interface is turned off, the power consumption can be as low as about 5mA, and the main control cannot wake up the AH module through the interface; if the interface is not turned off, the power consumption is about 10mA, and the main control can wake up the AH module through the interface.

6 main parameters

Note: There are no special instructions. The test conditions are 3.3V power input, 1.3V is provided by the internal LDO, and the temperature is 25°C.

6.1 Wi-Fi main parameters

Table **6-1. Wi-Fi** parameters

parameter	Typical value	unit
Working parameters		
Working frequency	Refer to Table 2-1	MHz
band selectable	1ÿ2ÿ4ÿ8	MHz
bandwidth modulation and	BPSKÿQPSKÿ16QAMÿ64QAM	
demodulation method supports MCS	0~7 (1/2/4/8M mode), 10 (1M mode)	
Physical layer transmission rate		
1M MCS10	150	Kbps
8M MCS7	32.5	Mbps
Protocol layer transmission limit rate (1)		
TCP	About 15	Mbps
UDP	About 16	Mbps
Communication distance (transmit power +20dBm, one-to-one TCP traffic) (2)		
1M bandwidth	TBD	
2M bandwidth	1200 US, >2Mbps	
4M bandwidth	1200 meters, >3Mbps	
8M bandwidth	1200 meters, >4Mbps	
Transmission parameters		
Transmit	+20ÿ3ÿ	dBm
power transmit error vector magnitude (MCS7)	<= -27	dB
Receive parameters		
Receiving sensitivity (10%PER)		
1M PPDU MCS=10	-105	dBm
8M PPDU MCS=0	-95	dBm
8M PPDU MCS=7	-81	dBm
Adjacent frequency suppression		
Receive adjacent band suppression (MCS10)	28	dBc
Receive non-adjacent band suppression (MCS10) Out-	35	dBc
of-band interference tolerance	-20	dBm
other		
Maximum input signal strength	-10	dBm

illustrate:

(1) The traffic limit is tested when the bandwidth is 8M and the maximum number of aggregations is 16;

(2) The communication distance is tested in an ideal environment without obstruction. The actual environment may be affected by interference and affect the test results;

(3) 20dbm is the maximum transmit power that satisfies Tx-EVM<=-27. If Tx-EVM is allowed to be sacrificed, the maximum transmit power can be increased. to 25dBm.

6.2 Power consumption

Table **6-2. TX-AH-Rx00P** module power consumption

Mode	Typical value	unit
Continuous transmitting mode (100% duty cycle), Pout=+20dBm	300	mA
Continuous receiving mode (1.3V is generated by 3.3V through the internal	100	mA
LDO) Continuous receiving mode (1.3V is supplied from the outside,	55	mA
converted to 3.3V) Deep-sleep	110[1]	uA
DTIM10	195[2]	uA
DTIM20	160[2]	uA
DTIM30	145[2]	uA
AP low power consumption	5 [3]	mA

[1] Refers to the low power consumption of 2M bandwidth STA; 1.3V is powered by DCDC, and the RF power supply (VCC1/VCC2) is automatically controlled on and off by the module. cut off (if RF does not turn off the power supply separately during sleep, up to an additional leakage of about 200uA will be added);

[2]Keep-alive power consumption in 2M bandwidth mode;

[3] When 1.3V is powered by DCDC, the interface is turned off;

6.3 Reflow soldering temperature curve

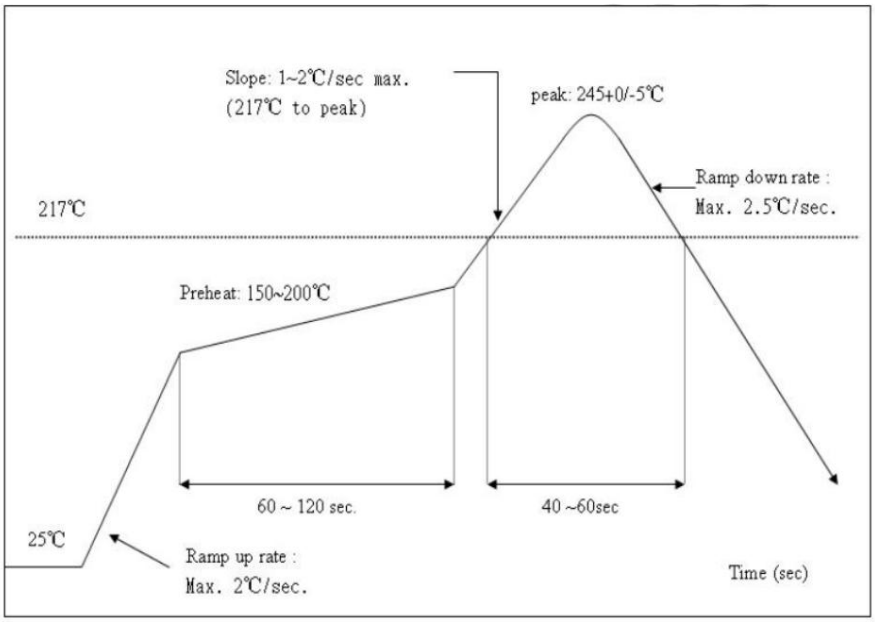


Figure **6-1. TX-AH-Rx00P** reflow soldering temperature curve

Table **6-3. TX-AH-Rx00P** module reflow soldering parameters

parameter	Standard Profile	Limit Profile
Pre-heat	150 - 200ÿÿ60 - 120 sec	
Heat	Above 217ÿÿ40 - 60 sec	
Peak temperature	245+0/-5ÿ	250 ÿ
Cycle of reflow	2 times	

6.4 Module flattening parameters

Table **6-4. TX-AH-Rx00P** module flattening parameters

	Typical value	maximum value	unit
Parameter	0.23	0.46	%
flatness diagonal flatness value	0.06	0.12	mm

