WT32C3-S1

WT32C3-S2

Datasheet

2.4GHz WiFi (802.11b/g/n) and Bluetooth 5 module

Built around ESP32-C3 series of SoCs,RISC-V single-core microprocessor

4MB flash

On-board PCB antenna or external antenna connector

V1.0.0

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About this document

This document provides users with the technical specifications for WT32C3-S1 and WT32C3-S2.

Document updates

Please visit Wireless-Tag's official website to download the latest version of the document.

Revision history

Please go to the document revision history page to view the revisions of the document.

Revision History

No.	Version	Changes	Change (+/-) Descriptions	Author	Date
1	V1.0.0	C	Created the document	Wang	January 13, 2021

*Changes：C——create, A——add, M——modify, D——delete

Contents

1 Overview

WT32C3-S1 and WT32C3-S2 are general-purpose Wi-Fi and Bluetooth low energy (Bluetooth LE) modules, which are embedded wireless network control modules with low power consumption and high cost performance. It can meet the needs of IoT applications such as smart grid, building automation, security, smart home, and telemedicine.

WT32C3-S1 and WT32C3-S2 modules are equipped with 4 MB external SPI flash. WT32C3-S1 adopts PCB onboard antenna, WT32C3-S2 adopts connector to connect external antenna.

The WT32C3-S1 and WT32C3-S2 modules use the ESP32-C3 chip. The ESP32-C3 chip is equipped with a RISC-V 32-bit single-core processor with a main frequency of up to 160MHz.

The module supports for the standard IEEE802.11 b/g/n protocol and Bluetooth Low Energy 5.0 (Bluetooth LE): Bluetooth 5, Bluetooth mesh. The module can be used to help Bluetooth pairing and network connection to existing devices, or build an independent network controller.

2 Features

- SDM-19 package
- On-board PCB antenna
- Operating voltage: 3.3V
- Operating ambient temperature: -20-85°C
- ESP32-C3 chip embedded, 32-bit RISC-V single-core microprocessor, up to 160MHz
  - SRAM 400KB
  - RTC SRAM 8KB
  - ROM 384KB
- Embedded Flash 4MB
- System

  WIFI
  - IEEE 802.11 b/g/n protocol
  - 1T1R mode with data rate up to 150 Mbps
  - WIFI @2.4 GHz, support for WEP/WPA-PSK/WPA2-PSK security mode
  - Frame aggregation (TX/RX A-MPDU, RX A-MSDU)

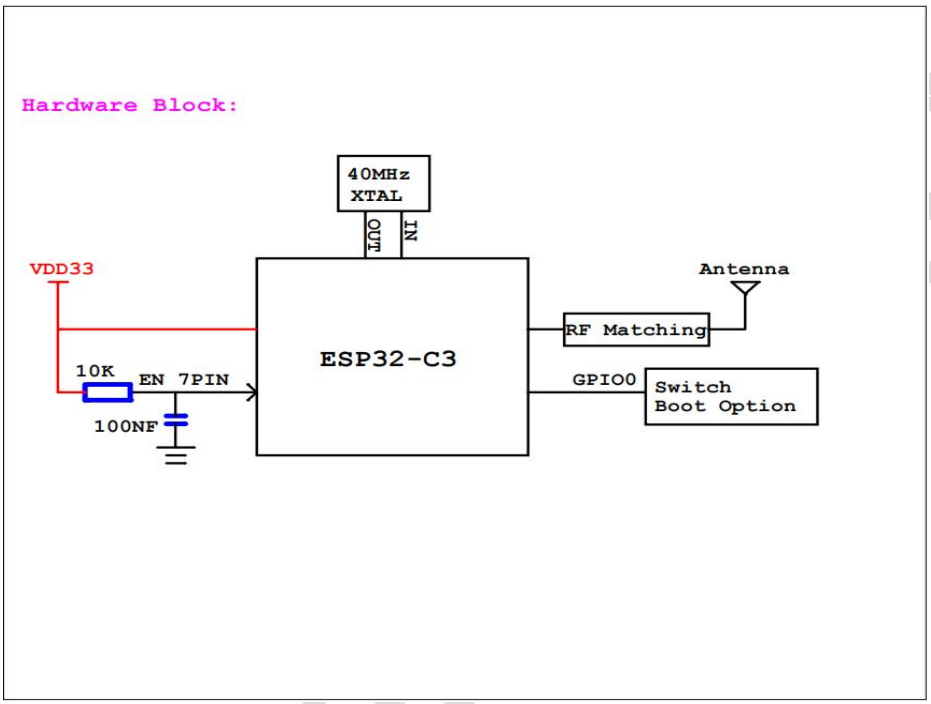
  BLE
  - Bluetooth Low Energy 5.0(Bluetooth LE): Bluetooth 5, Bluetooth mesh
  - Speed: 125 Kbps, 500 Kbps, 1 Mbps, 2 Mbps
  - Advertising Extensions
  - Multiple Advertisement Sets
  - Channel Selection Algorithm #2

