Tektronix 802.11ah TX-AH-Rx00P Series Module Technical Specifications

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Revision Record

Date	Version	Description Description	Revised by
2023-11-16	V6.2	Add package information	WY
2023-9-2	V6.0	Modified VCC supply range to 3.1-3.3V	WY
2023-7-20	V5.9	Add description of SDIO: 4-wire only, 1-wire not supported;	WY
2023-7-17	V5.8	Delete the description of 700M module;	WY
2023-5-23	V5.7	Modify the description of the number of supported nodes;	WY
2023-5-19	V5.6	Addition of diagram for module with shield; Modification of the description of the SPI interface by adding a pull-up description; Modify the tolerance of module dimensions;	WY
2023-4-3	V5.5	Modify the description of STA low-power wake-up; Modify the description of AP low power consumption;	WY
2023-2-22	V5.4	Modify the frequency band range of 700P;	WY
2022-11-14	V5.3	Add the picture of 900P;	WY
2022-10-28	V5.2.	Modify description of AP low power consumption; add description of temperature; Add description of SNIFFER; Note Add description of 700M frequency point subject to 5G interference;	WY
2022-10-15	V5.1.	Update reflow profile;	WY
2022-9-27	V5.0	Update the picture of module to V1.3;	WY
2022-9-23	V4.9	Modify pin description of SPI1;	WY
2022-9-8	V4.8	Add description of maximum transmit power;	WY

2022-7-30	V4.7	Add description of Mode key;	WY
2022-7-14	V4.6	Add the description of Dual Antenna; Modify the reference circuit of Power Supply; Modify the reference circuit of UART;	WY
2022-7-5	V4.5	Modify the pen error; Add description of auto relay mode;	WY
2022-6-23	V4.4	Modify the description of 1.3V IO;	WY

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2022-6-20	V4.3	Update the pictures of modules to V1.2; Add pictures of bridge/development board/test box;	WY
2022-5-19	V4.2	Update the description of module power supply;	WY
2022-4-12	V4.1	Updating the module authentication status;	WY
2022-3-23	V4.0	Update the description of TCP/UDP peak traffic;	WY
2021-11-22	V3.3	Adding description of ADKEY; SDIO/USB interface add pairing button;	WY
2021-10-28	V3.2	Add description of CCA and other mechanisms;	WY
2021-8-31	V3.1	Modify the module size diagram;	WY
2021-8-13	V3.0	Modify the reference schematic of UART;	WY
2021-7-22	V2.7	Add description of roaming function;	WY
2021-7-9	V2.5	Add RF Layout notes; Add Feature: AP Low Power, Trunking, Multicast;	WY
2021-4-25	V2.2	Modifying low power current values; Modify the reference circuit for low power consumption;	WY
2021-3-29	V2.1	Modify the reference circuit for Ethernet PHY	WY
2021-3-16	V1.9	Update the development and testing section of the program	WY
2021-3-10	V1.8	Modify RF supply current	WY
2021-3-9	V1.7	Add development and test subsection	WY
2021-2-25	V1.6	Modify SPI interface description	WY
2021-2-5	V1.5	Modification of Low Power Circuit Reference Design	WY
2020-12-7	V1.0	Create	WY

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1 Product Overview

As an optimized Wi-Fi solution for IoT devices, the TX-AH-Rx00Pxx series modules (hereinafter referred to as TX-AH-Rx00P) designed by Taixin Semiconductor are the industry's leading IEEE 802.11ah compliant Wi-Fi modules.

TX-AH-Rx00P integrates the 802.11ah SOC TXW83xx, which operates in the 730M~950M frequency band and provides more than 2.4GHz and 5GHz Wi-Fi modules.

The TX-AH-Rx00P integrates 802.11ah SOC TXW83xx, which can operate in 730M~950M frequency band, providing a longer transmission range than 2.4GHz and 5GHz Wi-Fi with the same transmit power. The module can operate in channel widths of 1/2/4/8MHz and can provide physical throughput from 150 Kbps to 32.5Mbps, thus supporting applications ranging from low rate sensors to multiple high rate surveillance cameras.

The TX-AH-Rx00P module utilizes the Channel Conflict Assessment (CCA) and Carrier Sense Multiple Access/Conflict Detection (CSMA_CD) mechanisms for channel access backoff avoidance. Automatic frequency selection, automatic power control and other means are adopted to optimize the network transmission performance.

Using TX-AH-Rx00P can be interfaced with application processors via USB, SDIO, SPI, UART and other interfaces, which can be applied in various fields such as wireless security, drone mapping, smart home and smart grid. In addition, TX-AH-Rx00P provides RMII interface to realize the low-cost solution of single-module wireless bridge.

In terms of low power consumption, the TX-AH-Rx00P provides STA active power consumption as low as 200uA. The module also supports low power consumption of AP, and the power consumption of AP is less than 5mA when entering low power mode.

In terms of networking, the module supports relay mode, which can expand the coverage area. The module supports roaming mode, STA can roam between different APs. The module supports multicast mode, which is suitable for data multicasting scenario.

In terms of antenna, it supports single antenna and dual antenna, in which dual antenna is one of the two options, automatically switching the antenna selection according to the signal. The internal architecture and external connection diagram of the chip/module are shown in Figure 1-1.

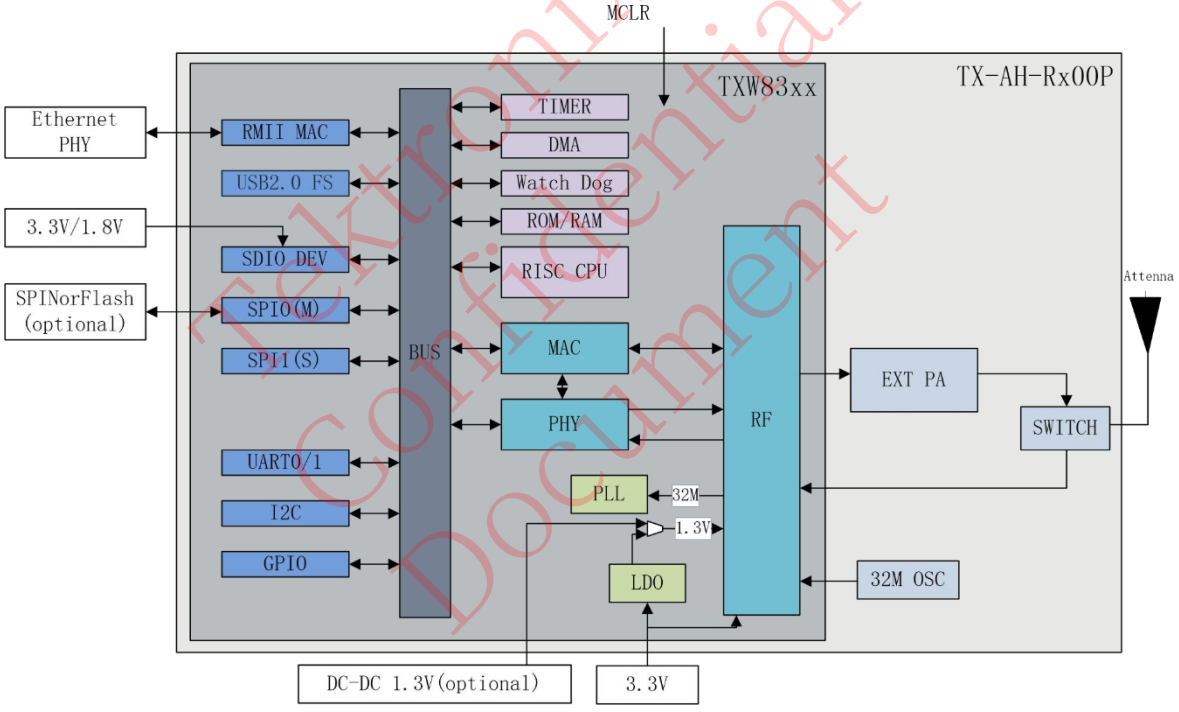

Figure 1-1. Chip/Module Internal Architecture and External Connection Diagrams

The appearance of the modules is shown in Fig. 1-2. 1-2(a) is TX-AH-R900PNR and 1-2(b) is TX-AH-R900P without shield; 1-2(c) is TX-AH-R900P without shield; 1-2(d) is TX-AH-R900P without shield; 1-2(e) is TX-AH-R900P without shield; 1-2(f) is TX-AH-R900P without shield; and 1-2(g) is TX-AH-R900P without shield.

is TX-AH-R900PNR-860M-S with shield.

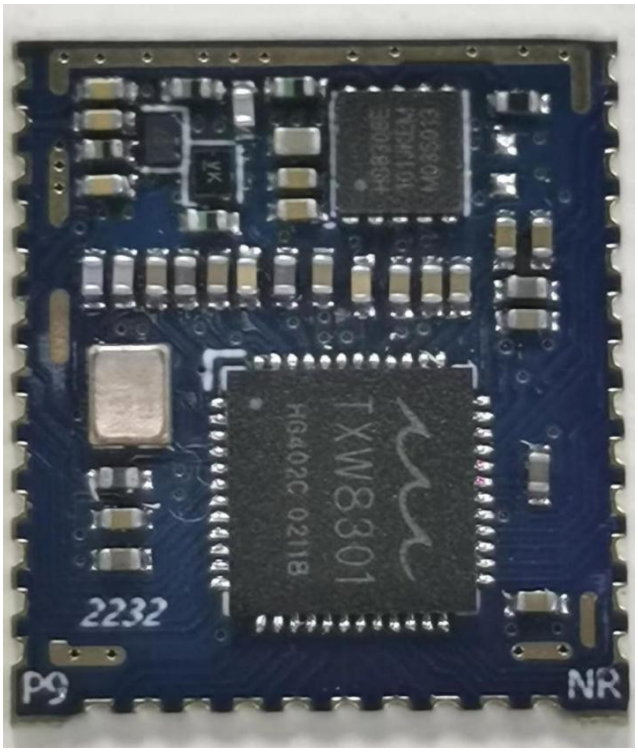

Figure 1-2(a). Appearance of TX-AH-Rx00Pxx modules (TX-AH-R900PNR as an example)

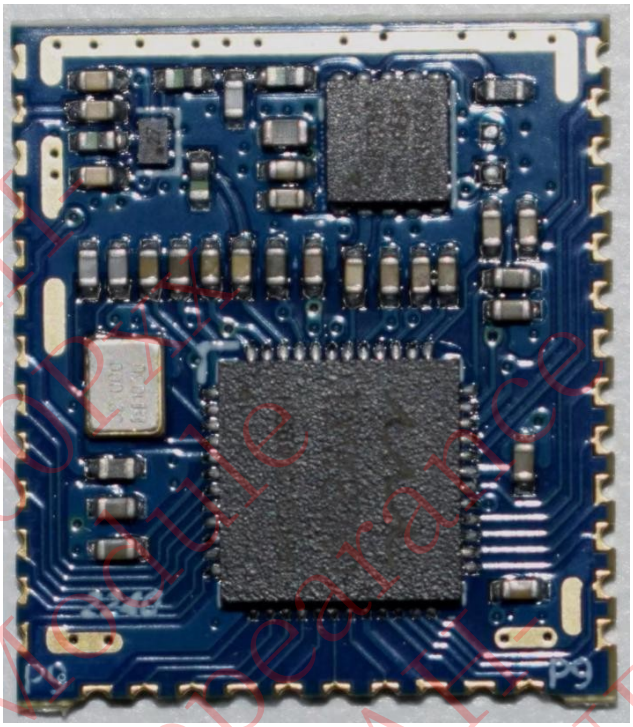

Figure 1-2(b). Appearance of TX-AH-Rx00Pxx module (Take TX-AH-R900P for example)

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Figure 1-2(c). Appearance of TX-AH-Rx00Pxx module (for example, TX-AH-R900PNR-860M-S)

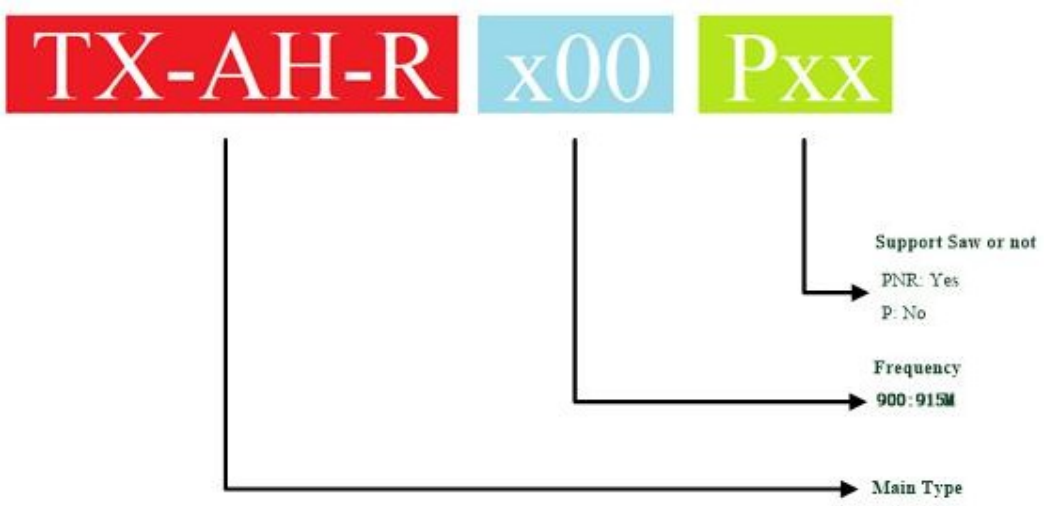
Note: The PCB number of the modules is based on the needs of TECSIN inventory management, and may be changed in different batches without prior notice if not related to specification changes.

TX-AH-Rx00P Specification Table 1-1.