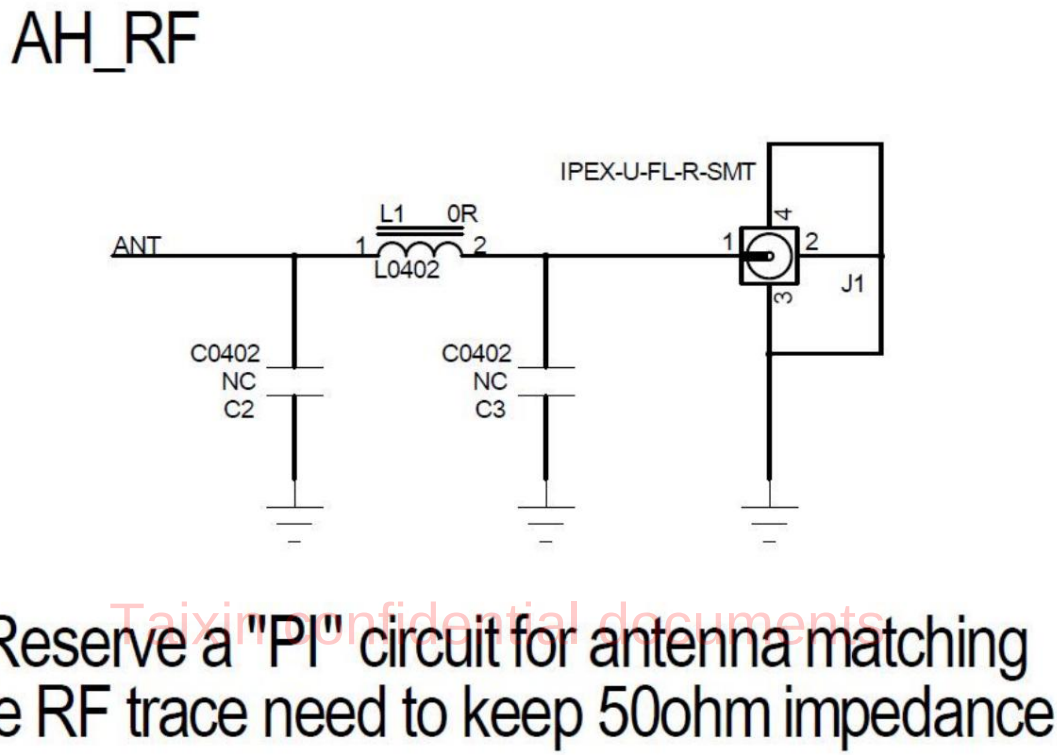
6.5 Electrostatic parameters

Table **6-5. TX-AH-Rx00P** electrostatic parameters

electrostatic model	condition	maximum value	unit
HBM	25ÿ	2	kV

7Peripheral circuit schematic diagram

7.1 RF part reference schematic diagram

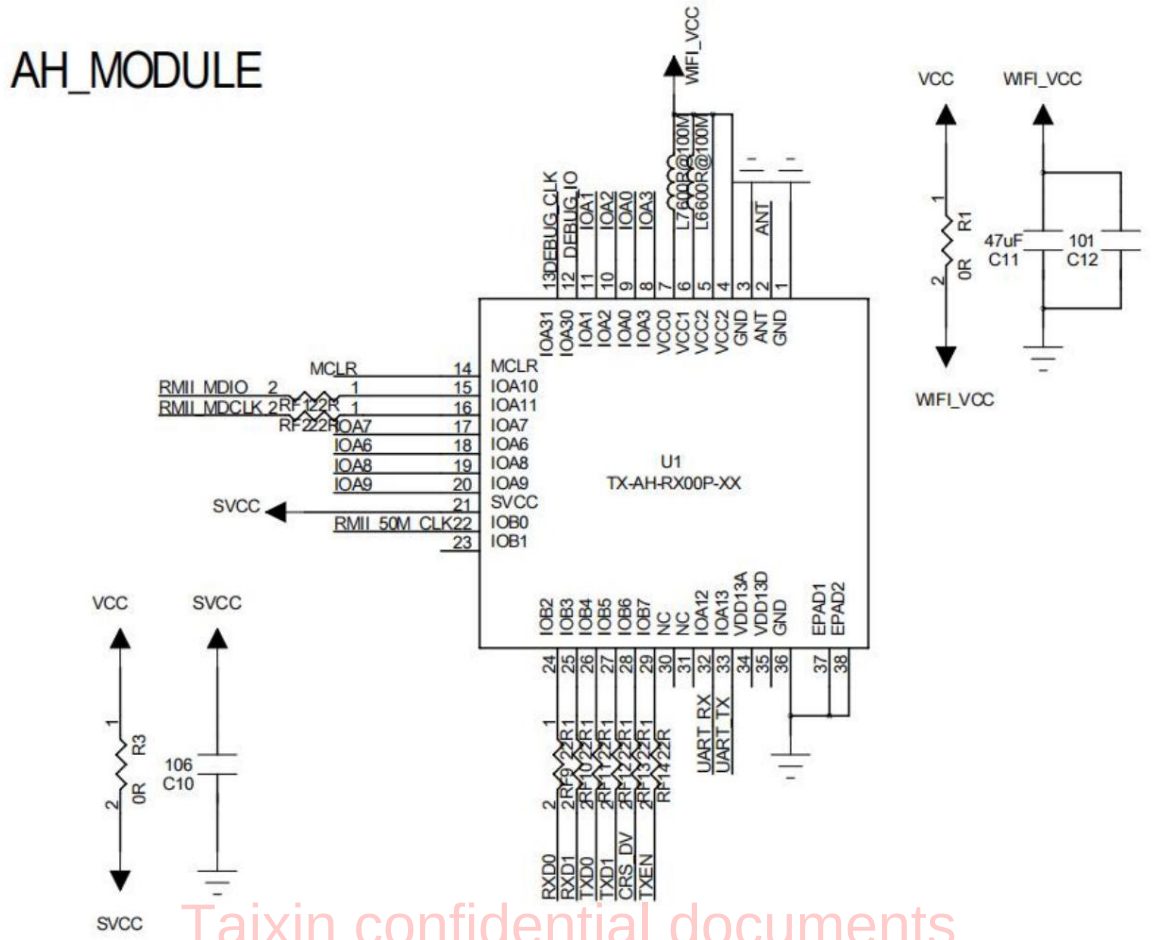


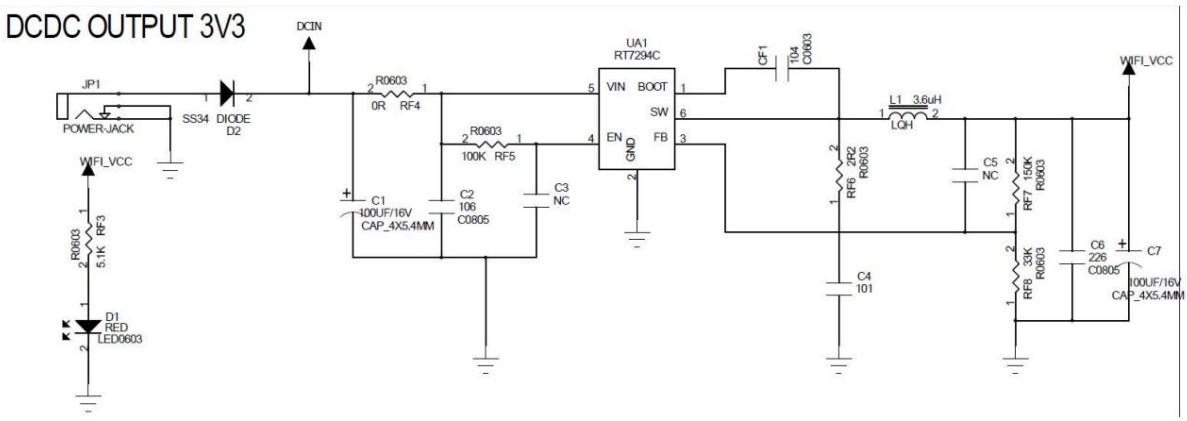
7.2 RMII reference schematic diagram

Currently supported Ethernet PHYs: IP101GR, RTL8201F, please contact me if other Ethernet PHYs are supported.

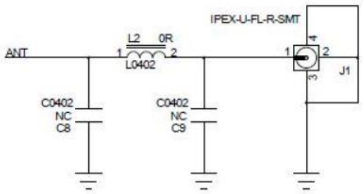
Division FAE.

The following uses IP101GR as an example to illustrate the reference schematic diagram. If you need the RTL8201F schematic diagram, please contact our FAE.



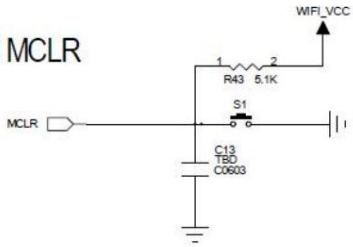


AH_RF

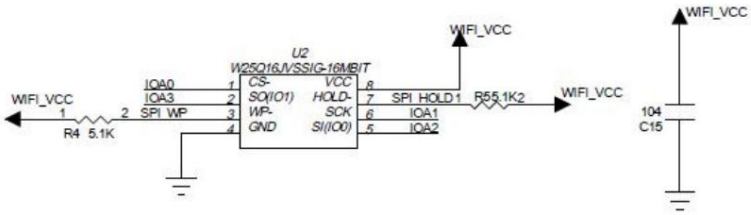


Reserve a "PI" circuit for antenna matching
The RF trace need to keep 50ohm impedance

AH MCLR

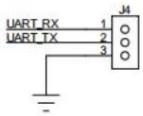


SPI BOOT

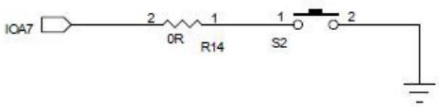


AH UART

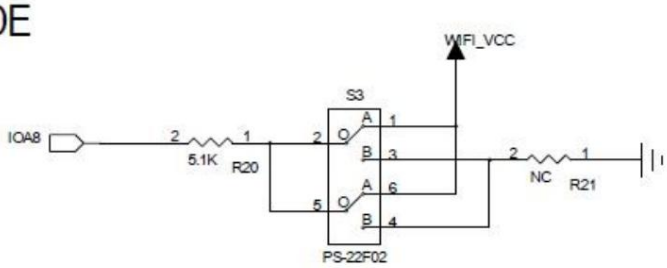
uart is for printing



CONNECT KEY

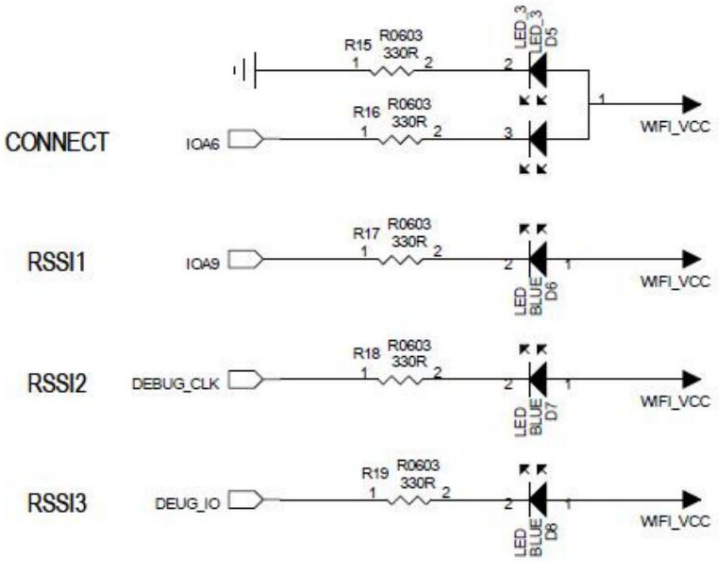


AP/STA MODE

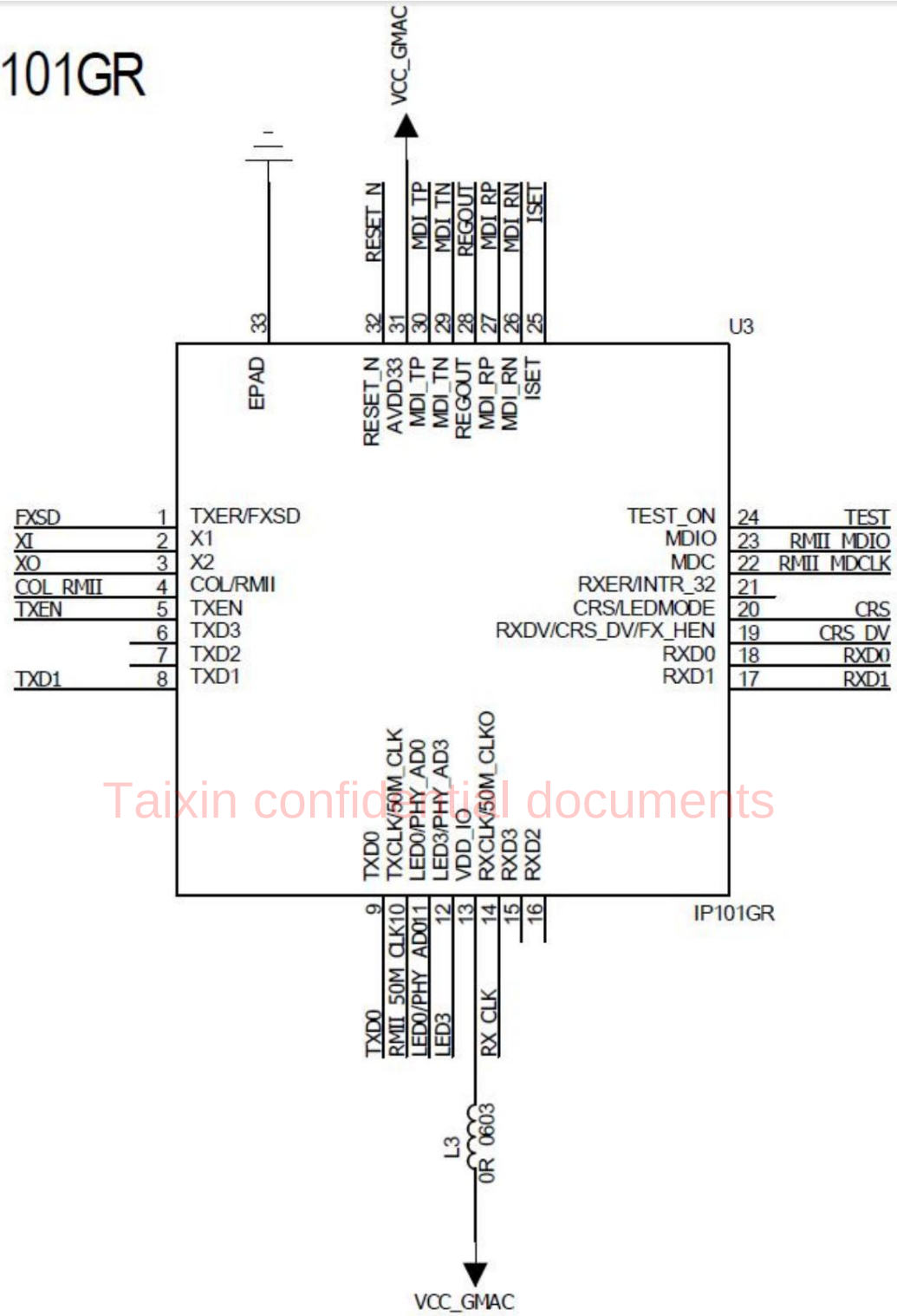


Mode is STA when pulled low (default), and AP when pulled high;