  Hardware
  - Support for GPIO, SPI, UART, I2C, I2S, infrared transceiver, LED PWM controller, USB JTAG interface, general DMA controller, TWAITM controller (compatible with ISO11898-1), temperature sensor, SAR ADC
  - Support for STA/AP/STA+AP mode
  - Support for remote OTA

3 Hardware Specifications

3.1 Block Diagram

Figure 1 Block Diagram



3.2 Pin Descriptions

Figure 2 Pin Layout

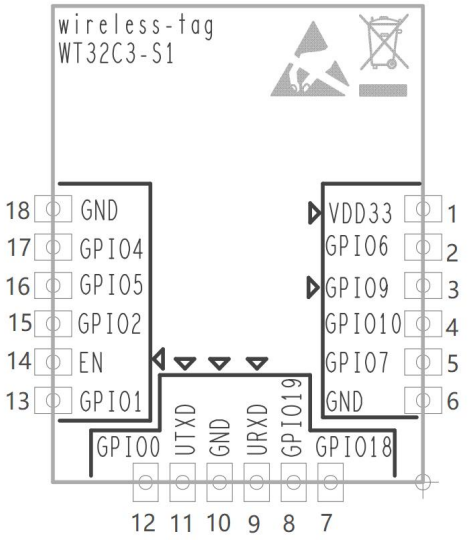


Table 1 Pin Definitions and Descriptions

Pin	Name	Description
1	VDD33	3.3V power supply; The output current delivered by the external power supply is recommended to be above 500mA.
2	GPIO6	GPIO6,FSPICLK,MTCK
3	GPIO9	GPIO9
4	GPIO10	GPIO10,FSPICS0
5	GPIO7	GPIO7,FSPID,MTDO
6	GND	GND
7	GPIO18	GPIO18,USB_D-
8	GPIO19	GPIO18,USB_D+
9	URXD	GPIO20,U0RXD
10	GND	GND
11	UTXD	GPIO21,U0TXD
12	GPIO0	GPIO0.ADC1_CH0,XAL_32K_P
13	GPIO1	GPIO0.ADC1_CH1,XAL_32K_N
14	CHIP_EN	Chip Enable pin: High level: on, enables the chip. Low level: off, low current. Note: Do not leave the EN pin floating.

Pin	Name	Description
15	GPIO2	GPIO2,ADC1_CH2,FSPIQ
16	GPIO5	GPIO5,ADC2_CH0,FSPIWP,MTDI
17	GPIO4	GPIO4,ADC1_CH4,FSPIHD,MTMS
18	GND	GND

3.3 Strapping Pins

ESP32-C3 series has three strapping pins.

- GPIO2
- GPIO8
- GPIO9

Software can read the strapping values of these pins in "GPIO_STRAPPING" register.

During the chip's system reset(power-on reset, RTC watchdog reset, brownout reset, analog super watchdog reset, crystal clock glitch detection reset), the latches of the strapping pins sample the voltage level as strapping bits of "0" or "1", and hold these bits until the chip is powered down or shut down.

By default, GPIO9 is connected to the internal pull-up resistor. If GPIO9 is not connected or connected to an external high-impedance circuit, the latched bit value will be "1".

To change the strapping bit values, you can apply the external pull-down/pull-up resistances, or use the host MCU's GPIOs to control the voltage level of these pins when powering on ESP32-C3 family.

After reset, the strapping pins work as normal-function pins.

Refer to Table 2 for a detailed boot-mode configuration of the strapping pins.

Note:

Some pins have been internally pulled up, please refer to the schematic diagram.