Category	Parameter	Description
Wireless Parameters	Wi-Fi Protocol	802.11ah
	Frequency Range	Different frequency points for different sub-specification, please refer to Table 2-1.
Hardware Parameters	Data Interface	SDIO/USB/SPI/RMII/UART/I2C
	VCC Operating Voltage	3.1 V~ 3.3 V
	VCC Supply Current	Not less than 150mA
	RF operating voltage	3.1 V~ 3.3 V
	RF supply current	Not less than 450mA
	Operating temperature	-20 ℃~ 70℃[1]
	Storage temperature	-20 ℃~ 70℃[1]
	Package size	(17.00± 0.40)mm× (15.00± 0.25)mm× (2.40± 0.20)mm
Software parameters	Security Mechanisms	WPA2-PSK
	Encryption Type	AES
	Upgrade Firmware	Over-the-Air (OTA) / UART (Xmodem)
	HOST Wi-Fi Driver	Linux/RTOS/Non-OS Wi-Fi driver available for HOST

[1] Temperature refers to the module surface temperature.

2 Model Comparison



TX-AH-Rx00P series modules have specifications as shown in Table 2-1, please choose according to your needs.

Table 2-1. TX-AH-Rx00P Subdivision Specifications

Module Name	Front Screen Printing Distinction	Certified Status	Remarks: TX-AH-Rx00P
TX-AH-R900P	Lower left P9, lower right P9	FCC/CE certified	Support 860MHz ~ 928MHz
TX-AH-R900PNR	Lower Left P9, Lower Right NR	FCC Certified	Support 902MHz ~ 928MHz with 915M Saw Improved Reception Performance
TX-AH-R900PNR-860M	Lower Left 86, Lower Right NR	CE Approved	Support 859MHz ~ 894MHz with 875M Saw Improve Reception Performance

Remarks:

1, The difference between P series modules and earlier A series modules is:

(1) The lower left corner of the P series is silk screened with P, while the lower left corner of the A series is silk screened with R;

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

(2) P series PIN4/5 need power supply, A series don't; (2) Module is not with shield by default, if you need shield, you need to specify it when you place an order, with shield with suffix -S in the name of the above module, S means (Shield, shield).

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3 Pin Description

The pinouts of TX-AH-Rx00P are shown in Figure 3-1.

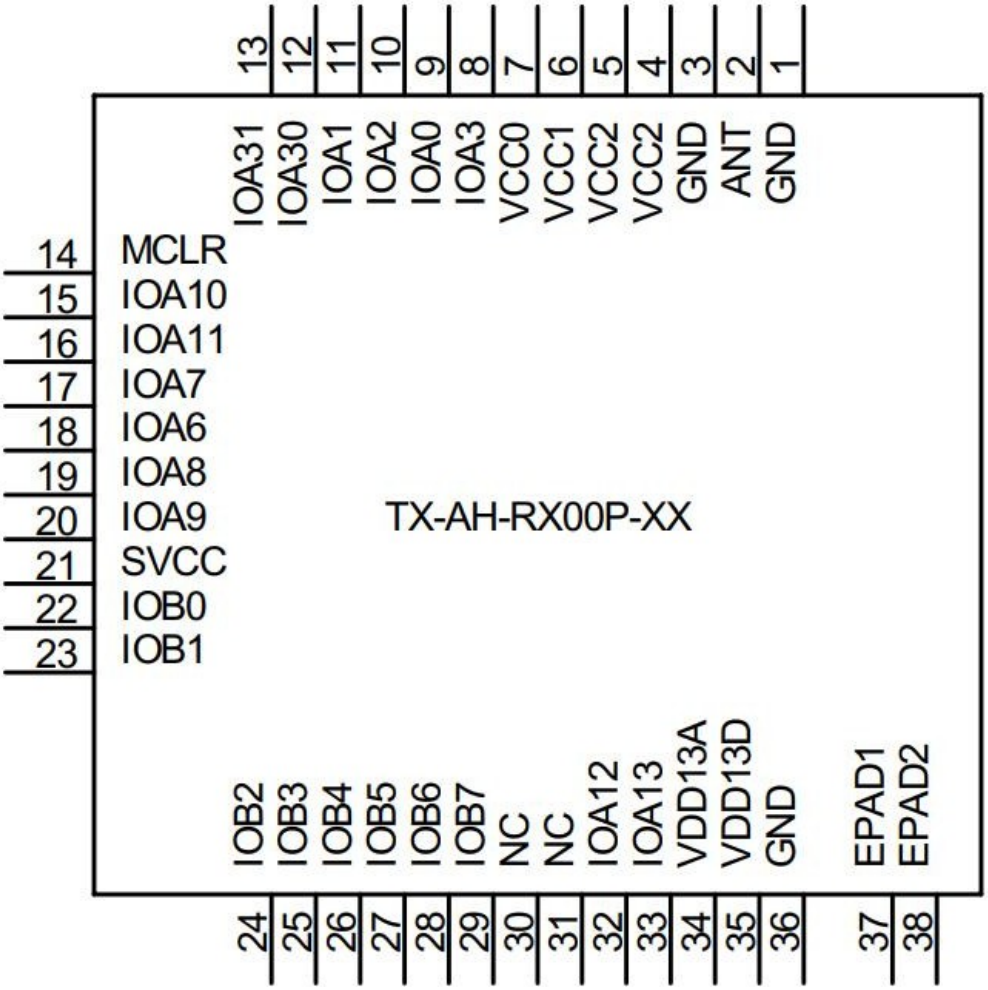

Figure 3-1. TX-AH-Rx00P Module Pin Assignment

TX-AH-Rx00P connects to a total of 38 pins (including 2 EPADs), see Table 3-1 for pin definitions.

Table 3-1. TX-AH-Rx00P Pin Definitions

Pin Definition	Pin Name	Function
1 GND	GND	Ground
2 ANT	ANT	RF Antenna
3	GND	Ground
4 VCC2	VCC2	RF Supply 2, Nominal 3.3V, Range 3.1-3.3V
5 VCC2 RF supply 2, nominal 3.3V, range 3.1-3.3V	VCC2	

6	VCC1	RF supply 1, nominal 3.3V, range 3.1-3.3V, bead string recommended
7	VCC0	Master VCC supply, nominal 3.3V, range 3.1-3.3V, string bead recommended
8 VCC0	IOA3	SPI0_MISO/GPIOA3, connect to external NorFlash MISO.
9 IOA0_MISO/ GPIOA3, connect to external NorFlash	IOA0	SPI0_CS/I2C_SCL/GPIOA0, connect to CS of external NorFlash.
10 IOA2	IOA2	SPI0_MOSI/GPIOA2, connect to external NorFlash MOSI.
11 IOA1	IOA1	SPI0_CLK/I2C_SDA/GPIOA1, connect to CLK of external NorFlash.
12 IOA1SPI0_C LK/I2C_SDA/ GPIOA1	IOA30	Debug IO pin by default, can be used as normal IO after turning off this function.
13	IOA31	Default Debug Clock pin, can be used as normal IO after turning off this function.
14 MCLR	MCLR	Reset/Wakeup
15 MCLR	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	IOA6	sd_clk/spi1_cs/spi1_clk/gpioa6
19 IOA8	IOA8	sd_d0/spi1_io0/spi1_miso/gpioa8
20 IOA9	IOA9	sd_d1/spi1_io1/spi1_intio/gpioa9
21 IOA9	SVCC	SDIO power supply (1.8V/3.3V optional), connected to the power supply of SDIO Host; if IOA6~IOA11 are used for other functions, SVCC also needs to be powered. If IOA6~IOA11 are used to do other functions, SVCC also needs to be powered, just share the power with VCC0;
IOB0	IOB0	RMII_REF_CLKIN/MCU_WAKE_AH/GPIOB0
23 IOB1	IOB0	GPIOB1
24 IOB2	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 IOB7	IOB7 RMII_TX_EN/GPIOB7 30	NC
31 NC	NC	NC, keep floating, if need external PA, can lead out as PA-EN, high effective;
32	IOA12	USB_DM/UART1_RX/ADKEY
33	IOA13	USB_DP/UART1_TX
34	VDD1V3A	1.3V supply input; Note: 1.3V is powered by 3.3V to LDO inside the module by default, these two pins need to be floated in this case; For power-sensitive scenarios, 1.3V can be supplied by external DC-DC to save power, at this time, these two pins need to be floated. One pin needs to be connected to t h e 1.3V DC-DC output; the recommended output
35	VDD1V3D	

		current is not less than 200mA.
36 VDD1V3D	GND	Ground
37 VDD1V3D	EPAD1	Ground
38 EPAD2	EPAD2	Ground

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4 Hardware 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 Memory Description

4.2.1 SPI Nor FLASH

TX-AH-Rx00P does not have built-in SPI Nor Flash, if you need external Nor Flash, please refer to the section of firmware boot method.

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

4.3 Crystal oscillator

TX-AH-Rx00P uses 32M crystal.

4.4 Reset/Wakeup

The MCLR pin can be used for either reset or wakeup.

During non-deep sleep, the reset module can be realized by pulling down and then pulling up the MCLR; the duration of MCLR low is required to be not less than 2ms;

When the AH module enters into deep sleep state, wake-up function can be realized by pulling down and then pulling up MCLR; the duration of MCLR low level is about 500uS.

The duration of MCLR low level is about 500uS.

4.5 ADKEY

IOA12 can be used as an ADKEY with a sampling bit width of 10bit, which is used to sample low-speed signals, such as the voltage of a keypad, etc. The full scale is 1.1V. The 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), ioa7(sd_cmd), ioa8(sd_d0), ioa9(sd_d1), ioa10(sd_d2) IOA11(SD_D3)	Supports SDIO2.0 protocol, up to 50MHz clock, 4-wire mode only (1-wire mode not supported), SDIO mode and SPI mode.
USB interface (slave)	IOA12(USB_DM). IOA13(USB_DP)	Supports USB2.0 FS protocol, typical interface communication rate 5Mbps.
SPI0 interface (master)	IOA0(SPI0_CS), IOA1(SPI0_CLK), IOA2(SPI0_MOSI), IOA2(SPI0_MOSI), IOA2(SPI0_MOSI), IOA2(SPI0_MOSI), IOA2(SPI0_MOSI) IOA3(SPI0_MISO)	Support external SPI Flash (support NOR BOOT), not recommended to connect other SPI devices.
SPI1 interface (slave)	IOA6(SPI1_CLK), IOA7(SPI1_MOSI), IOA8(SPI1_MISO), IOA9(SPI1_INTIO). IOA11(SPI1_CS)	Supports external SPI devices (NOR BOOT not supported), pin-multiplexing with SDIO (SPI mode for SDIO)
RMII Interface	IOB0 (RMII_REF_CLKIN), IOB2 (RMII_RXD0), IOB3 (RMII_RXD1), IOB4 (RMII_TXD0), IOB5 (RMII_TXD1), IOB6 (RMII_CRS_DV), IOB7 (RMII_TX_EN), IOA10 (RMII_MDIO). IOA11 (RMII_MDC).	MAC support up to 100Mbps. IOA10/IOA11 are multiplexed with UART0 pin, when you need to use UART0, you can set RMII_MDIO to IOA10/IOA11. IOA10/IOA11 are multiplexed with UART0 pins so that RMII_MDIO/MDC can be moved to IOA7/IOA8 when UART0 is needed.
UART0 Interface	IOA10(UART0_RX). IOA11(UART0_TX)	Muxed with SDIO/SPI1 pins, available when using SDIO/SPI1. UART1 interface
UART1 Interface	IOA12(UART1_RX). IOA13(UART1_TX)	Multiplexed with USB pins, UART0 is available when using USB.
I2C interface (master)	IOA0(I2C_SCL). IOA0(I2C_SCL), IOA1(I2C_SDA) IOA0(I2C_SCL), IOA1(I2C_SDA) IOA12(I2C_SCL). IOA12(I2C_SCL), IOA13(I2C_SDA)	There are two ways of pin out. The first one is multiplexed with SPI0 pin, and the second one can be used when using SPI0; The second pin is multiplexed with the USB/UART1 pin. The second pin is multiplexed with USB/UART1, so the first pin can be used when using USB/UART1.

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5 Software Function Description

5.1 Module Operation Mode

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

5.2.1 Module+HOST method

In wireless surveillance, UAV mapping and other application scenarios, TX-AH-Rx00P needs external application processor (i.e. HOST) to realize image encoding/decoding functions. The operating systems that support HOST are Linux/RTOS (Rtthread/Liteos, etc.)/Non-OS, and we can provide drivers for the corresponding operating systems.

5.2.2 Single-module approach

For wireless bridge application, TX-AH-Rx00P can be connected to Ethernet PHY through RMII interface to realize one-to-one wireless bridge solution without external HOST.

In case of 1-to-N bridge, if the AP side has higher requirements on protocol processing performance, it may still need to hang the application processor to realize the protocol processing at the AP side, which can be handled differently according to the actual situation.

5.2 Firmware boot mode

TX-AH-Rx00P supports SDIO device boot/USB device boot/SPI NorFlash boot firmware loading. When the module communicates with HOST via SDIO/USB, you can consider to use SDIO device boot or USB device boot.

When the module communicates with HOST through SDIO/USB, you can consider using SDIO device boot or USB device boot, in this case, the module can not plug in SPI NorFlash, the disadvantage is that the speed of these two kinds of boot is slower than that of SPI NorFlash boot.

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

5.3 Networking Methods

The supported networking methods are as follows:

(1) AP-STA mode, basic star network, one AP connects to multiple STAs; the maximum number of supported STAs can be configured by firmware, the default firmware supports up to 8 STAs, and it can be configured to support up to 32 STAs (firmware modification is required).

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

(3) Roaming function, support STA to roam between APs, STA will automatically select stronger APs according to the signal condition.

(4) Auto Relay Mode, combining roaming and relay, can realize the network of STA auto relay.

(5) Multicast mode, use multicast to transmit data, suitable for scenarios where the data volume is not too large but there are more nodes.

5.4 Low Power Modes

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

5.2.1 STA Low Power

STA low power requires an external 1.3v DC-DC to supply the module's 1.3v power supply PIN34/35. It can support the keep-alive function, and the keep-alive DTIM time can be adjusted.

If PIN4/5/6/7 of the module are fixedly connected to 3.3V constant power supply, the power consumption can be as low as about 400uA at DTIM10.

If you want to get a lower current, you can separate PIN4/5/6 and PIN7, and disconnect PIN4/5/6 during hibernation, then the power consumption of DTIM10 can be as low as 200uA or less. For details, please refer to the low power reference circuit in Section 7.9.