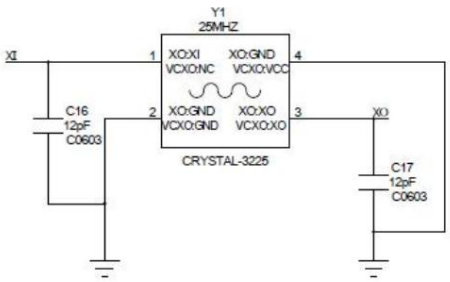
Note: Role/pairing can be set through serial port commands, thus eliminating the need for physical buttons;



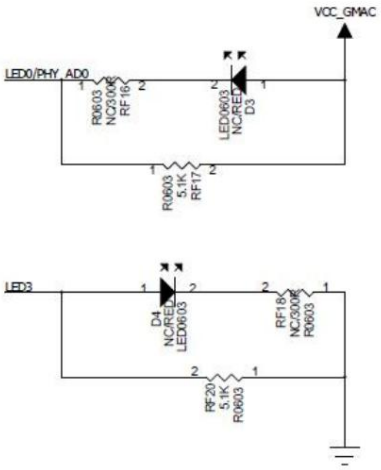
IP101GR



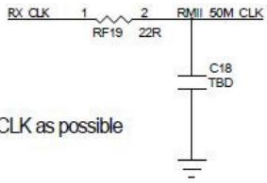
25MHZ CRYSTAL



LED

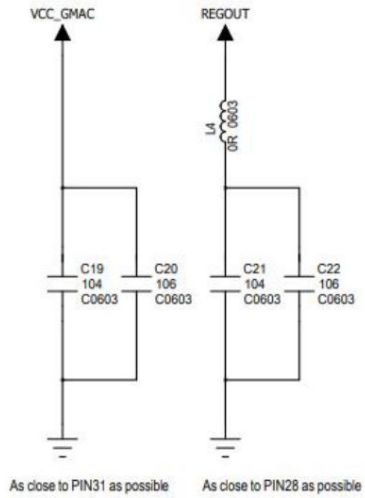


50MHZ CLK



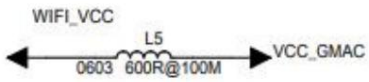
As close to chip RX_CLK as possible

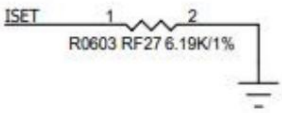
BYPASS CAPACITOR



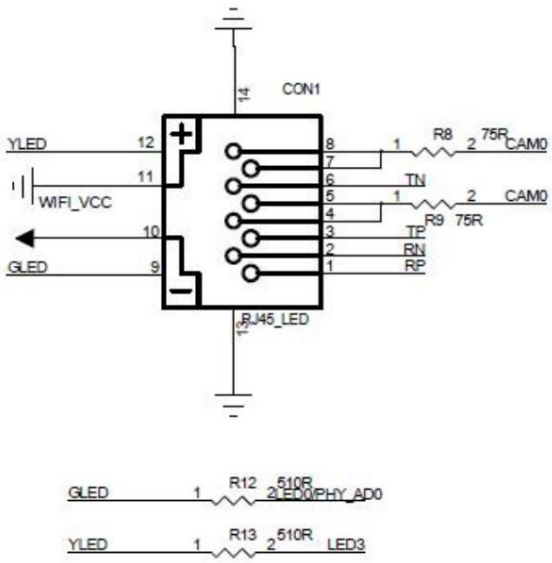
As close to PIN31 as possible

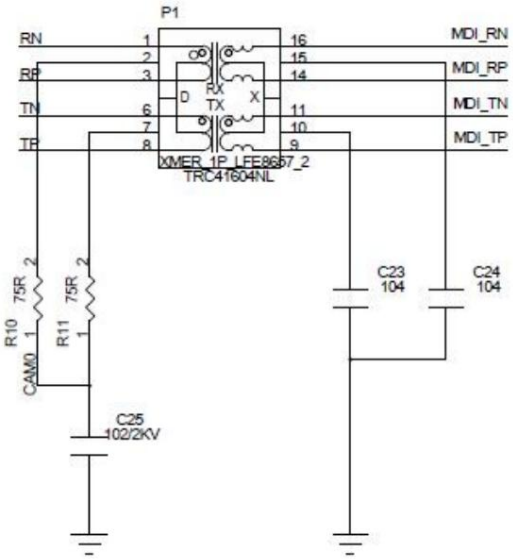
As close to PIN28 as possible





ETHERNET INTERFACE

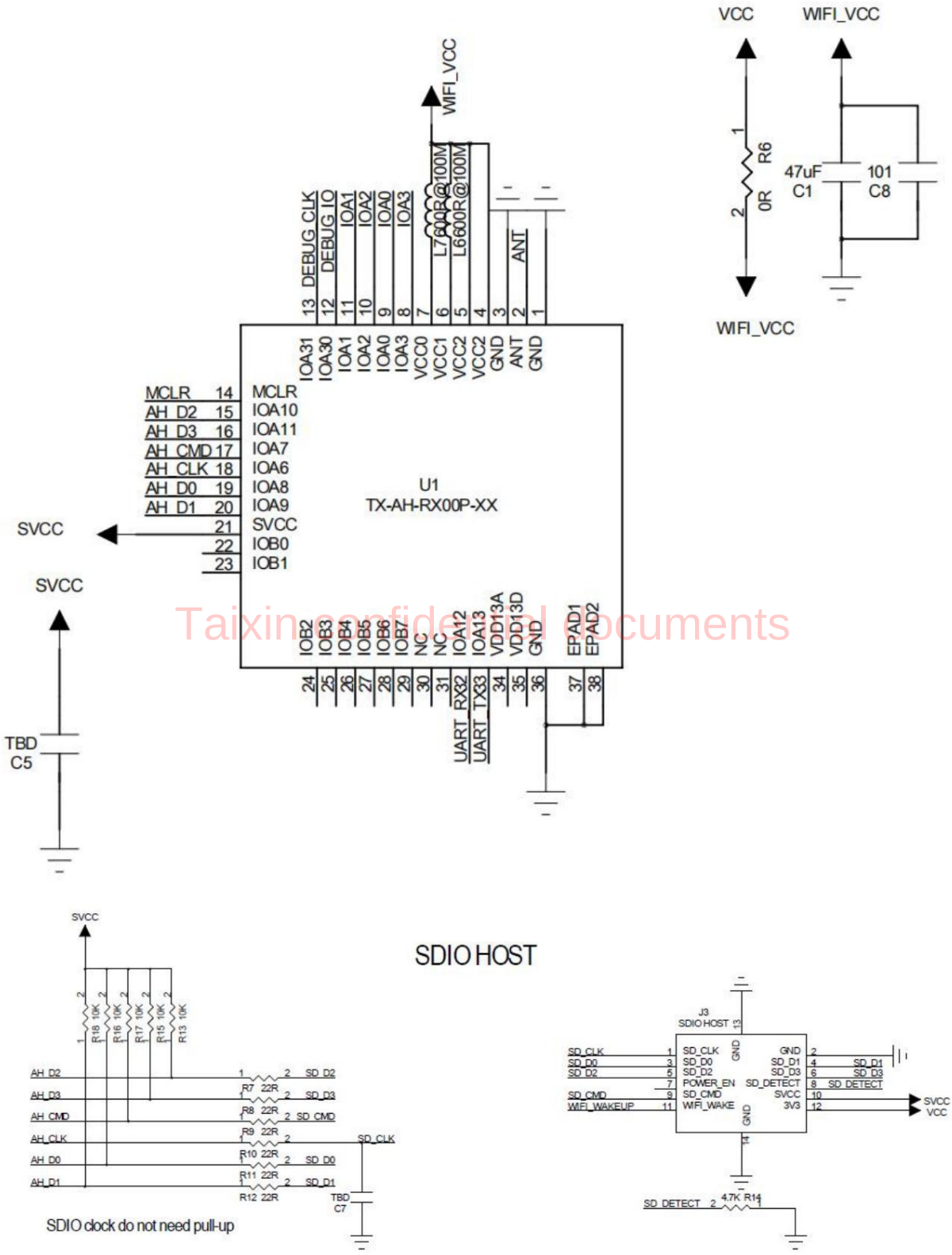




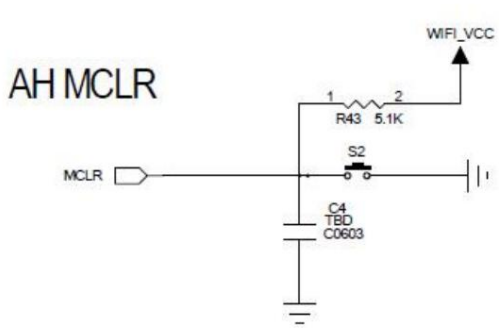
MODE SELECT

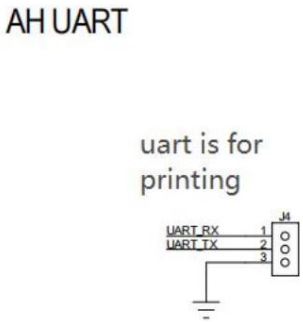
	PULL HIGH	PULL LOW
COL/RMII	RMII MODE	MII MODE
TEST	TEST MODE	NORMAL MODE
CRS	LED MODE1	LED MODE0

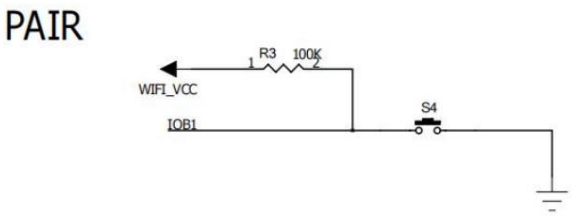
7.3 SDIO device boot reference schematic diagram