Table 2 Strapping Pins

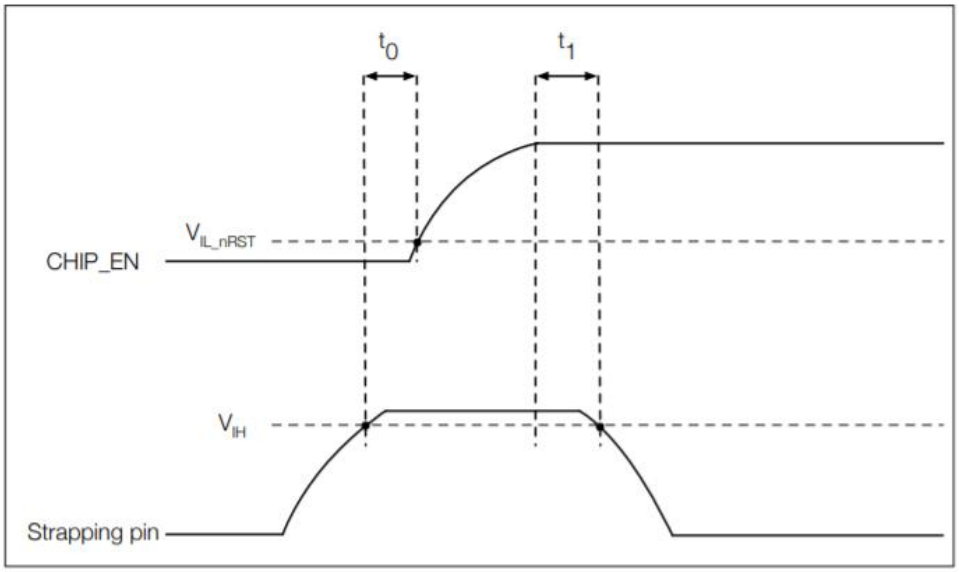
Booting Mode [1]			
Pin	**Default**	**SPI Boot**	**Download Boot**
GPIO2	N/A	1	1
GPIO8	N/A	Don't care	1
GPIO9	Internal pull-up	1	0
Enabling/Disabling ROM Code Print During Booting			

Pin	Default	Functionality
GPIO8	N/A	When the value of eFuse field UART_PRINT_CONTROL is 0, print is enabled and not controlled by GPIO8. 1, if GPIO8 is 0, print is enabled; if GPIO8 is 1, it is disabled. 2, if GPIO8 is 0, print is disabled; if GPIO8 is 1, it is enabled. 3, print is disabled and not controlled by GPIO8.

Parameter Descriptions of Setup and Hold Times for the Strapping Pin		
Parameter	**Description**	**Min**
t0	Setup time before CHIP_EN goes from low to high	0ms
t1	Hold time after CHIP_EN goes high	3ms

Figure 3 shows the setup and hold times for the strapping pin before and after the CHIP_EN signal goes high.

Figure 3 Setup and Hold Times for the Strapping Pin



Note:

1. The strapping combination of GPIO8 = 0 and GPIO9 = 0 is invalid.

4 Electrical Characteristics

4.1 Absolute Maximum Ratings

Stresses above those listed in Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

4.2 Recommended Operating Conditions

Table 3 Operating Conditions

Symbol	Parameter		Min	Typ	Max	Unit
VDD	Power supply voltage		3.0	3.3	3.6	V
I_{VDD}	Current delivered by external power supply		0.5	-	-	A
T_A	Ambient temperature	85°C version	-40	-	85	℃
		105°C version			105	
Humidity	Humidity condition		-	-	85	%RH

4.3 Current Consumption

Table 4 Current Consumption Depending on RF Modes

Work mode	Description		Peak（mA）
Active(RF working)	TX	802.11b, 1 Mbps, @17dBm	384
		802.11g, 54 Mbps, @16.4dBm	287
		802.11n, HT20, MCS 7, @16 dBm	275
		802.11n, HT40, MCS 7, @16 dBm	260
	RX	802.11b/g/n, HT20	83
		802.11n, HT40	86

Note:

Ambient temperature, 3.3V power supply, TX continues mode, DC power accuracy: 100 μA.