5.2.2 AP Low Power

AP low power consumption requires external 1.3v DC-DC to supply the 1.3v power supply PIN34/35 of the module; PIN4/5/6/7 of the module can be fixed to 3.3v constant power supply.

If the interface is turned off, the power consumption can be as low as about 5mA, and the master can not wake up the AH module through the interface; if the interface is not turned off, the power consumption is about 10mA, and the master can wake up the AH module through the interface.

6 Main Parameters

Note: No special instructions, the test conditions are 3.3V power input, 1.3V supplied by the internal LDO, and the temperature is 25℃.

6.1 Wi-Fi Main Parameters

Table 6-1. Wi-Fi Parameters

Parameter	Typical Value	Unit
Operating Parameters		
Working Frequency Band	Refer to Table 2-1	MHz
Selectable bandwidth	1, 2, 4, 8	MHz
Modulation and Demodulation	BPSK, QPSK, 16QAM, 64QAM	
Support 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 (01)		
TCP	Approx. 15	Mbps
UDP	Approx. 16	Mbps
Communication distance (Transmit power +20dBm, one-to-one TCP traffic) (02)		
1M bandwidth	TBD	
2M bandwidth	1200 meters, >2Mbps	
4M bandwidth	1200 meters, >3Mbps	
8M Bandwidth	1200 meters, >4Mbps	
Transmission Parameters		
Transmit Power	+20(03)	dBm
Transmit Error Vector Magnitude (MCS7)	<= -27	dB
Receive Parameters		
Receive Sensitivity (10% PER)		
1M PPDU MCS=10	-105	dBm
8M PPDU MCS=0	-95 dBm	dBm
8M PPDU MCS=7	-81 dBm	dBm
Neighbor Band Suppression		
Receive neighbor band rejection (MCS10)	28	dBc
Receive Non-Adjacent Band Rejection (MCS10)	35	dBc
Out-of-band interference tolerance	-20	dBm
Other		
Maximum Input Signal Strength	-10 dBm	dBm

Description:

(1) The traffic limit is tested at 8M bandwidth and maximum number of aggregates is 16;

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

(3) 20dbm is the maximum transmit power to satisfy Tx-EVM <= -27. If allowed to sacrifice Tx-EVM, the transmit power can be increased to a maximum of 25dBm.

6.2 Power Consumption

Table 6-2. TX-AH-Rx00P Module Power Consumption

Mode	Typical Value	Unit
Continuous transmit mode (100% duty cycle), Pout=+20dBm	300 mA	mA
Continuous receive mode (1.3V generated by 3.3V via internal LDO)	100 mA	mA
Continuous receive mode (1.3V externally supplied, converted to 3.3V)	55 mA	mA
Deep-sleep	(110) [1]	uA
DTIM10	(195) [2] uA	uA
DTIM20	(160) [2] uA	uA
DTIM30	(145) [2] uA	uA
AP Low Power	(5) [3] uA	mA

[1] refers to STA low power consumption in 2M bandwidth; 1.3V is supplied by the DCDC and the RF supply (VCC1/VCC2) is automatically turned on and off by the module (up to ~200uA additional leakage if the RF supply is not individually switched off during sleep);

[2] 2M bandwidth mode keep-alive power consumption;

[3] 1.3V DCDC power supply, interface shutdown;

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6.3 Reflow Temperature Profile

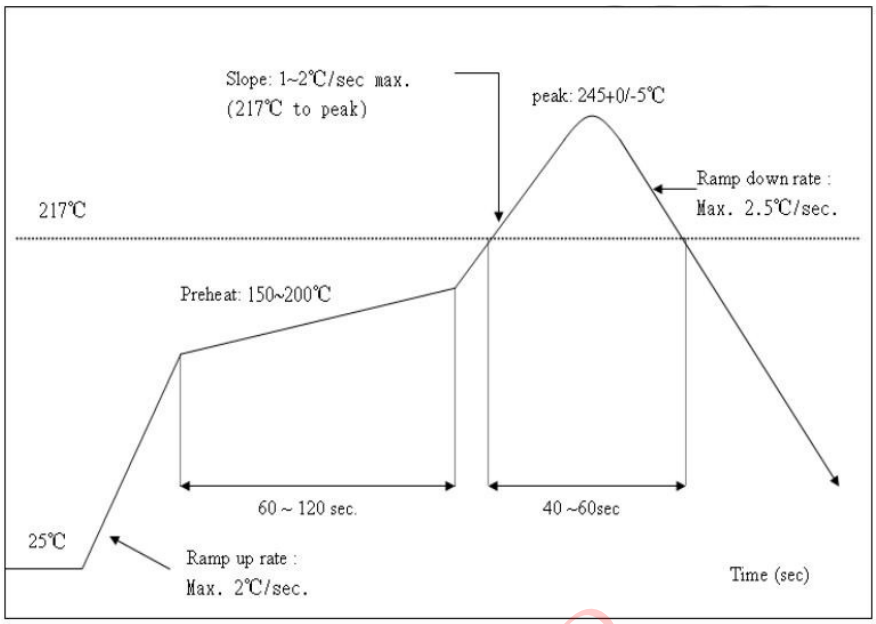


Figure 6-1. TX-AH-Rx00P Reflow Temperature

Profile Figure 6-3. TX-AH-Rx00P Module Reflow

Parameter	Standard Profile	Limit Profile
Pre-heat	150 - 200°C, 60 - 120 sec	
Heat	Above 217°C, 40 - 60 sec	
Peak temperature	245+0/-5°C	250 °C
Cycle of reflow	2 times	

6.4 Module Leveling Parameters

Table 6-4. TX-AH-Rx00P Module Leveling Parameters

Parameter	Typical value	Maximum value	Unit
Warping degree	0.23	0.46	% of the value
Diagonal Warpage	0.06	0.12	mm

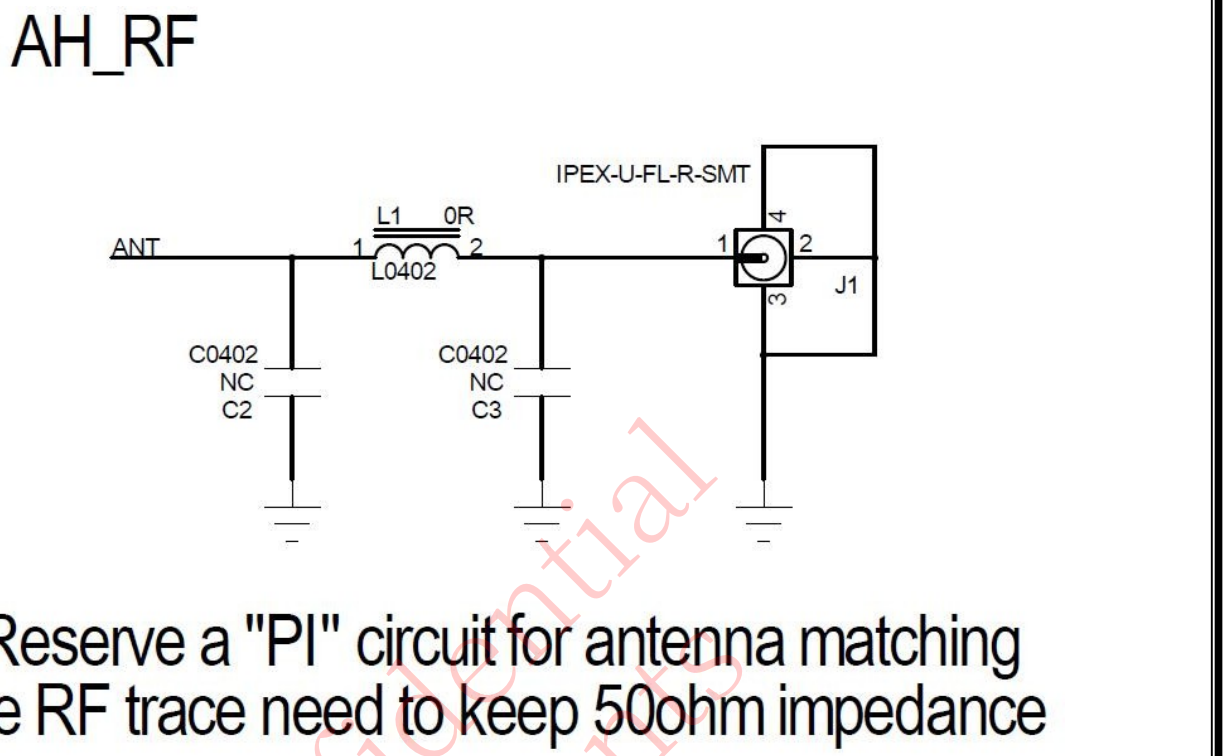
6.5 Static Characteristics

Table 6-5. TX-AH-Rx00P Electrostatic Parameters

Static Model	Condition	Maximum Value	Unit
HBM	25℃	2	kV

7 Peripheral Circuit Schematic

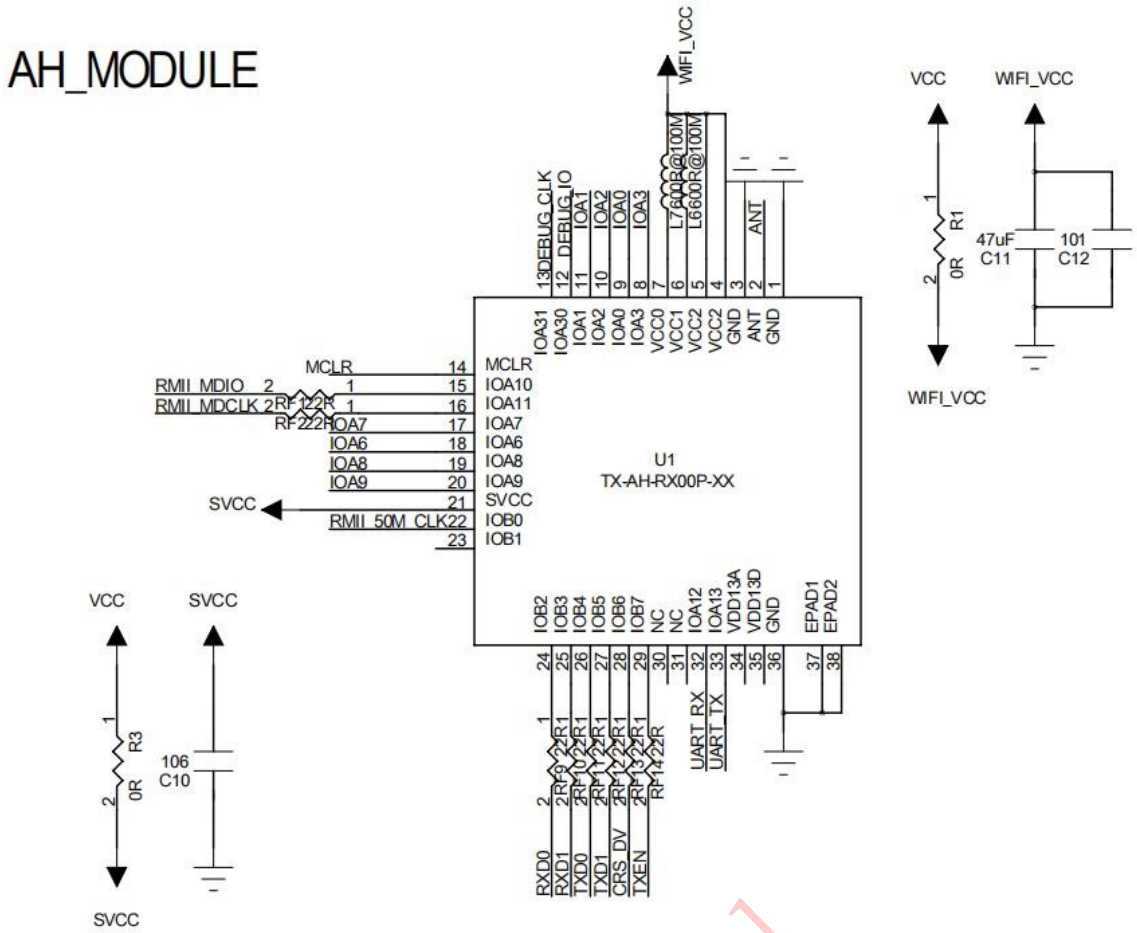
7.1 RF Section Reference Schematic

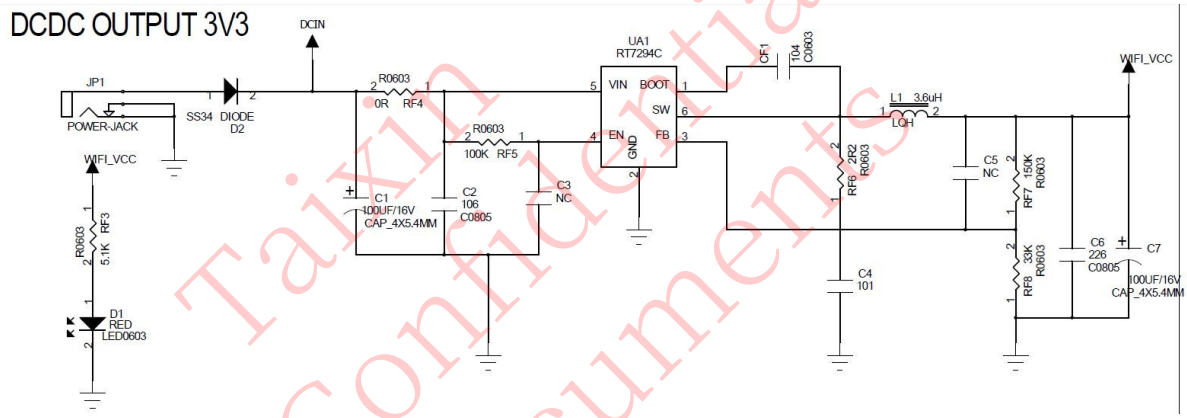


7.2 RMII Reference Schematic

Currently supported Ethernet PHYs: IP101GR, RTL8201F, please contact our FAE for other Ethernet PHYs.

The following is an example of IP101GR reference schematic. If you need RTL8201F schematic, please contact our FAE.