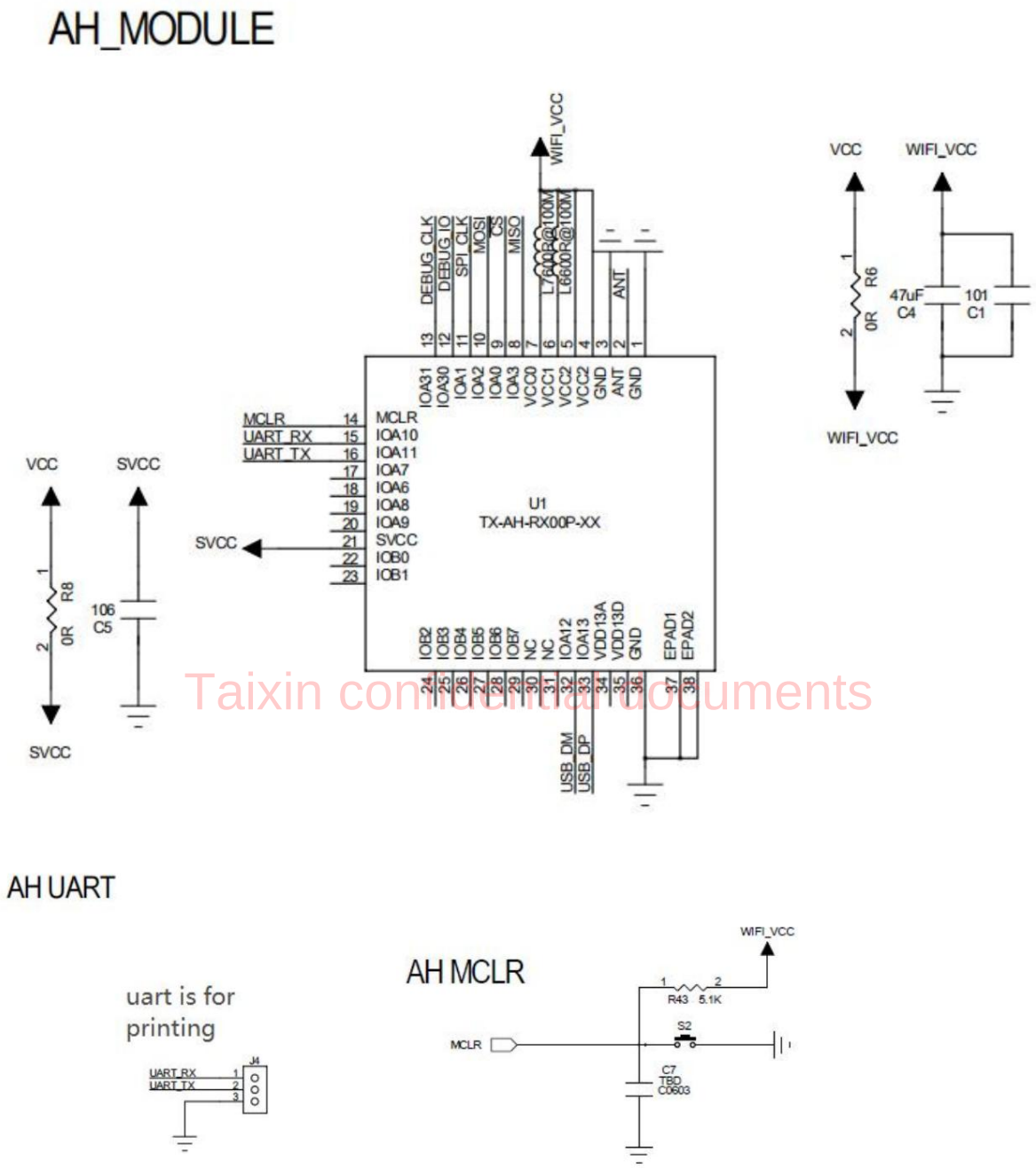
Note: CMD/D0~D3 of SDIO all need to be pulled up, but CLK does not need to be pulled up; it is recommended that SVCC supplies power from the main control.

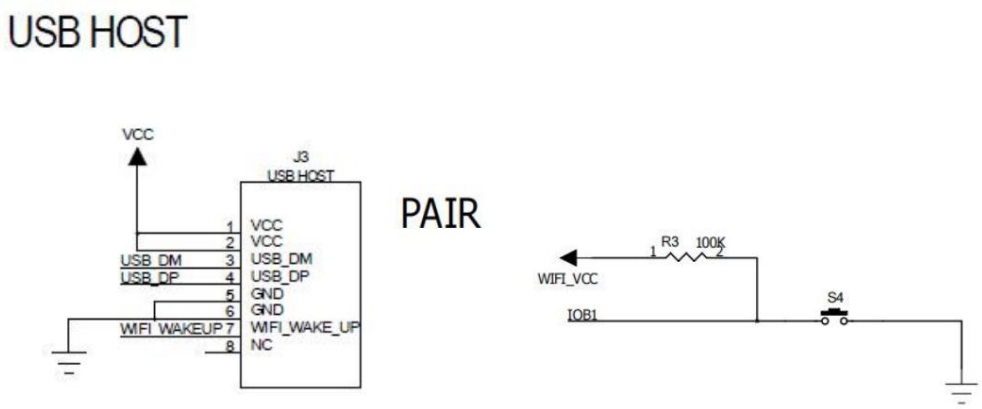






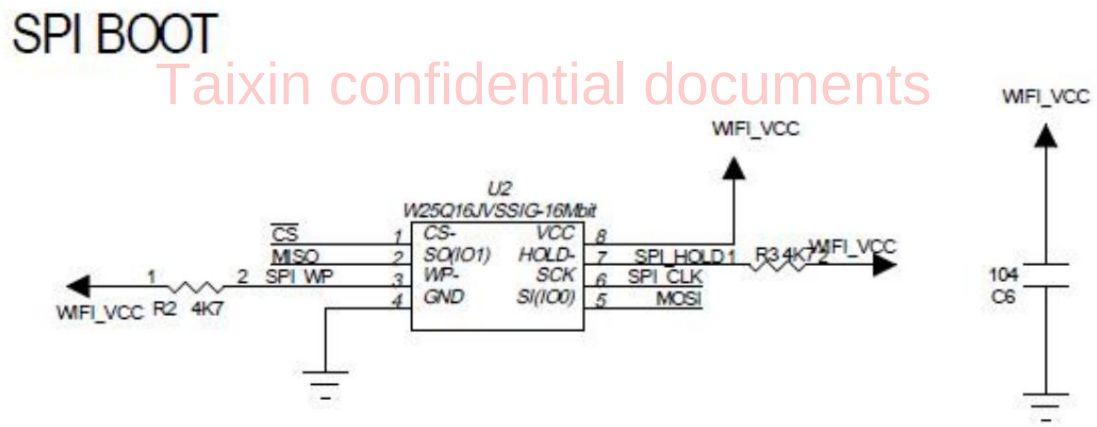
7.4 USB device boot reference schematic diagram





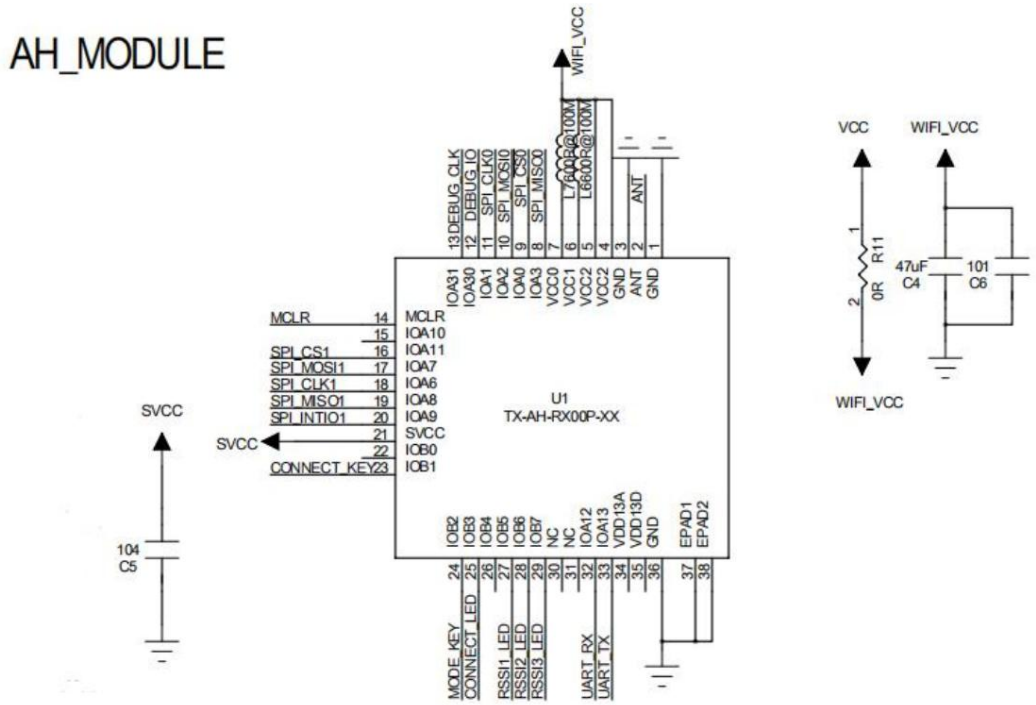
7.5 SPI NorFlash boot reference schematic diagram

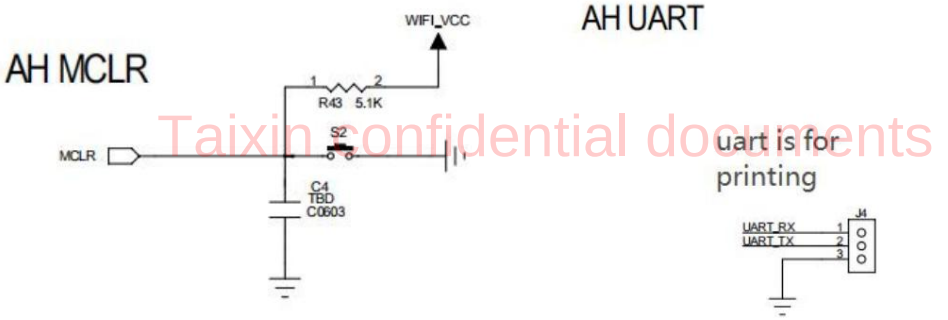
In the scenario of using the SDIO/USB interface, if the AH boot speed requirements are relatively high, you can consider not using SDIO/USB boot, but using the SPI nor boot solution. On the basis of sections 7.3 and 7.4, add the following circuit That's it. Since the RMII interface is a single module solution, it needs to be connected to Nor. The UART interface introduced later also needs to be connected to nor. The SPI interface is the SPI mode of SDIO, so you don't need to hang Nor. The capacity of Flash is not less than 8Mbit.

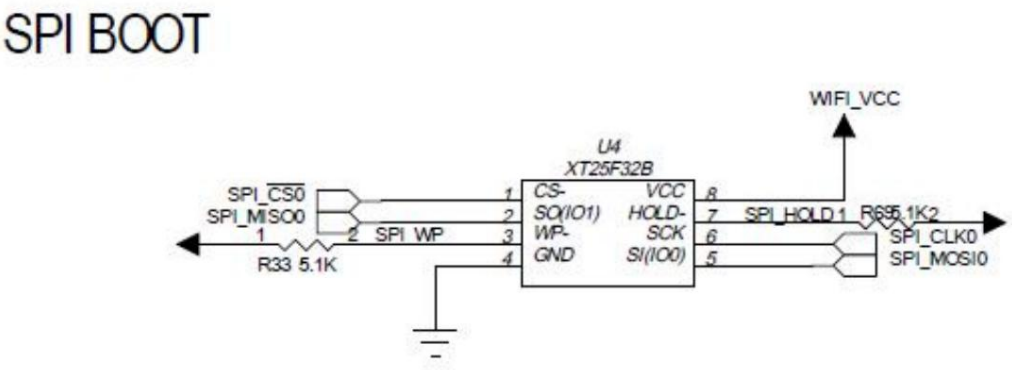


7.6 SPI interface communication reference schematic diagram

TX-AH-Rx00P can be used as an SPI slave to communicate with the Host MCU (implemented through the SPI mode of the SDIO interface). Note related SVCC is supplied from the main control power supply. Note that MOSI, MISO and INTIO require external circuit pull-ups.



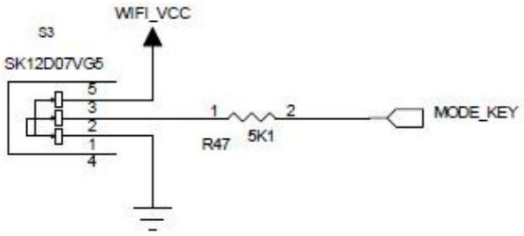




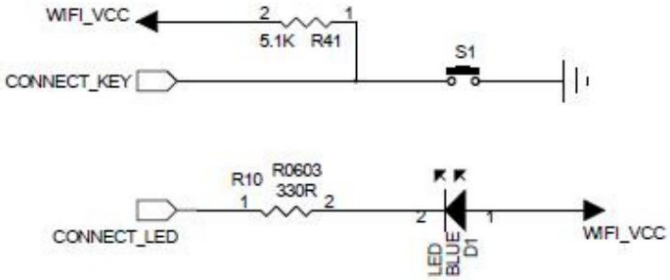
If buttons are needed for character selection and button pairing, the following circuit can be used to implement it.

If needs Keys & Leds, adopt this part

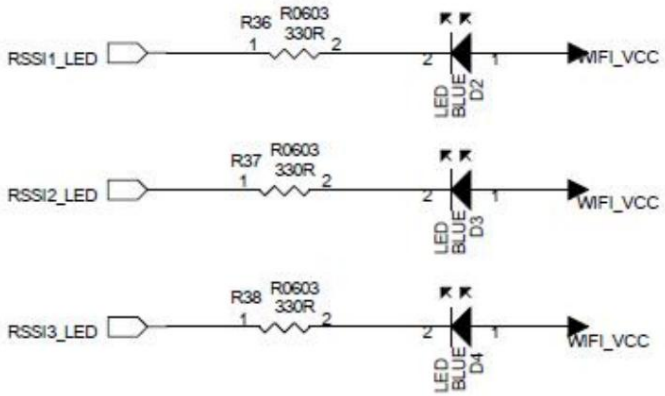
MODE KEY



CONNECT KEY/LED

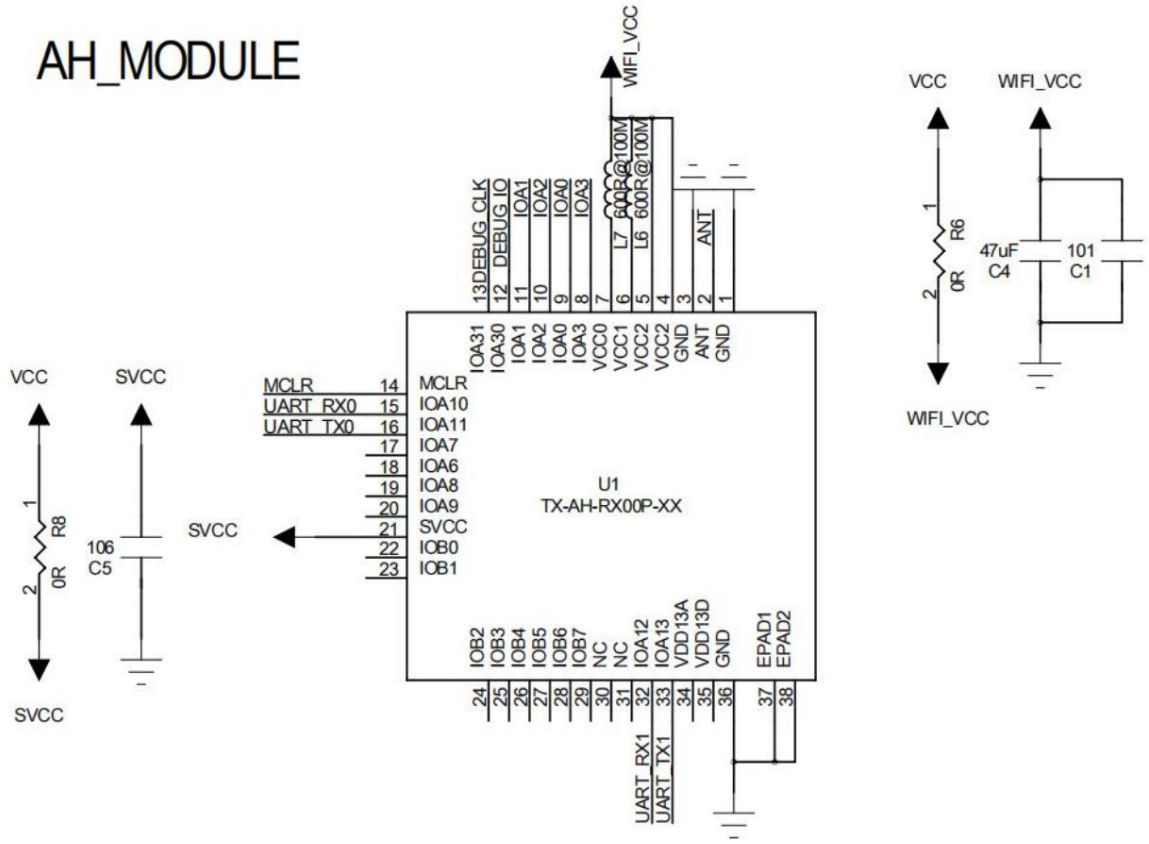


RSSI LED



7.7 UART interface communication reference schematic diagram

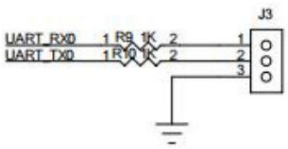
When using the UART interface for transmission, UART0 is used as the data transmission interface and UART1 is used as the debugging printing interface.