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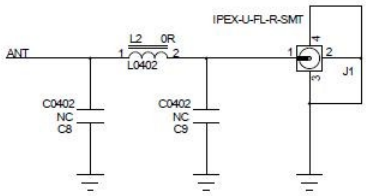
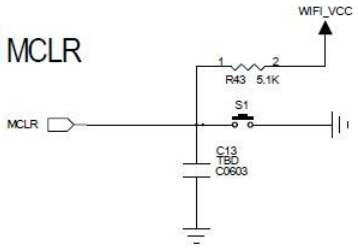
Hi-Tech District, Zhuhai) (11) (Building) (3) (Floor)

AH_RF

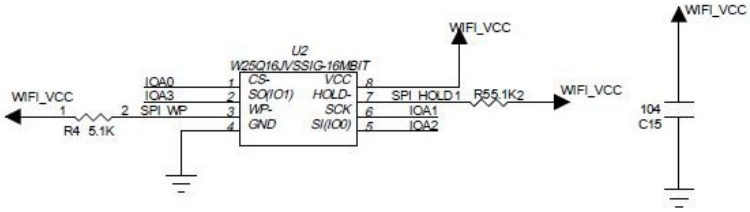


Reserve a "PI" circuit for antenna matching
The RF trace need to keep 50ohm impedance

AH MCLR

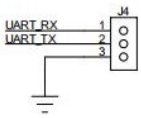


SPI BOOT

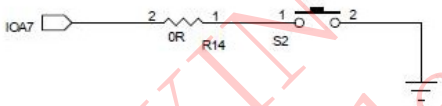


AH UART

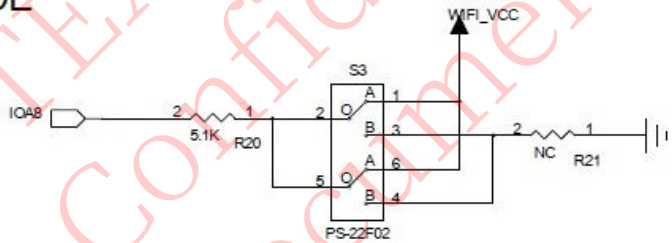
uart is for printing



CONNECT KEY

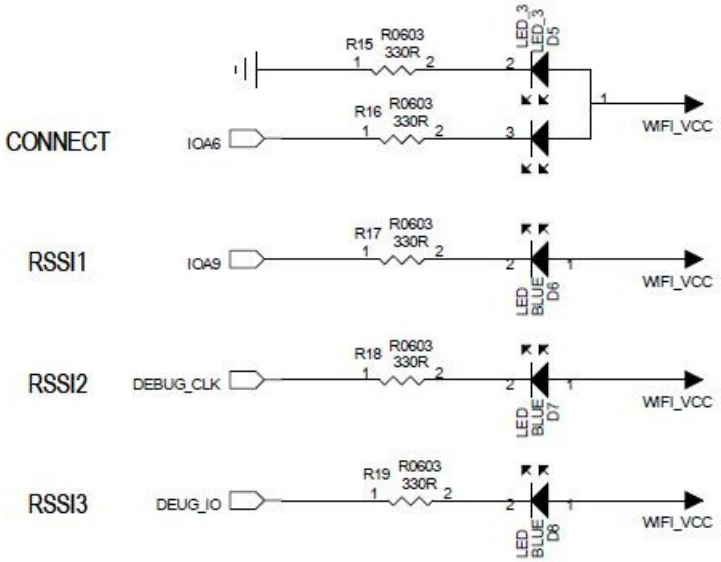


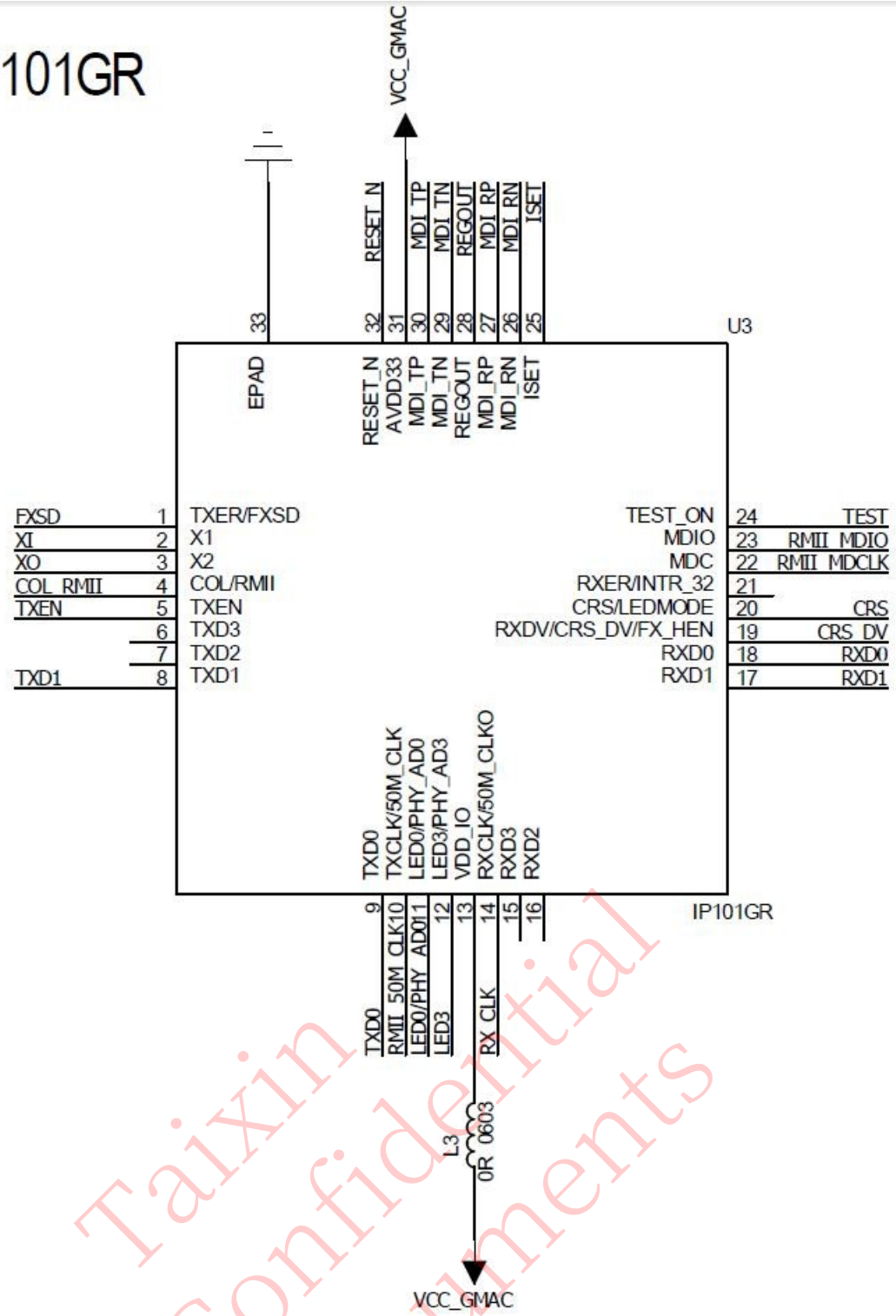
AP/STA MODE



Mode pull down is STA (default), pull up is AP.

Note: Role/Pairing can be set via serial commands, thus eliminating the need for physical buttons;





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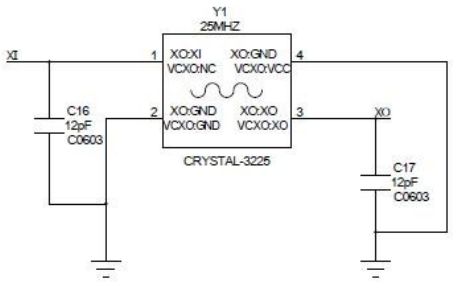
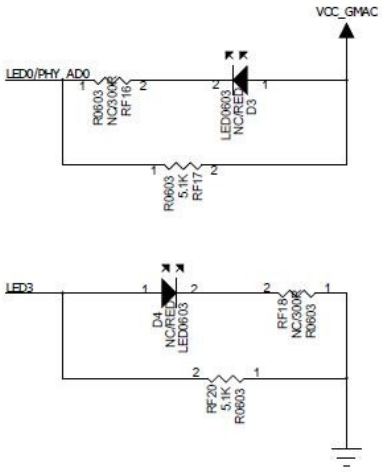
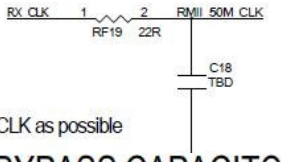
25MHZ CRYSTAL



LED

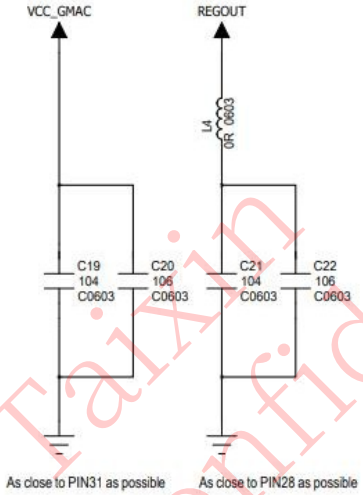


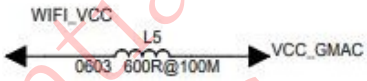
50MHZ CLK

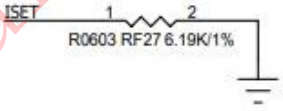


As close to chip RX_CLK as possible

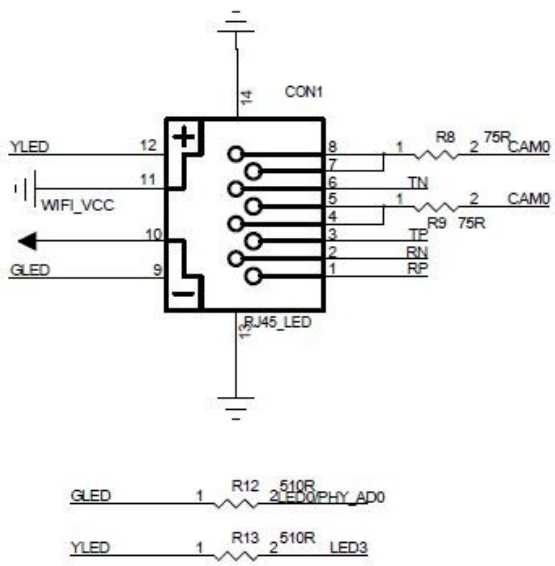
BYPASS CAPACITOR

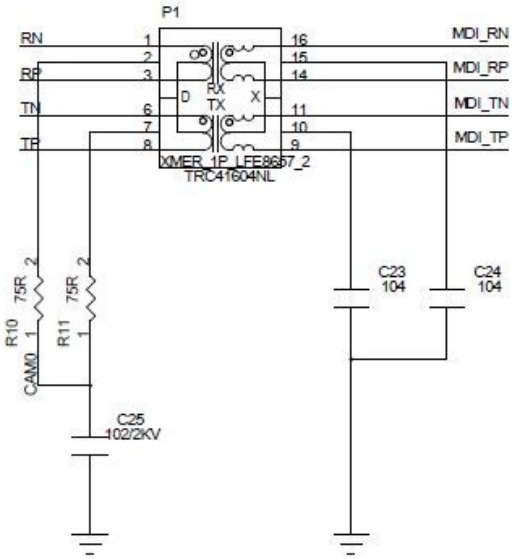




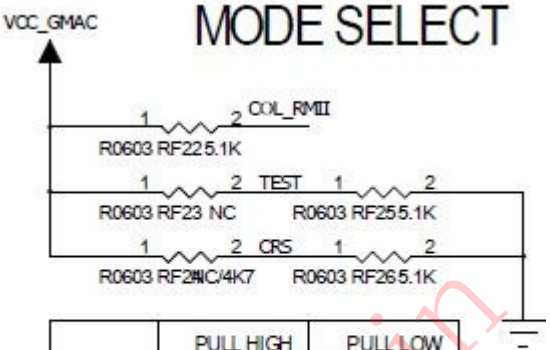


ETHERNET INTERFACE



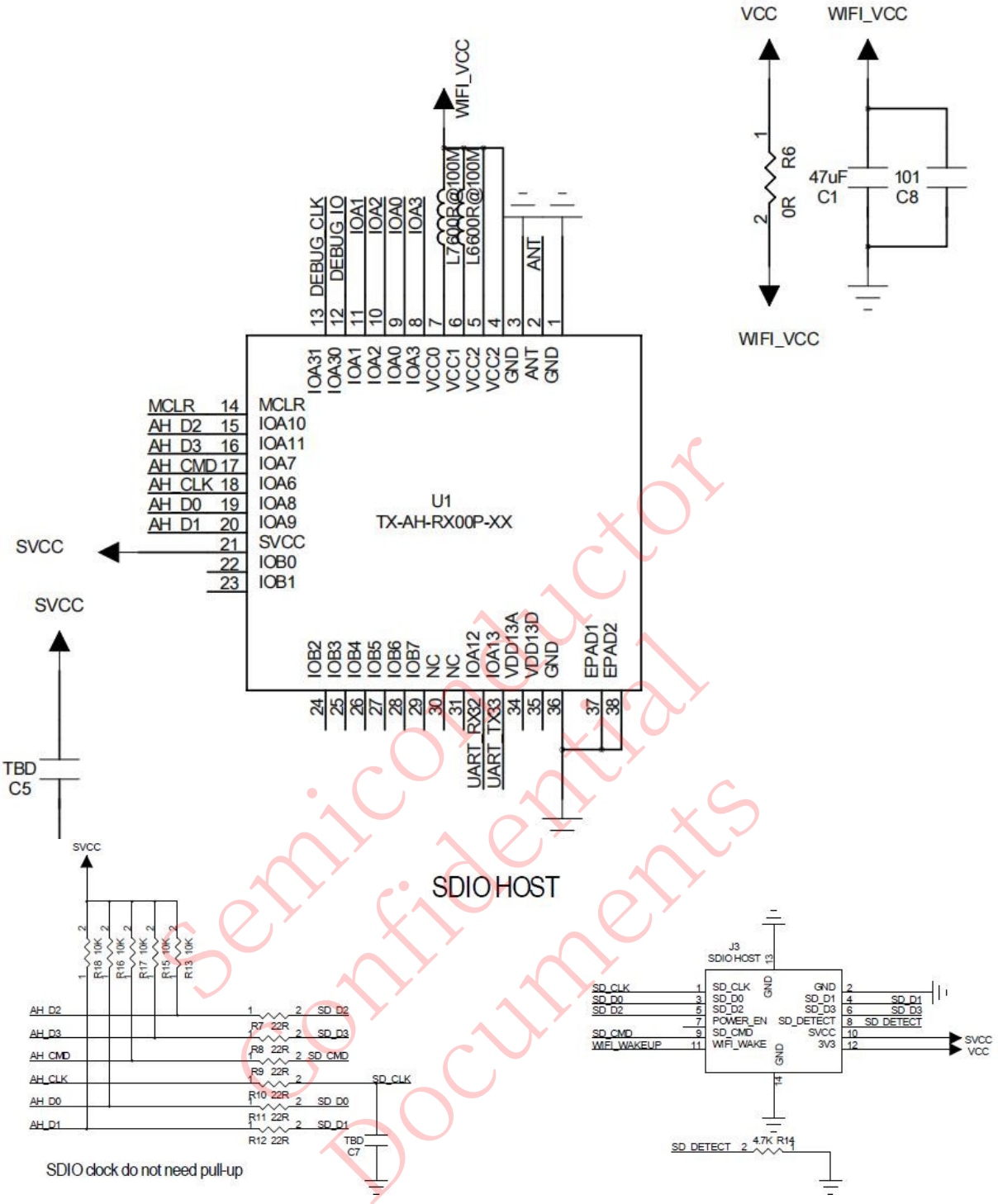


MODE SELECT



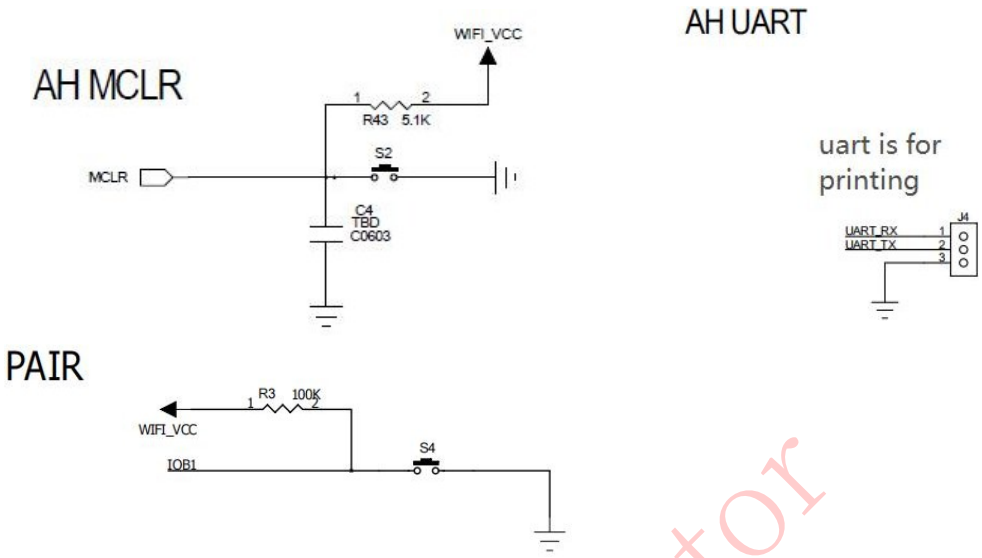
	PULL HIGH	PULL LOW
COL/RMII	RMII MODE	MII MODE
TEST	TEST MODE	NORMAL MODE
CRS	LED MODE1	LED MODE0

7.3 SDIO device boot reference schematic

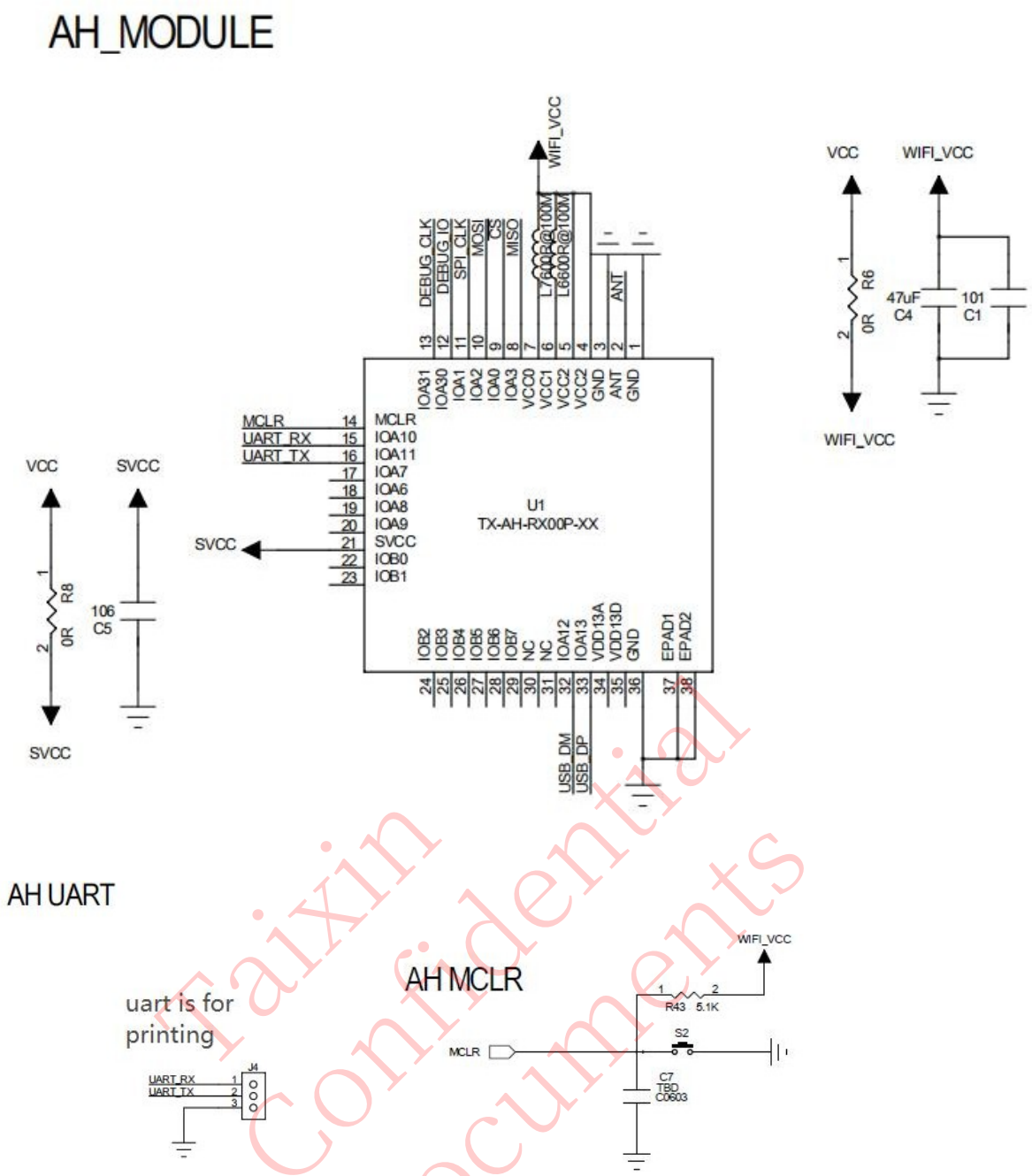


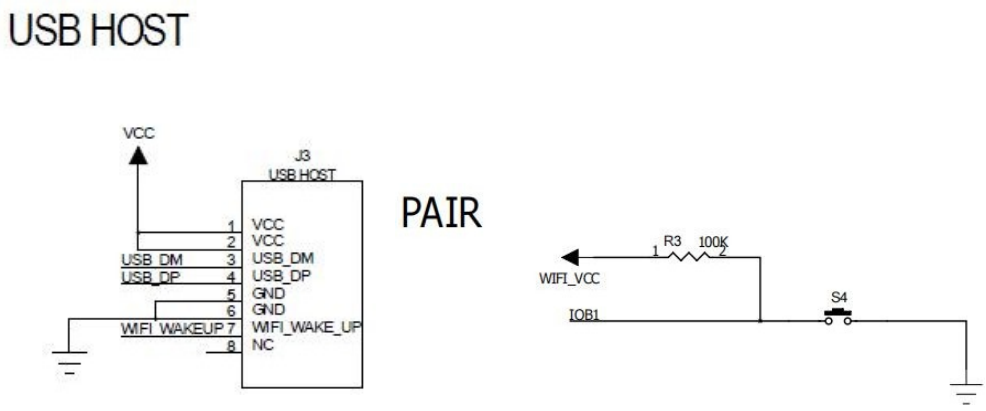
Note: CMD/D0~D3 of SDIO need to be pulled up, CLK does not need to be pulled up; SVCC is recommended to be powered from the master.

SDIO only supports 4-wire mode, not 1-wire mode.



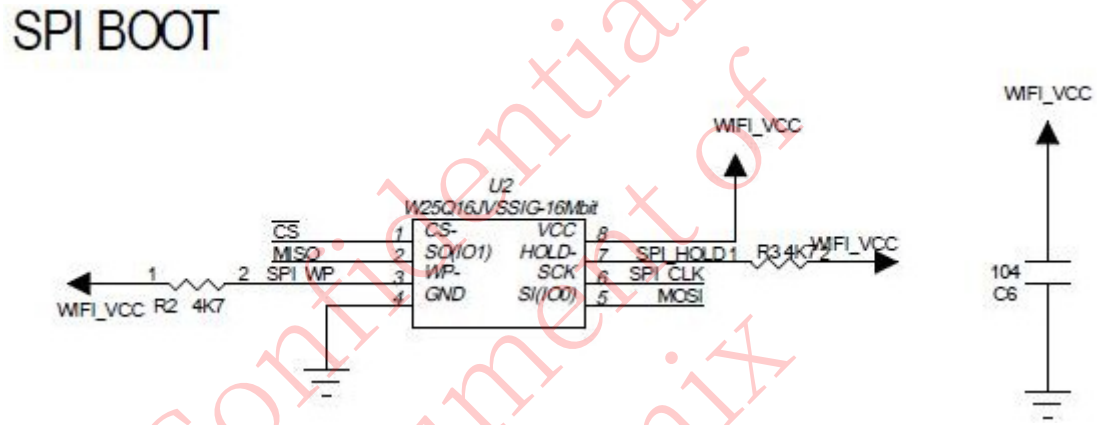
7.4 USB device boot reference schematic





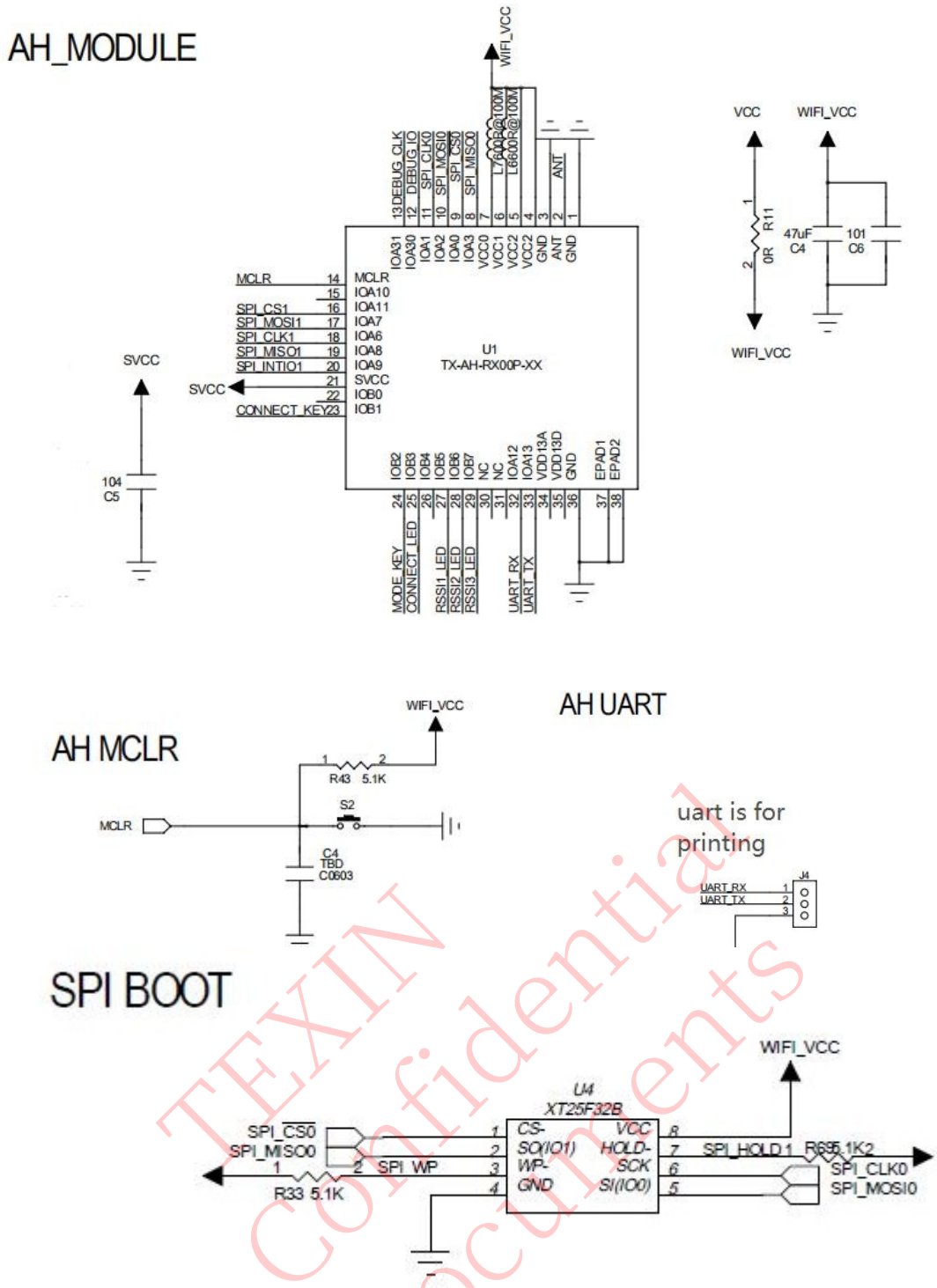
7.5 SPI NorFlash boot reference schematic

In the scenario of using SDIO/USB interface, if the requirement of AH boot speed is relatively high, we can consider not to use SDIO/USB boot, but to use SPI nor boot scheme, on the basis of subsection 7.3 and 7.4, add the following circuits: RMII interface is a single-module scheme, which needs to be hooked with Nor, and UART interface introduced later also needs to be hooked with Nor. The SPI interface is the SPI mode of SDIO, so it can be used without Nor. The capacity of Flash should not be less than 8Mbit.