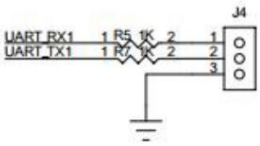
AH UART0

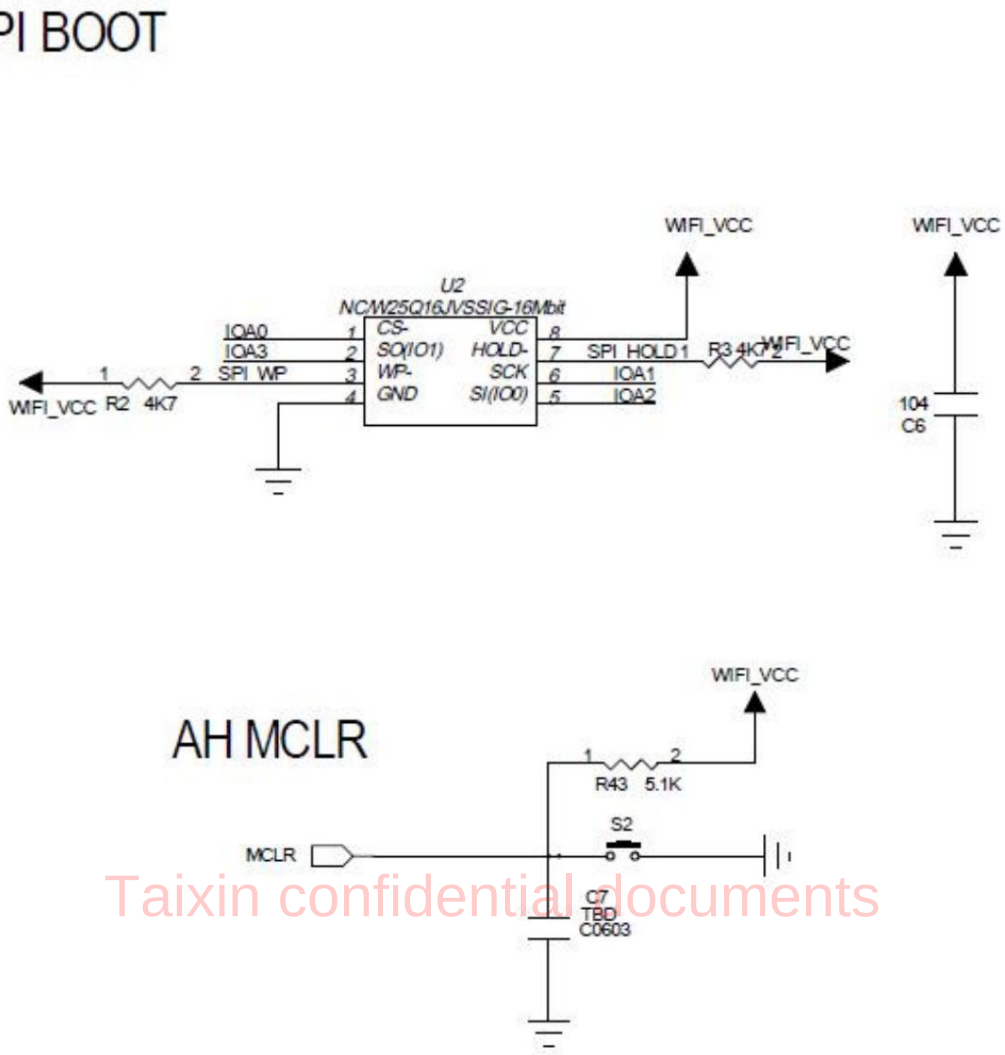
AH UART1

Host Interface



print for debug



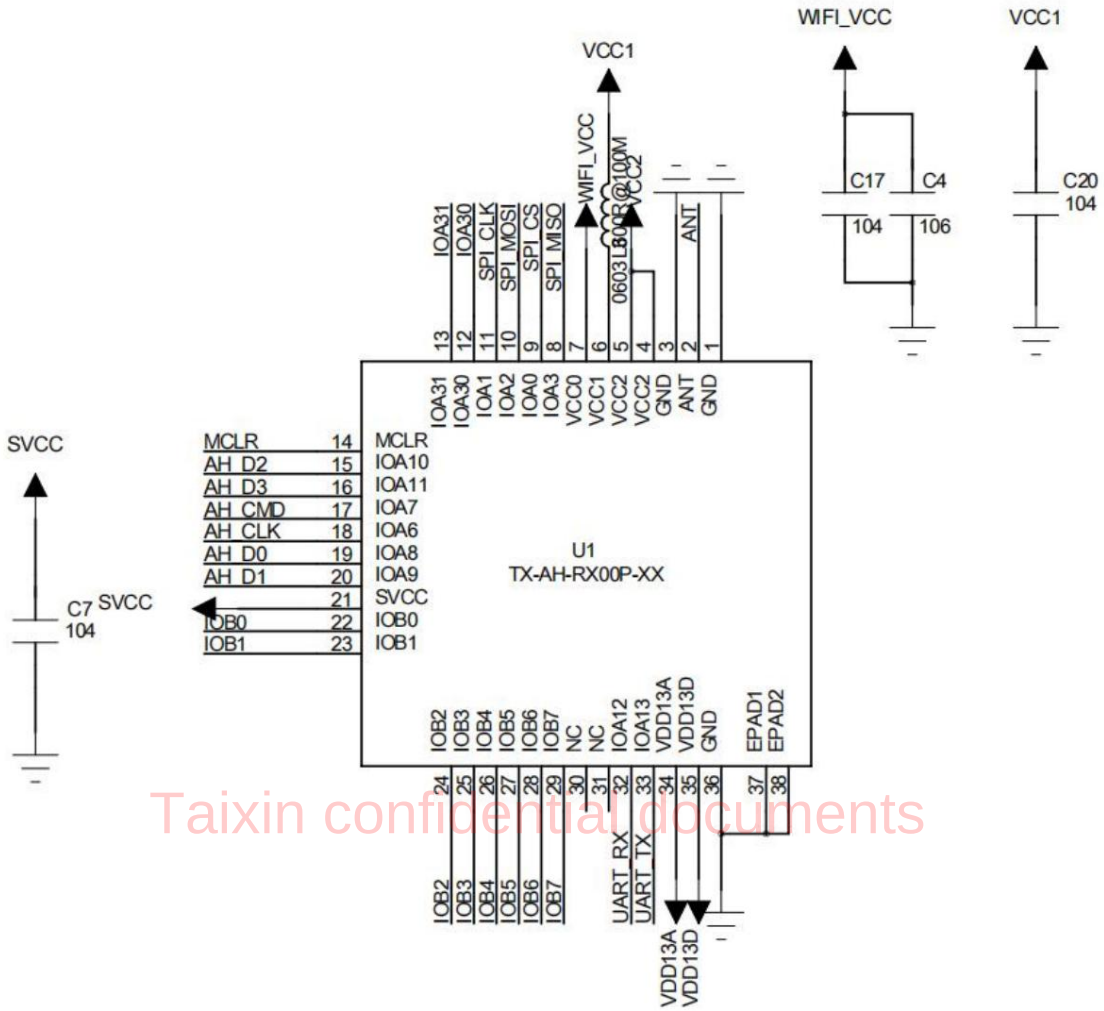


7.8 Low power reference schematic diagram

Taking the SDIO interface as an example to introduce the low-power

schematic diagram. Different from the reference schematic diagram in the non-low power consumption chapter, the low power consumption schematic diagram separates the main control power supply (VCC0) and the RF power supply (VCC1, VCC2).

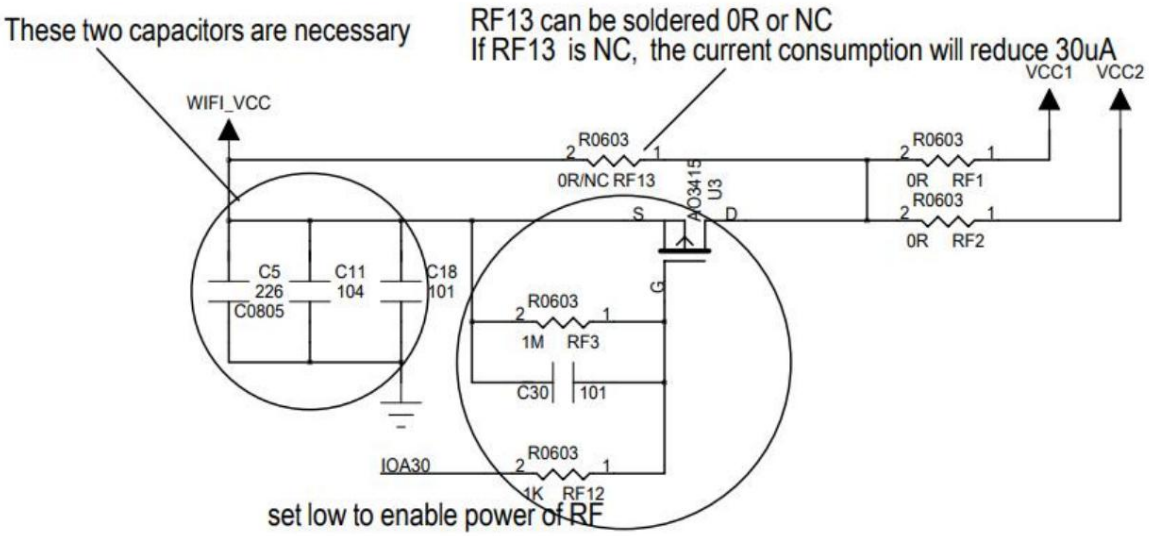
AH_MODULE



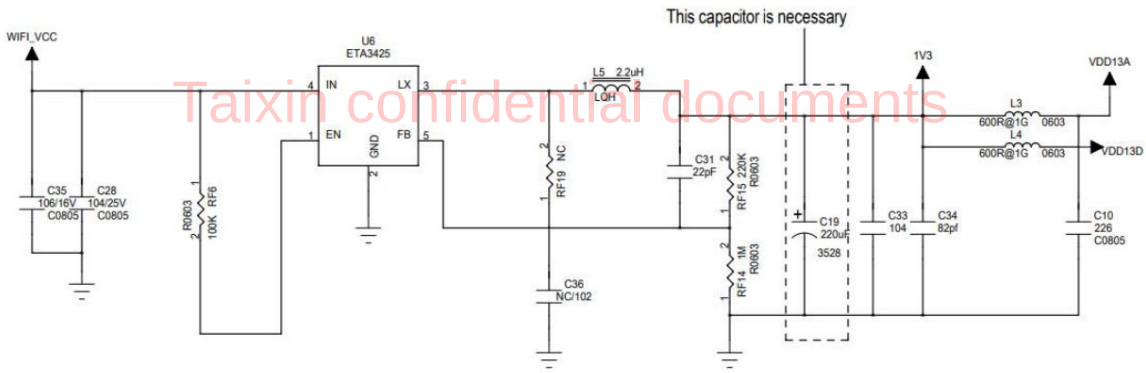
If the RF power supply is not turned off, the power consumption will be up to 200uA

more than if it is turned off. If the current for low power consumption is not particularly high, you can consider the RF13 welding 0R in the picture below and bypass the circuit inside the circle at the bottom. If you have high current requirements for low power consumption, you can use the circuit in the upper and lower circles of the RF13 NC. During sleep, pull IOA30 low through IO control to power the RF; when entering Deep-sleep, pull IOA30 high to turn off RF power supply.

AH LOW PWR MODE CONTROL



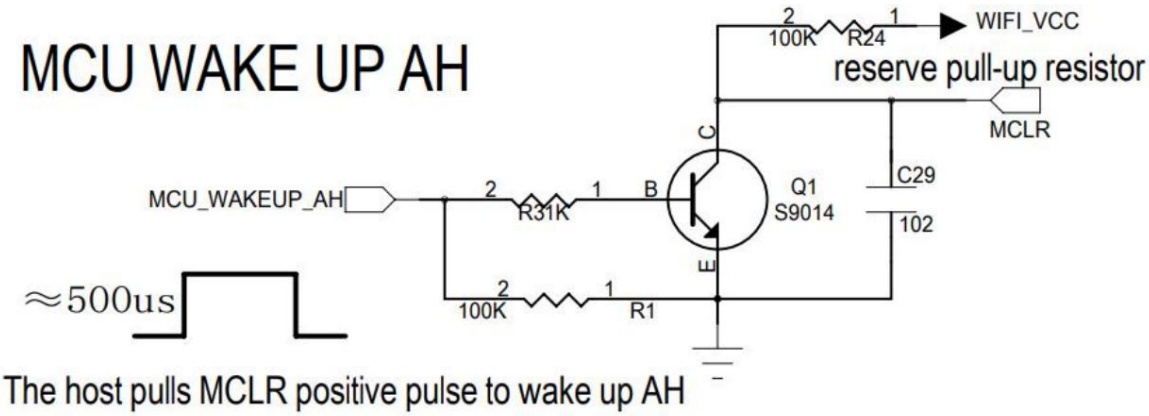
In order to obtain lower normal operating power consumption, use 1.3V DC-DC to power the module 1.3V power supply.