7.6 SPI interface communication reference schematic

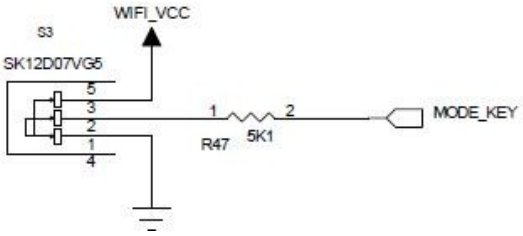
TX-AH-Rx00P can be used as SPI slave to communicate with Host MCU (realized by SPI mode of SDIO interface). Note that SVCC is fed from the power supply of the Host MCU. Note that MOSI, MISO and INTIO need external circuit pull-up.



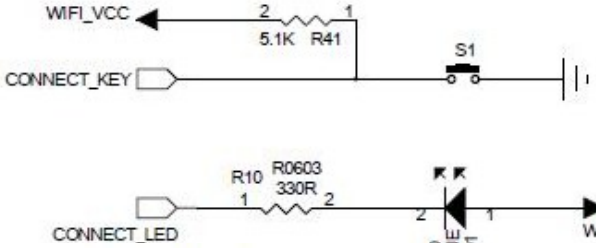
If you need to press keys for character selection and key pairing, you can realize it with the following circuit.

If needs Keys & Leds, adopt this part

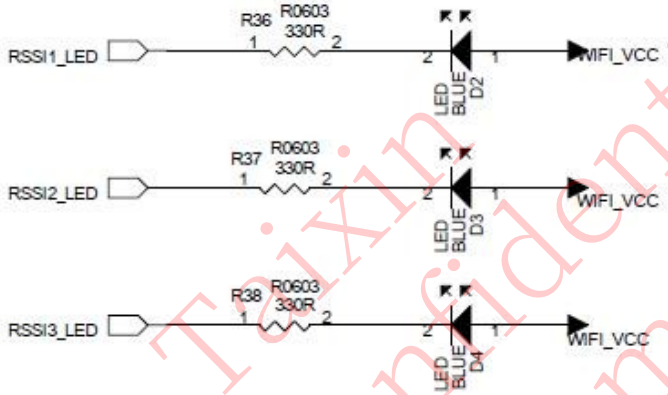
MODE KEY



CONNECT KEY/LED

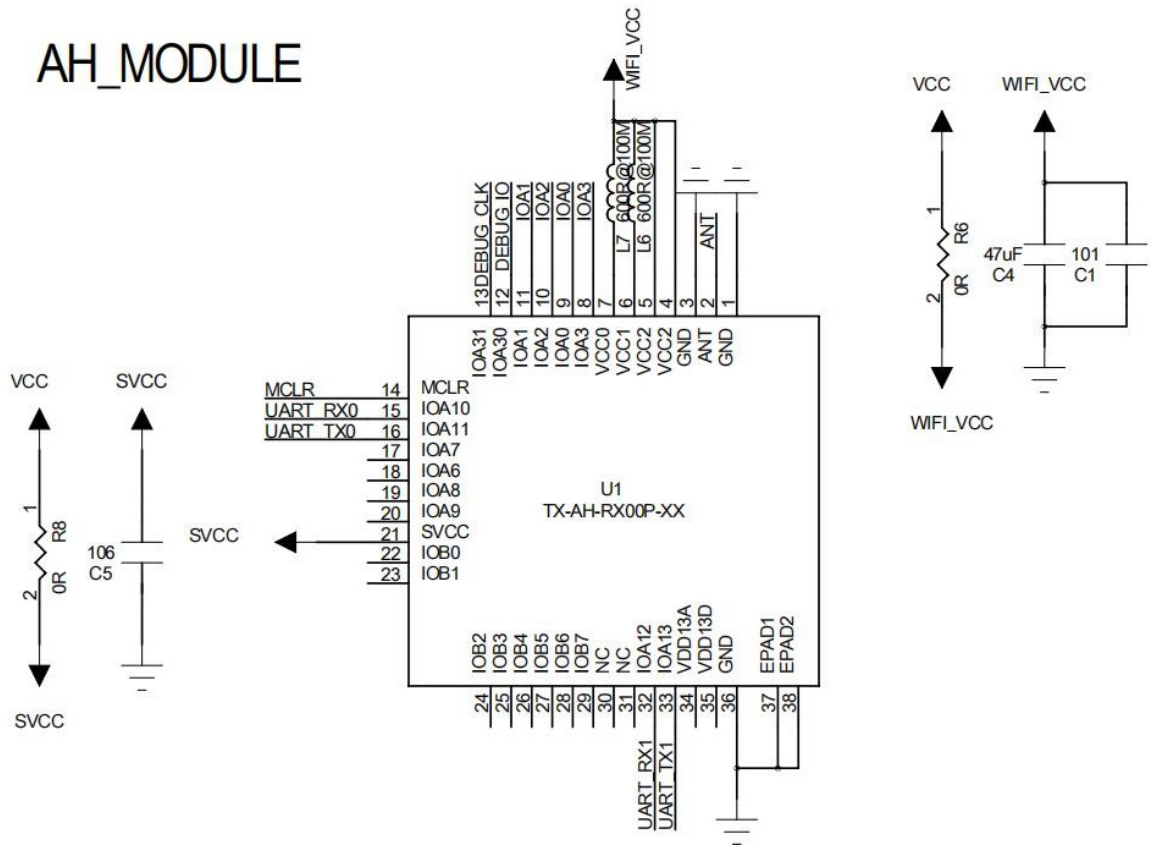


RSSI LED



7.7 UART Interface Communication Reference Schematic

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



AH UART0

AH UART1

Host Interface

print for debug

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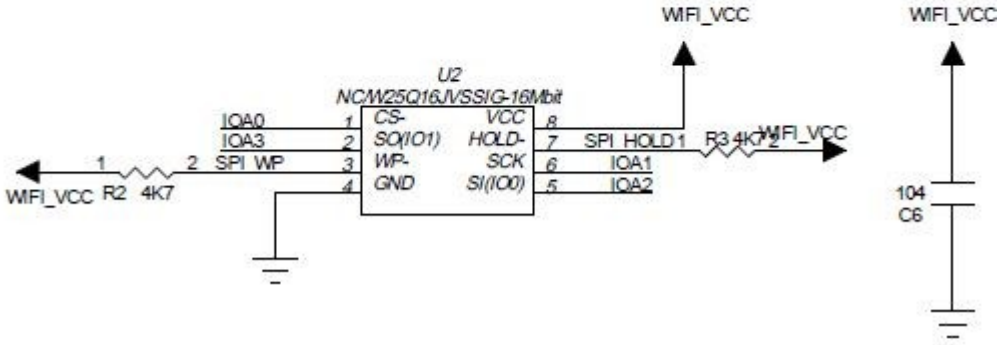
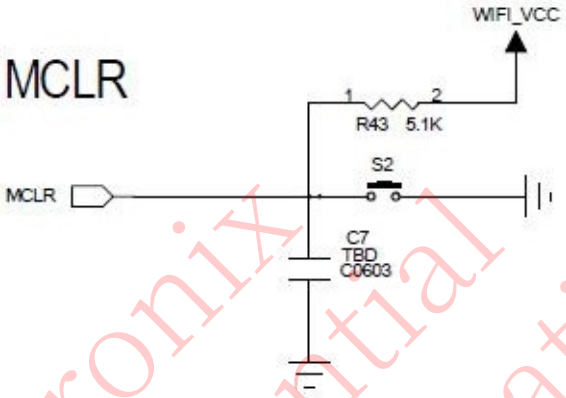
SPI BOOT



AH MCLR



7.8 Low Power Reference Schematic

The SDIO interface is used as an example to introduce the low power schematic.

Unlike the reference schematic in the non-low-power section, the low-power schematic supplies the power to the master (VCC0) and the power to the RF (VCC1

VCC2) separately.

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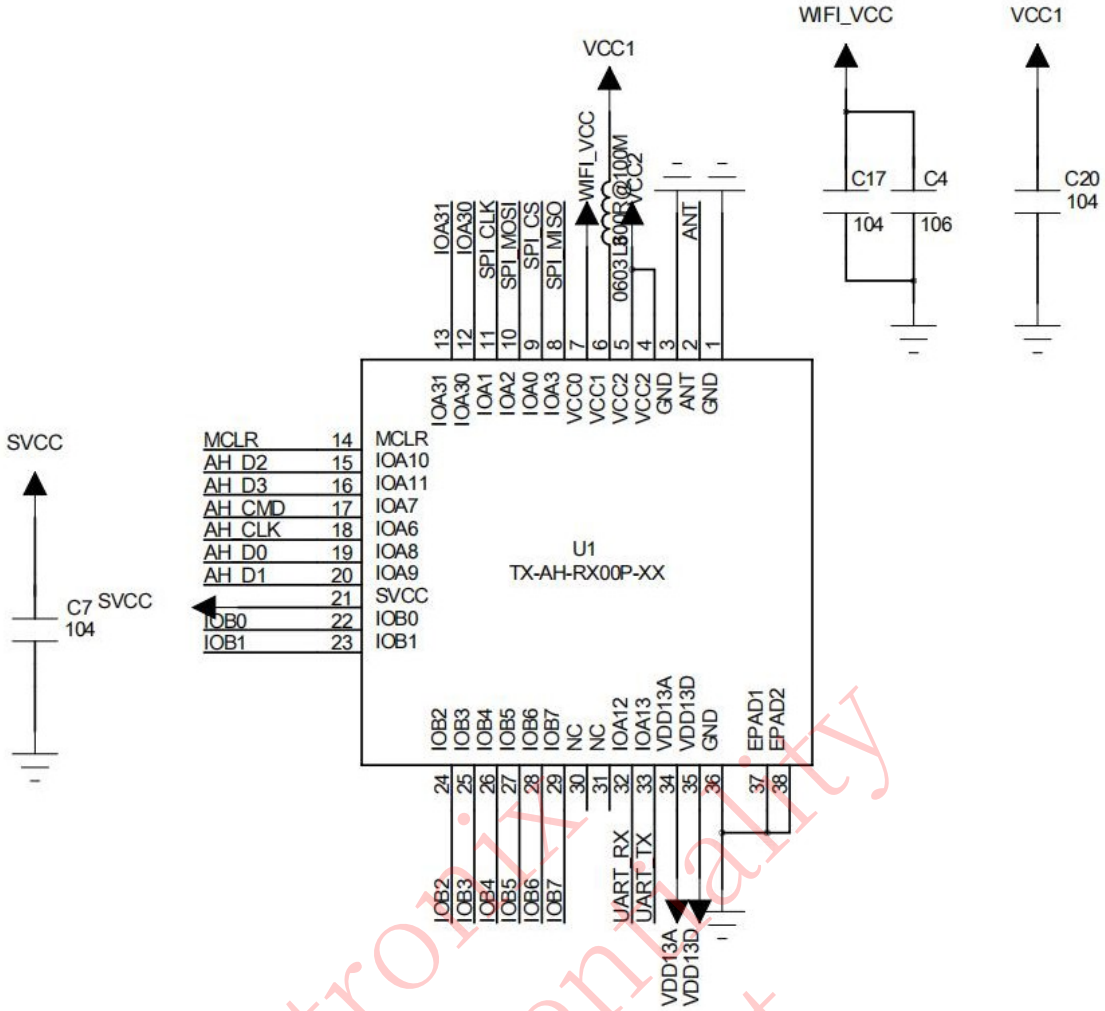
AH_MODULE



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 consumption is not particularly high, you can consider the RF13 solder 0R in the figure below, and bypass the circuit inside the bottom circle; if the current consumption is very high, you can NC the RF13, and use the circuit inside the bottom circle, and use the IO control to pull down the IOA30 to supply power to the RF during sleep, and pull up the IOA30 during deep-sleep to turn off the power to the RF. When entering deep-sleep, pull up IOA30 to turn off the power of RF.

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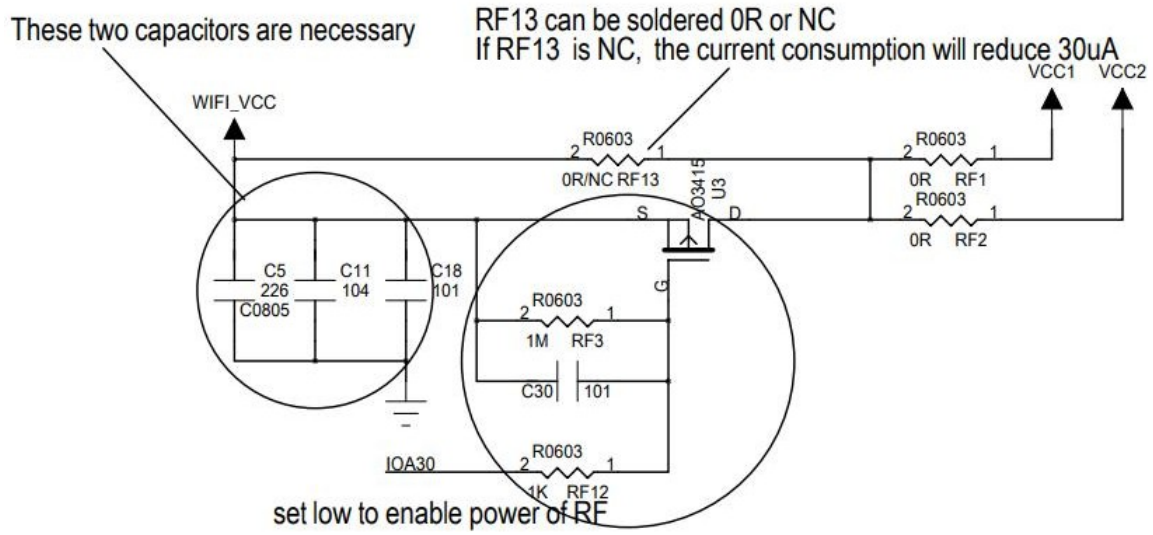
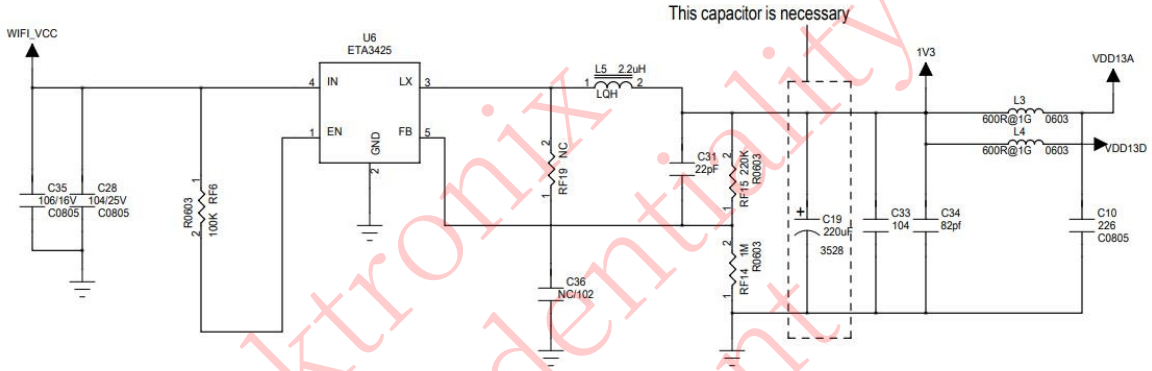
AH LOW PWR MODE CONTROL



In order to get lower power consumption for normal operation, 1.3V DC-DC is used to supply 1.3V power to the module.



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;

With the DC-DC (ETA3425) in the figure, the DC-DC can be turned off without switching off the DC-DC when entering sleep due to the small quiescent current.

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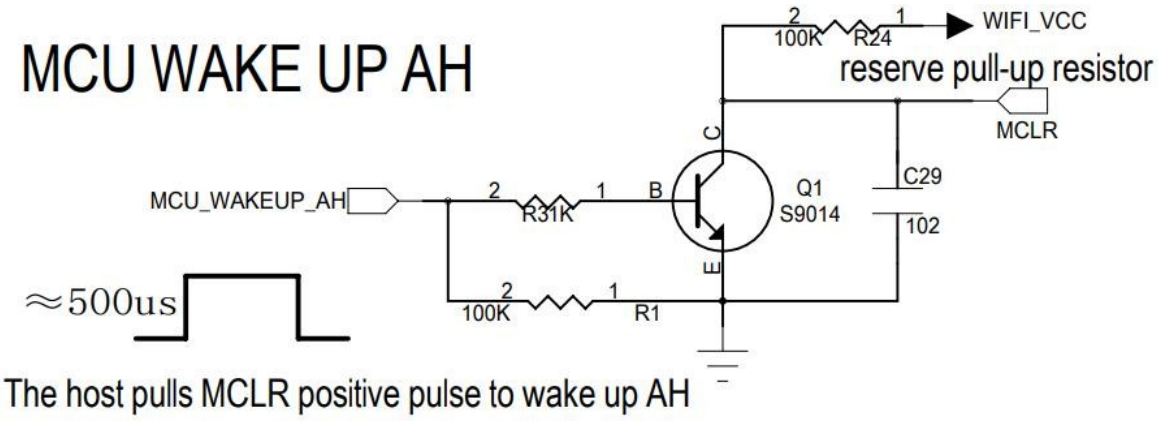
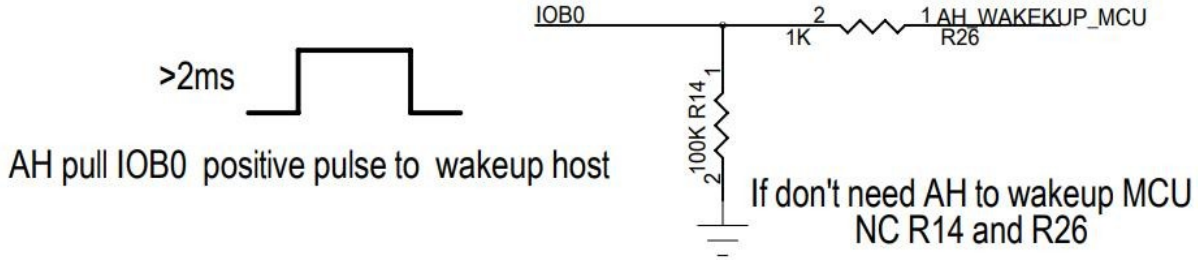
Zhuhai, China)

MCU WAKE UP AH



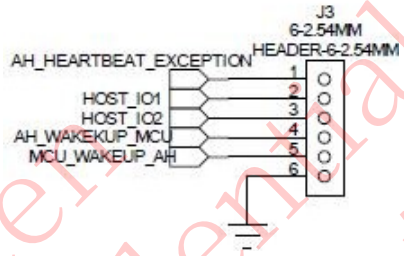
The host pulls MCLR positive pulse to wake up AH

AH WAKE UP MCU



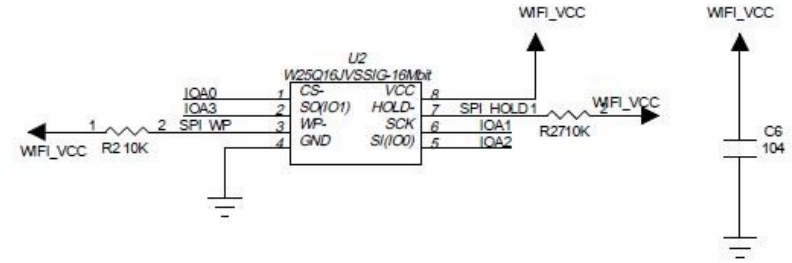
AH pull IOB0 positive pulse to wakeup host

MCU INTERFACE



The interface between AH and Host MCU is MCU_WAKEUP_AH (pull down MCLR about 500uS, in the figure, it is pulling positive pulse after inverter), AH_WAKEUP_MCU (pull up IOB0 by 2mS positive pulse).

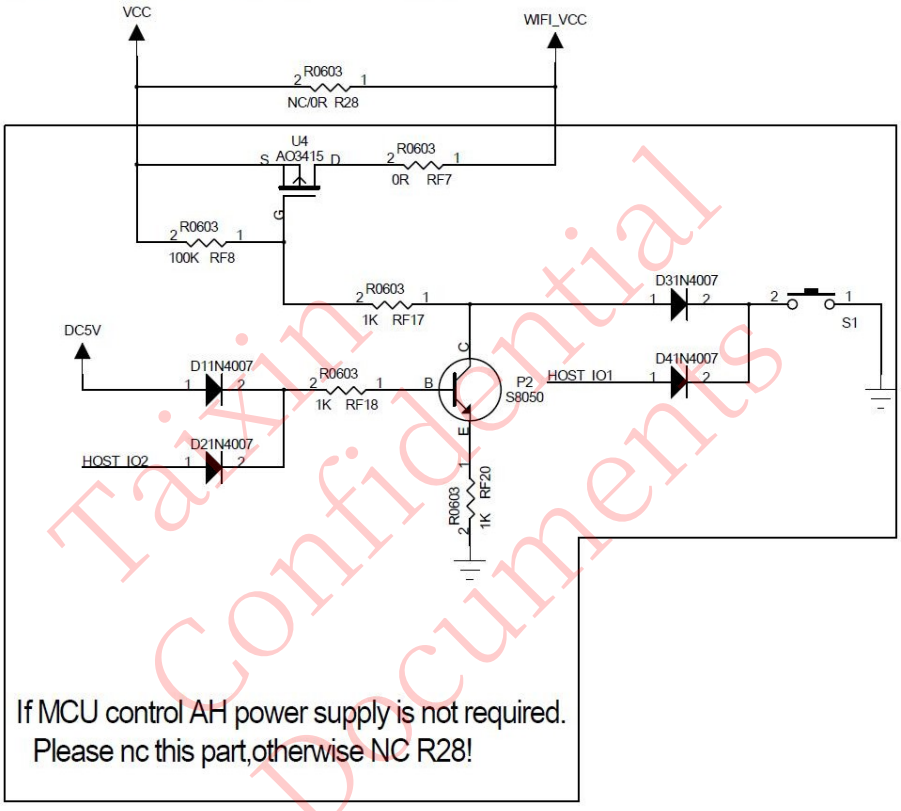
SPI BOOT



Need NOR-Flash in low power applications

Considering that the low power consumption program needs fast boot, it is recommended to use spi nor flash boot to load the firmware.

HOST CONTROL AH MODULE PWR



If a soft shutdown circuit is needed, it can be realized by the above circuit, where the MCU controls the switching of the AH power supply.

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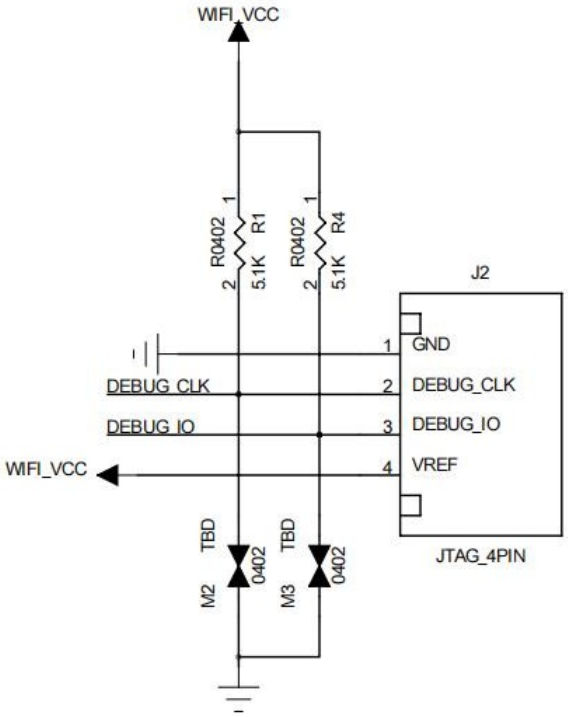
7.9 Debug Port Reference Schematic



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

8 PCB Related Documents

8.1 Module Dimensions

Note: Tolerance of each dimension not shown is less than +/-15%.