If the static leakage of the DC-DC used is relatively large, you can consider using IO to cut off the power supply of the DC-DC when entering sleep;

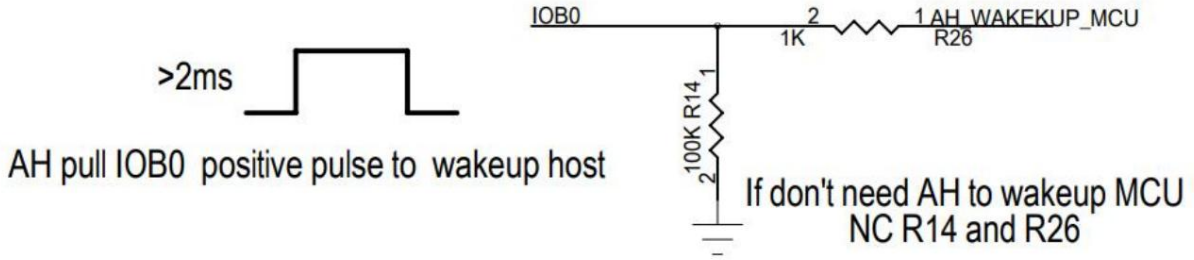
using the DC-DC in the picture (ET A3425),since the static current is very small, it does not need to be used when entering sleep. Turn off DC-DC.

MCU WAKE UP AH



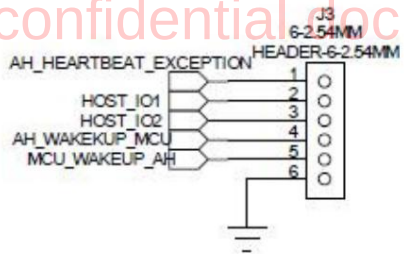
The host pulls MCLR positive pulse to wake up AH

AH WAKE UP MCU



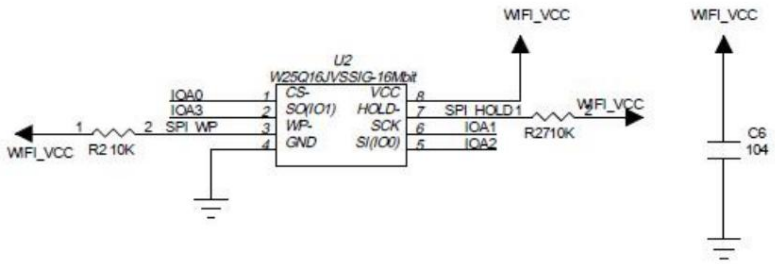
AH pull IOB0 positive pulse to wakeup host

MCU INTERFACE



The interface between AH and Host MCU includes MCU_WAKEUP_AH (pulling MCLR low for about 500uS, in the picture it has passed the inverter, so the positive pulse is pulled), AH_WAKEUP_MCU (IOB0 is pulled high for 2mS positive pulse).

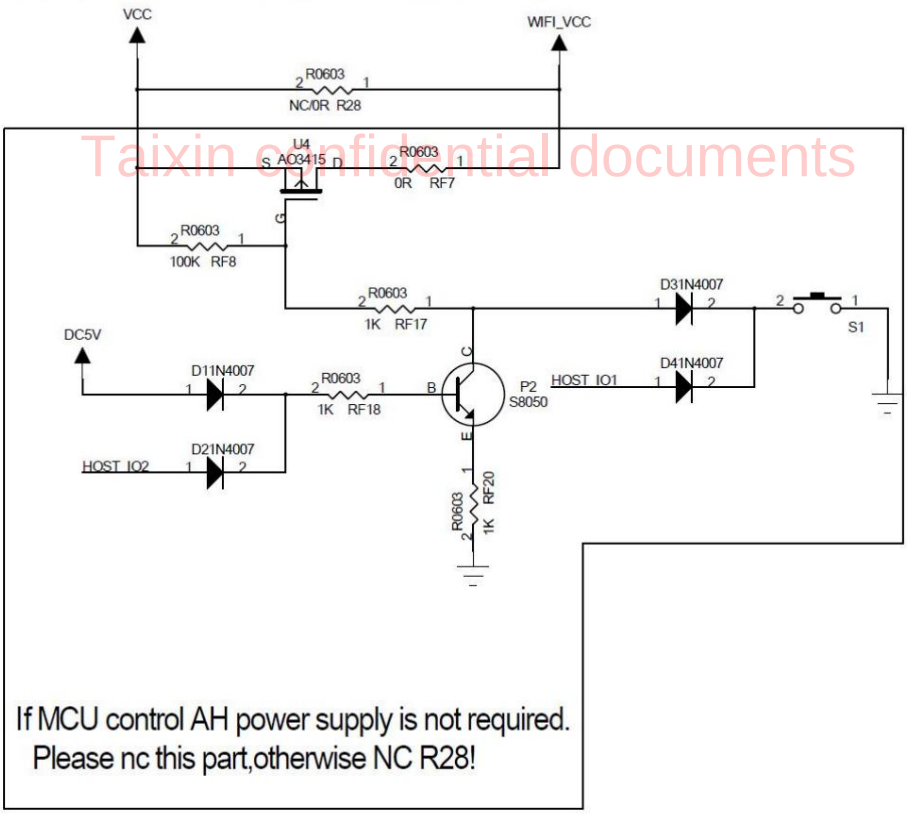
SPI BOOT



Need NOR-Flash in low power applications

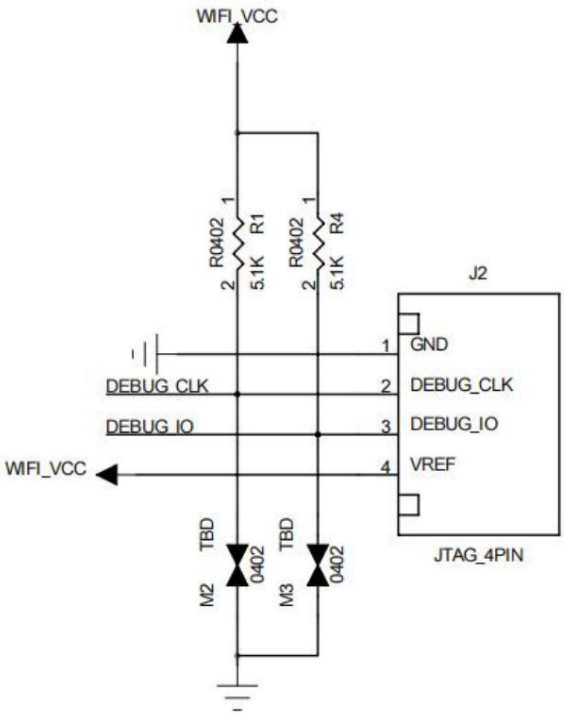
Considering that low-power solutions require fast startup, it is recommended to use spi nor flash boot to load firmware.

HOST CONTROL AH MODULE PWR



If a soft shutdown circuit is needed, it can be implemented through the above circuit, and the MCU controls the switch of the AH power supply.

7.9 Debug port reference schematic diagram



When you need to do secondary development and debugging, you can add this part of the circuit, and pay attention to adding TVS tube protection.