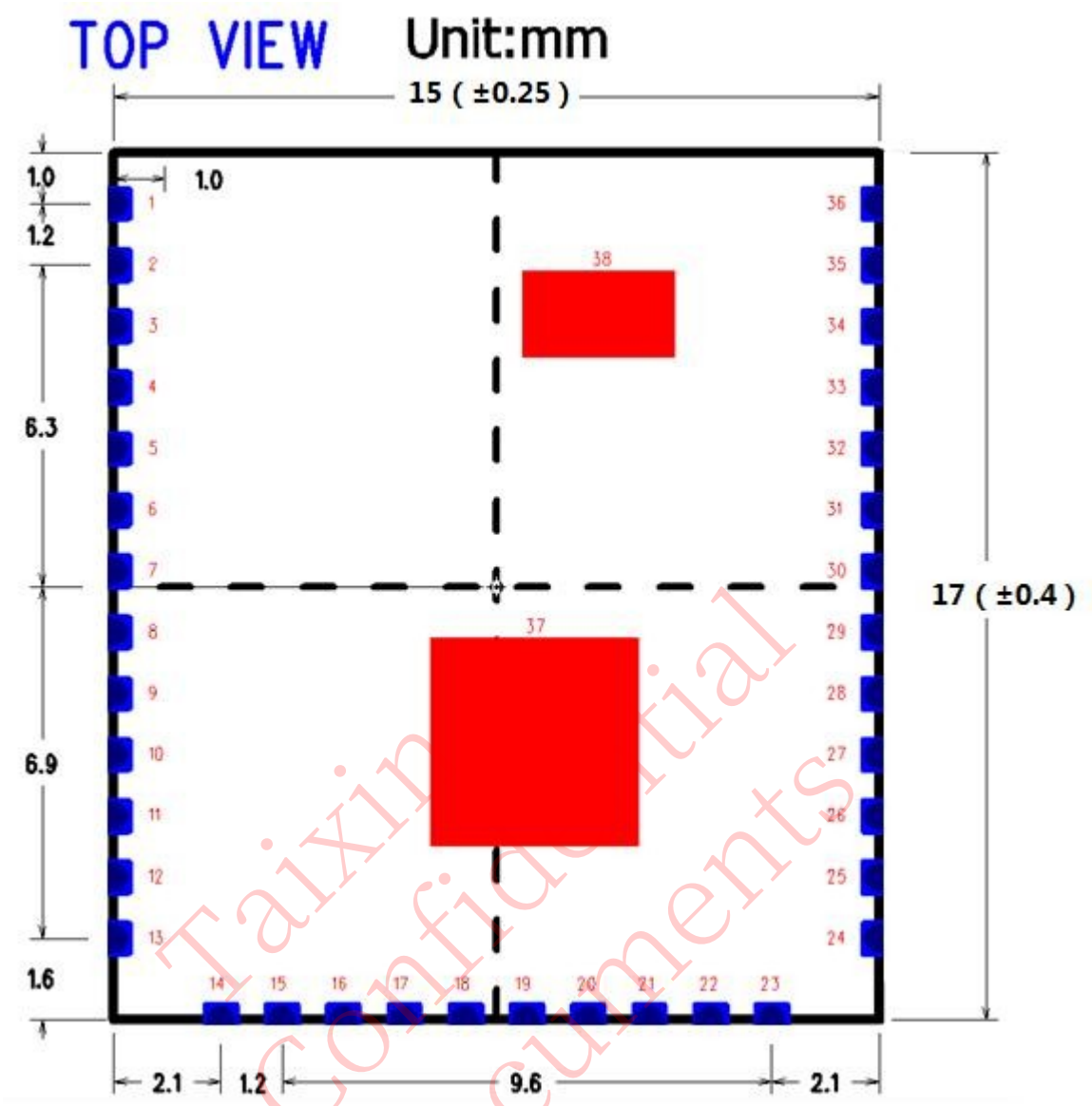


Figure 8-1. TX-AH-Rx00Pxx Module Top View

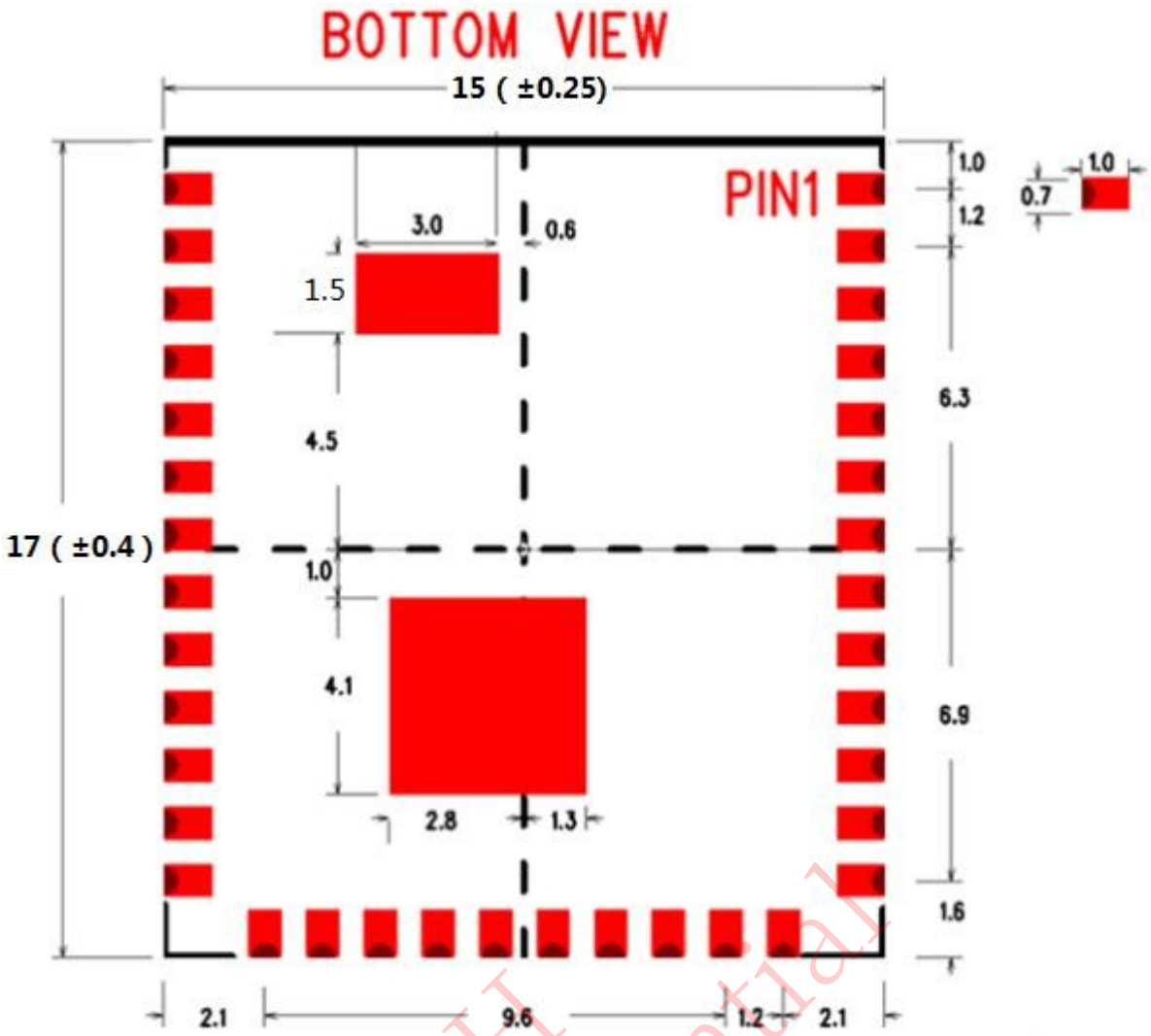


Figure 8-2. TX-AH-Rx00Pxx Module Bottom View

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8.2 PCB Package Diagram

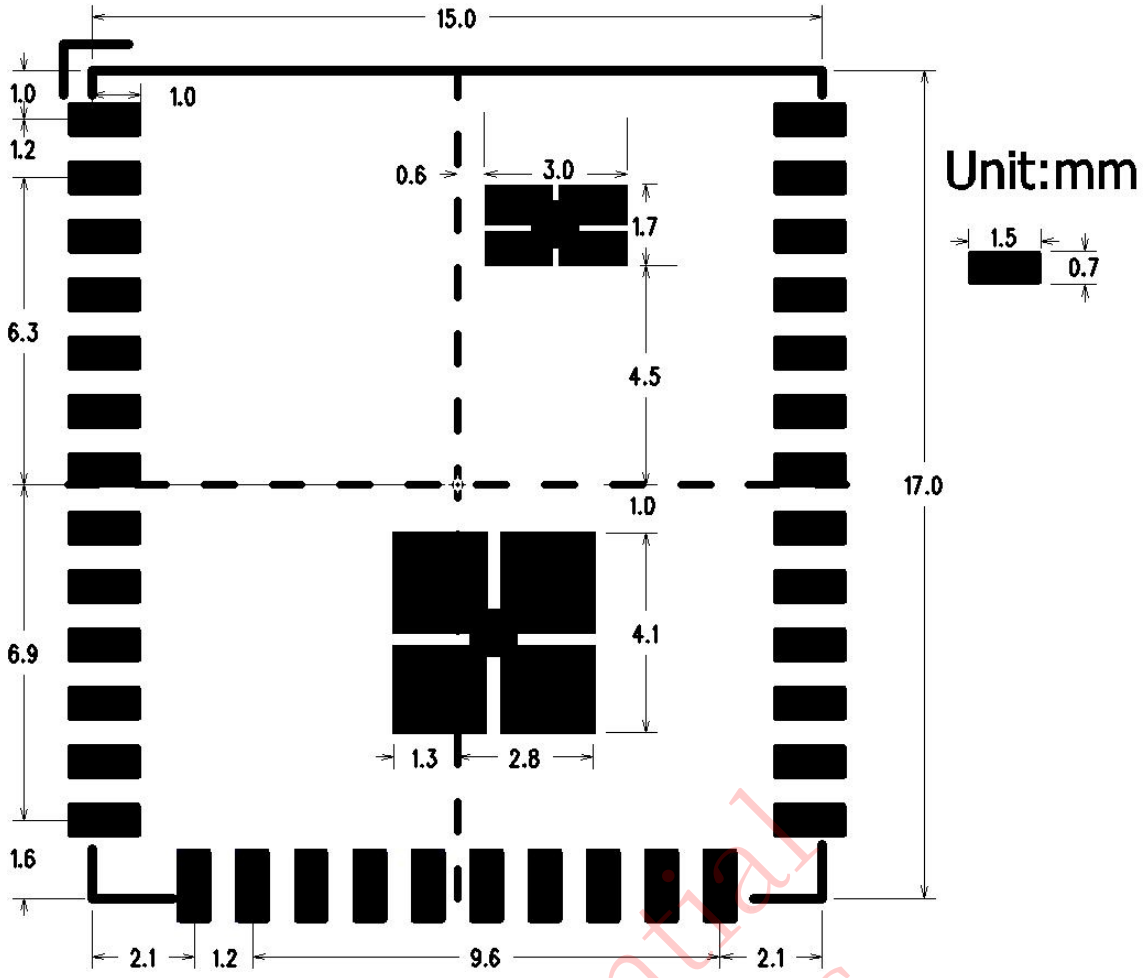

Figure 8-3. TX-AH-Rx00Pxx Module PCB Package Diagram

8.3 Layout Notes

1. The EPAD under the module needs to be grounded and perforated to improve heat dissipation;
2. The RF alignment of the module should be based on 50ohm impedance, and the alignment should be as short as possible without punching holes, and if there is a bend, it can be curved instead of folded to ensure the continuity of the impedance;
3. If there is DC-DC power supply, try to keep away from AH module to prevent noise ripple from DC-DC power supply;
4. Pay attention to the RX_CLK alignment of Ethernet PHY to minimize the impact of 50MHz clock and its multiplier on RF performance;
5. It is recommended to reserve the shield for the main control, because the sensitivity of the AH module may be affected by the EMI of the main control and the power supply, resulting in performance degradation, so it is recommended to reserve a position, and if you think that the performance is up to the standard without the shield, you don't need to put on the shield during the test.

9 Packaging Information

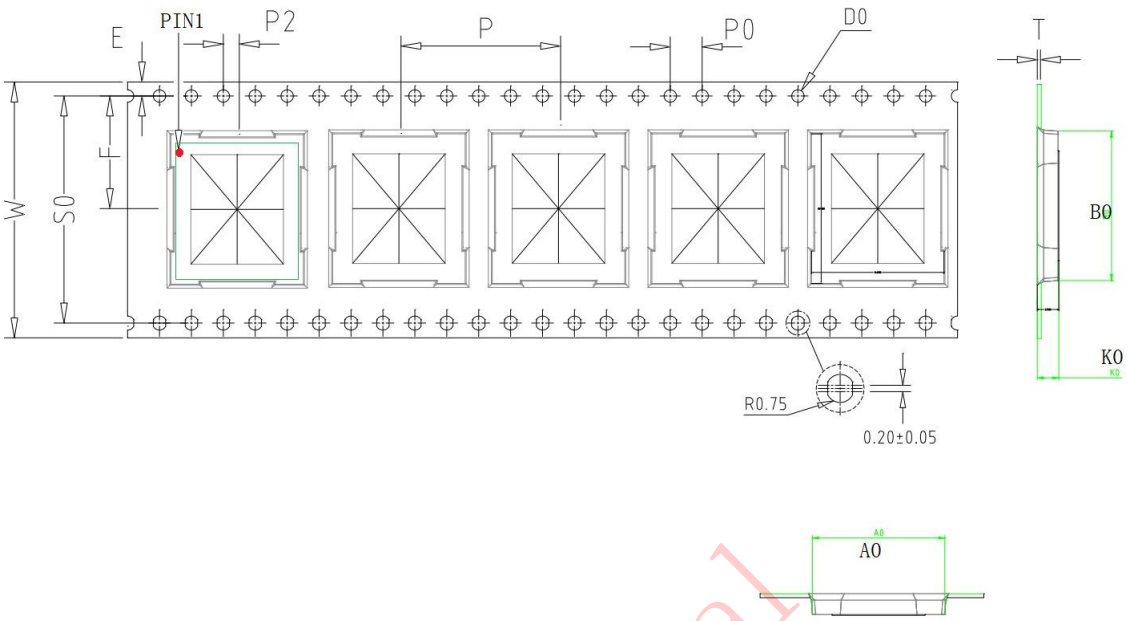

Figure 9-1 Module package dimensions

Table 9-1 Module Packing Dimensions (Unit mm)

ITEM	ITEM	ITEM W	W A0	K0	K1	P	F
DIM	32.00 +/-0.30	16.20 +/-0.15	18.30 +/-0.15	2.85 +/-0.15	/	20.00 +/-0.10	14.20 +/-0.15
ITEM	E	S0	S0	D0	D1	P2	P0 P2
DIM	1.75 +/-0.10	28.40 +/-0.10	1.50 +0.10/-0.00	0.00 +/-0.00	4.00 +/-0.10	2.00 +/-0.10	0.30 0.30 +/-0.05

Note

1.10 sprocket hole pitch cumulative tolerance +/-0.20mm.

2. Carrier camber not to exceed 1mm in 250mm.

3. A0 and B0 measured on a plane 0.3mm above the bottom of the packet.

4. K0 measured from a plane on the inside bottom of the packet to the top surface of the carrier.

5. All dimensions meet EIA-481-D requirements. 6. Material:
PS. Black(YHD-BK-300).

7. Material: PS. Black(YHD-BK-300). Thickness:0.30+/-0.05mm.

8. Packing length per reel: 20.4Meters.

9. Component loader per reel: 1000 Pcs.

10 About program development and testing

1, in order to facilitate customers to evaluate the performance of AH, we provide bridge prototypes (large white bridge) for customers to test; if customers need smaller size bridge for integration, we have 38mm*38mm small bridge boards for sales channels, please contact our sales;

Figure 10-1 Tecent AH bridge demo

2, in order to speed up the development of customer's program, our company has AH development board for sale, the board leads to SDIO/USB/SPI/UART interfaces, etc., and reserves the interface for testing sleep current, which is convenient for customers to do the program development and testing and evaluation, you can contact our sales to buy AH development board;

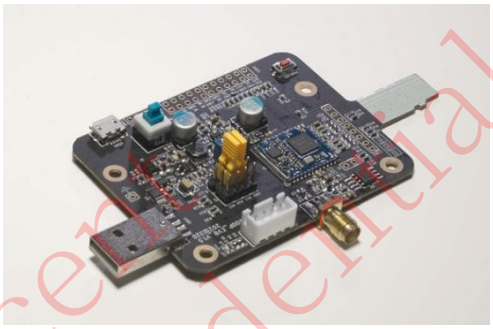

Figure 10-2 Tektronix AH Development Board

3, in order to facilitate the production test of AH, we provide AH production test box, please contact our FAE for details.

4, In order to facilitate the development of AH, we provide AH SNIFFER, you can consult with our FAE.

11 Other Precautions

1, When using this module, the frequency and power settings should meet the radio regulation of the region where it is sold.

2, 700M band is currently interfered by 5G signal from broadcasters in China, please pay attention to avoid it.