8 PCB related information

8.1 Module size diagram

Note: The tolerance of each dimension not indicated is less than **+/-15%**

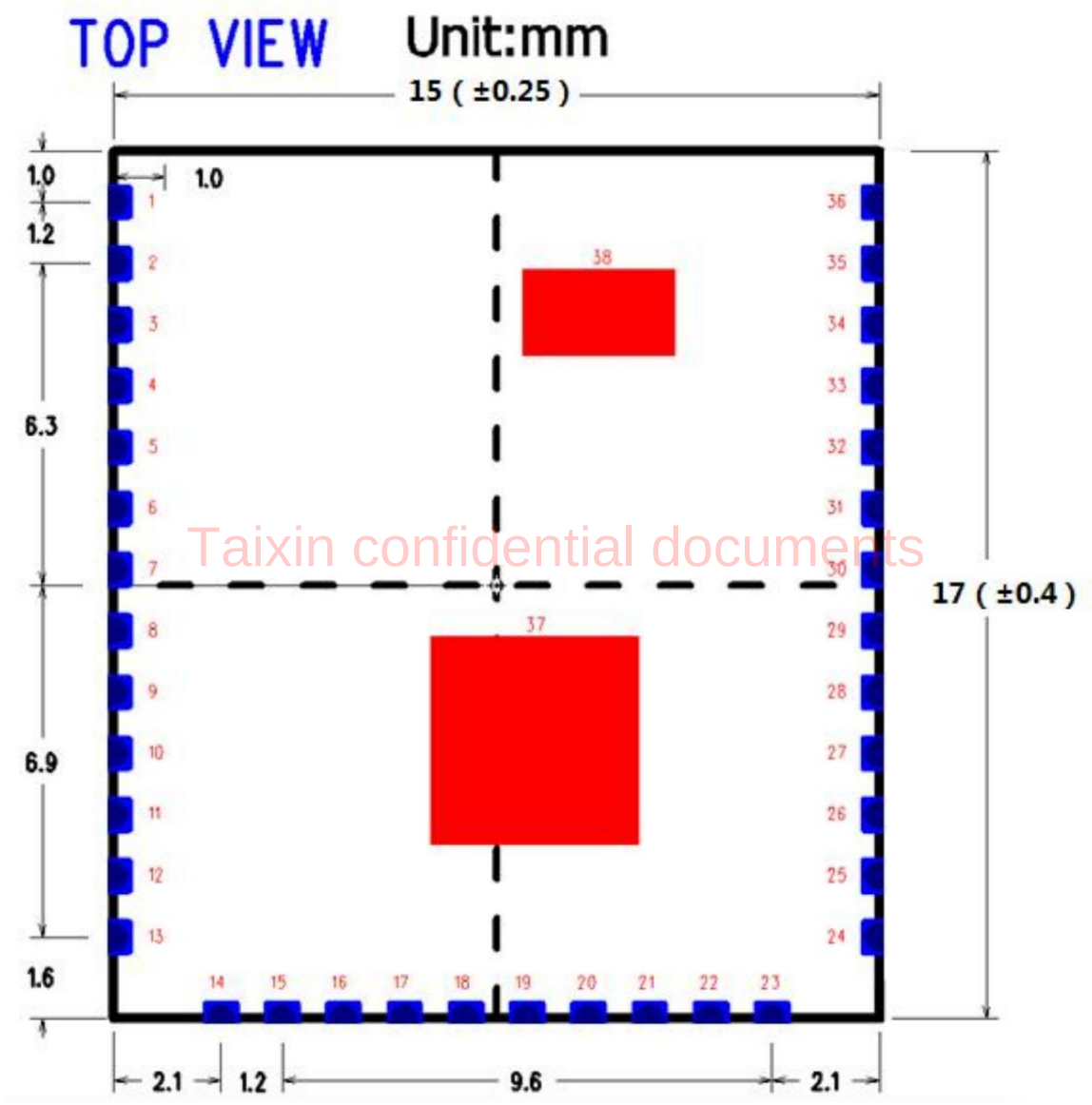


Figure **8-1. TX-AH-Rx00Pxx module Top View**

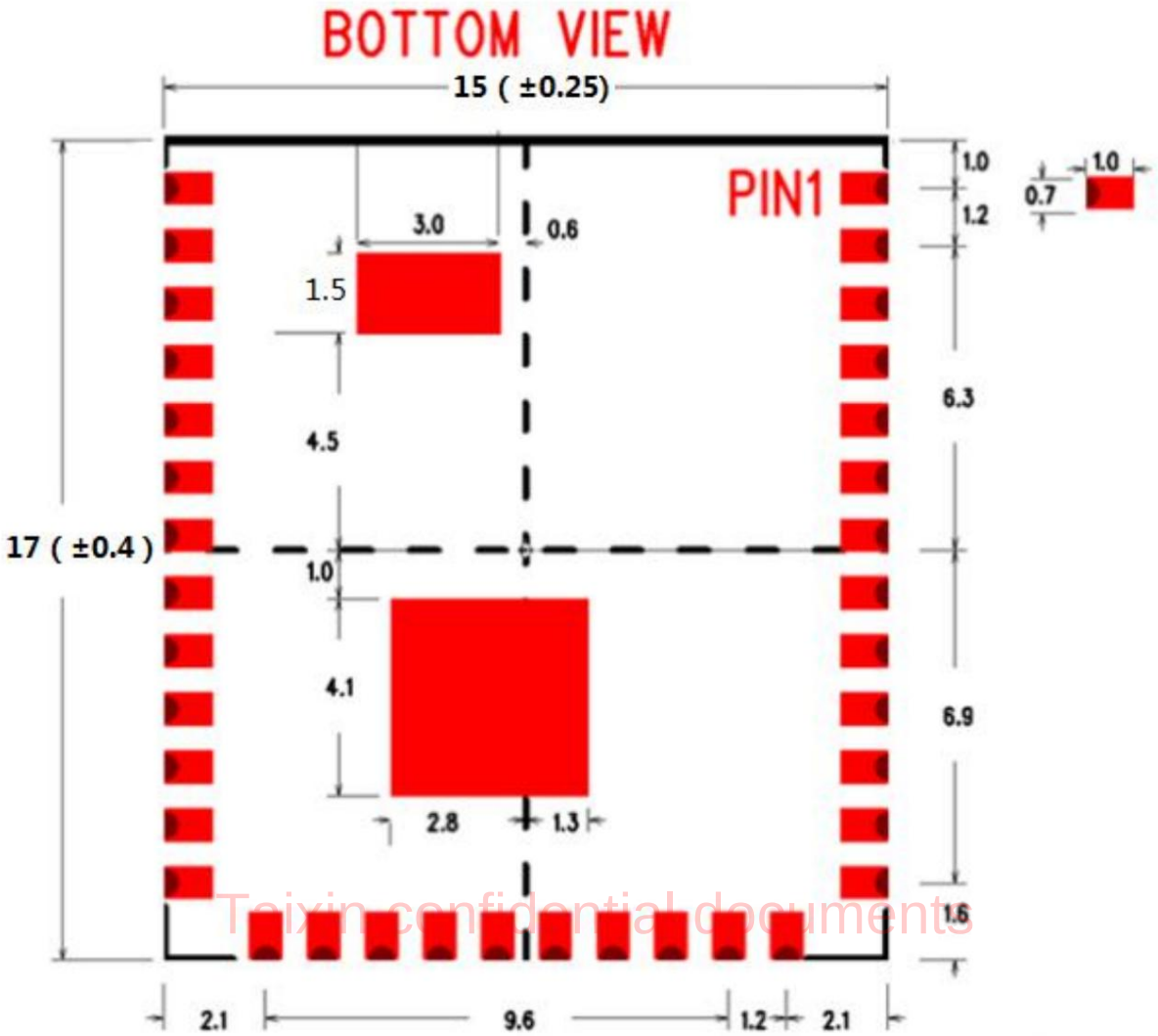


Figure **8-2. TX-AH-Rx00Pxx module Bottom View**

8.2 PCB packaging diagram

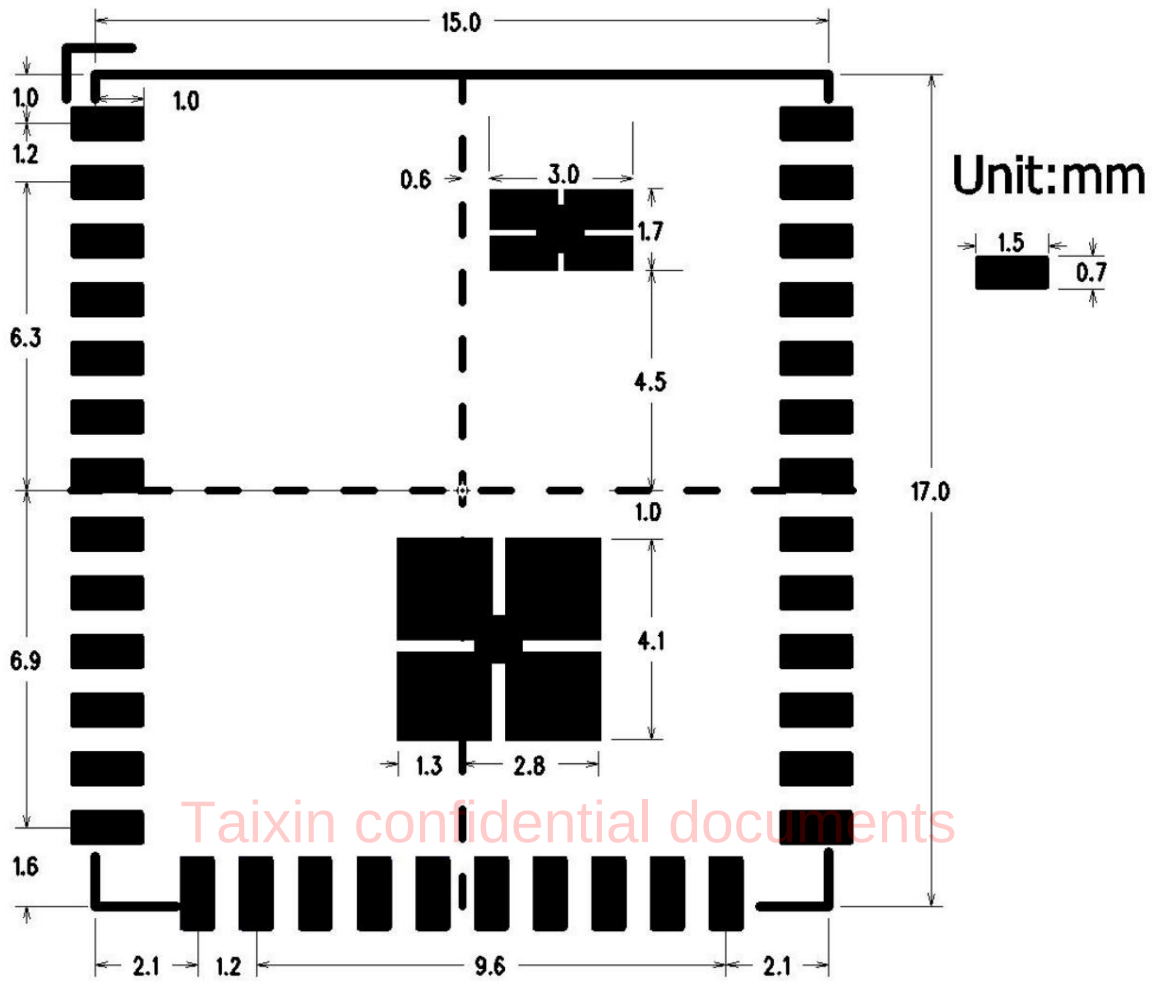


Figure **8-3. TX-AH-Rx00Pxx module PCB packaging diagram**

8.3 **Layout** considerations

1. The EPAD under the module needs to be grounded and drilled with more holes to improve heat dissipation; 2. The module

RF traces need to be routed according to 50ohm impedance. The traces should be as short as possible without drilling holes. If you want to turn, you can go in an arc. Do not walk on broken lines to ensure continuity of impedance;

3. If there is a DC-DC power supply, try to stay away from the AH module to prevent the crosstalk of the noise ripple of the DC-DC power supply; 4. Pay attention to the grounding treatment of

the RX_CLK trace of the Ethernet PHY to reduce the impact of the 50MHz clock and its frequency multiplication point RF performance; 5. It is recommended to reserve a shielding cover for the main control, because

the sensitivity of the AH module may be affected by the EMI of the main control and power supply, resulting in

The performance will decrease, so it is recommended to reserve a space. If you think the performance is up to standard without a shielding cover during the test, you do not need to use a shielding cover.

9About program development and testing

1. In order to facilitate customers to evaluate the performance of AH, our company provides bridge prototypes (large white bridges) for customers to test; if customers need smaller-sized bridges for integration, we have 38mm*38mm small bridge boards Sales channels, please contact our sales company for details;

Figure 9-1 Tyxin AH bridge demo

2. In order to speed up the development of customer solutions, our company has an AH development board for sale. The board has SDIO/USB/SPI/UART and other interfaces, and an interface for testing sleep current is reserved to facilitate customer plan development and test evaluation. Specifically, You can contact our sales department to purchase AH development board;

Figure 9-2 Taixin AH development board

3. In order to facilitate customers to conduct AH production testing, our company provides AH mass production test boxes. For details, please consult our FAE.

Figure 9-3 Tyxin AH test box

4. In order to facilitate customers to develop AH, our company provides AH SNIFFER. For details, please consult our FAE.

10 other things to note

1. When using this module, the frequency and power settings must meet the radio management regulations of the sales area.

2. The 700M frequency band currently has 5G signal interference from radio and television in China, please pay attention to avoid it.