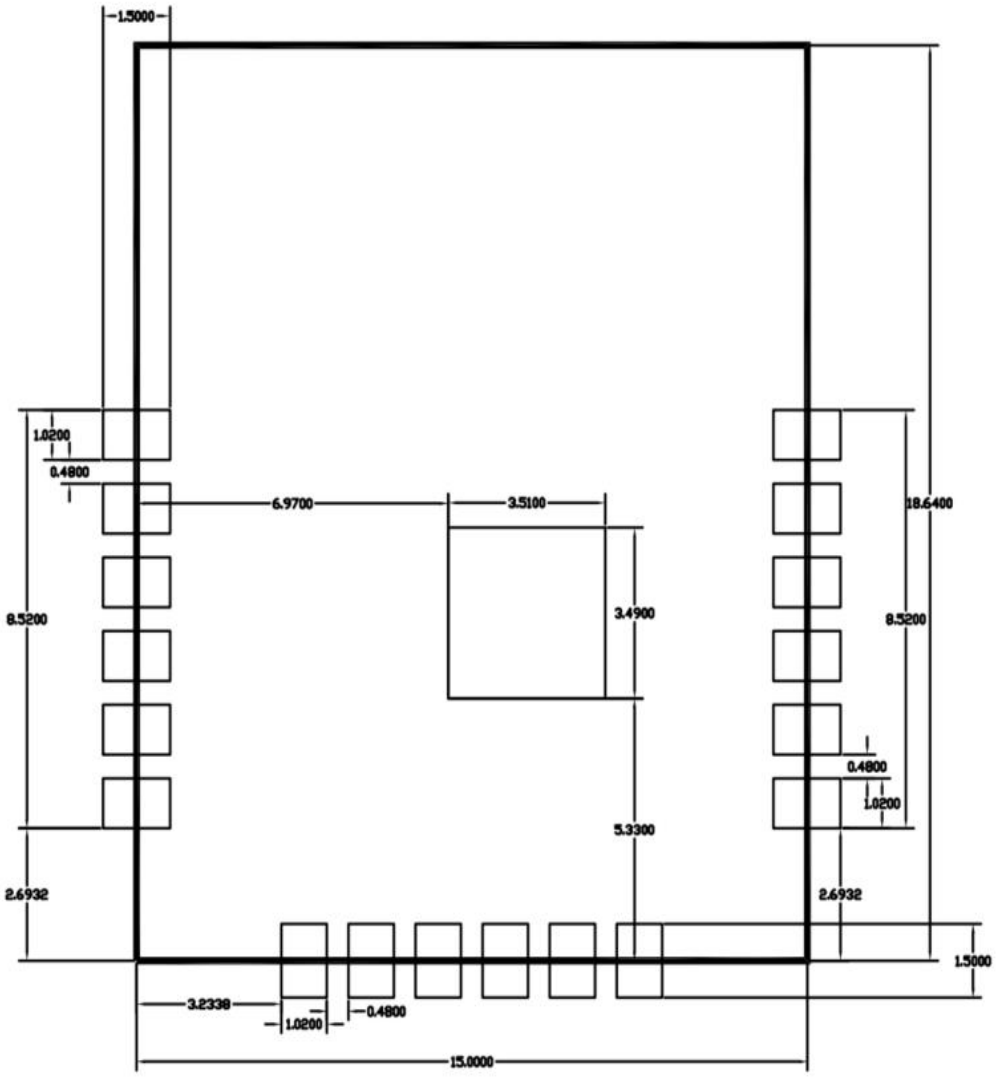
Table 5 Current Consumption Depending on Work Modes

Work mode	Description		Typical value
Modem-sleep	The CPU is powered on	160MHz	25.8mA
		80MHz	22.7mA
Light-sleep			0.3mA
Deep-sleep			14uA
Power off	EN is set to low level		0

5 Application Note

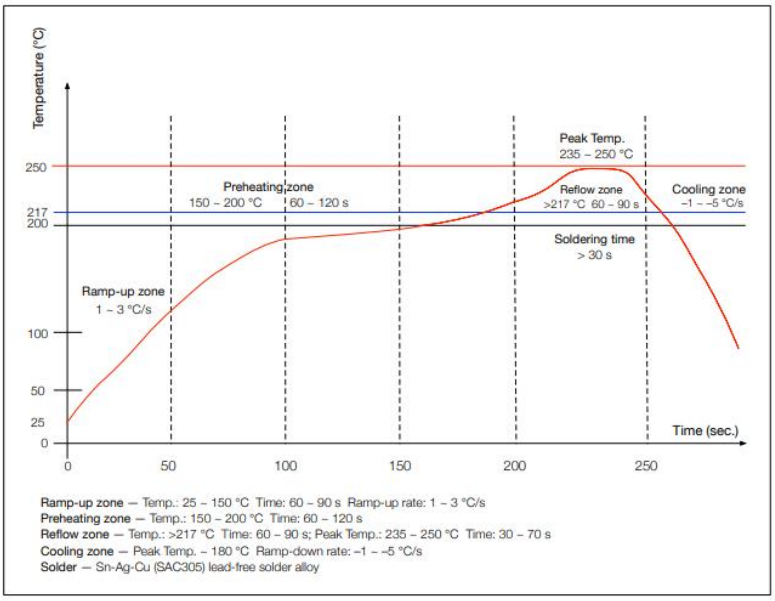
5.1 Module Dimensions

Figure 4 Module Dimensions



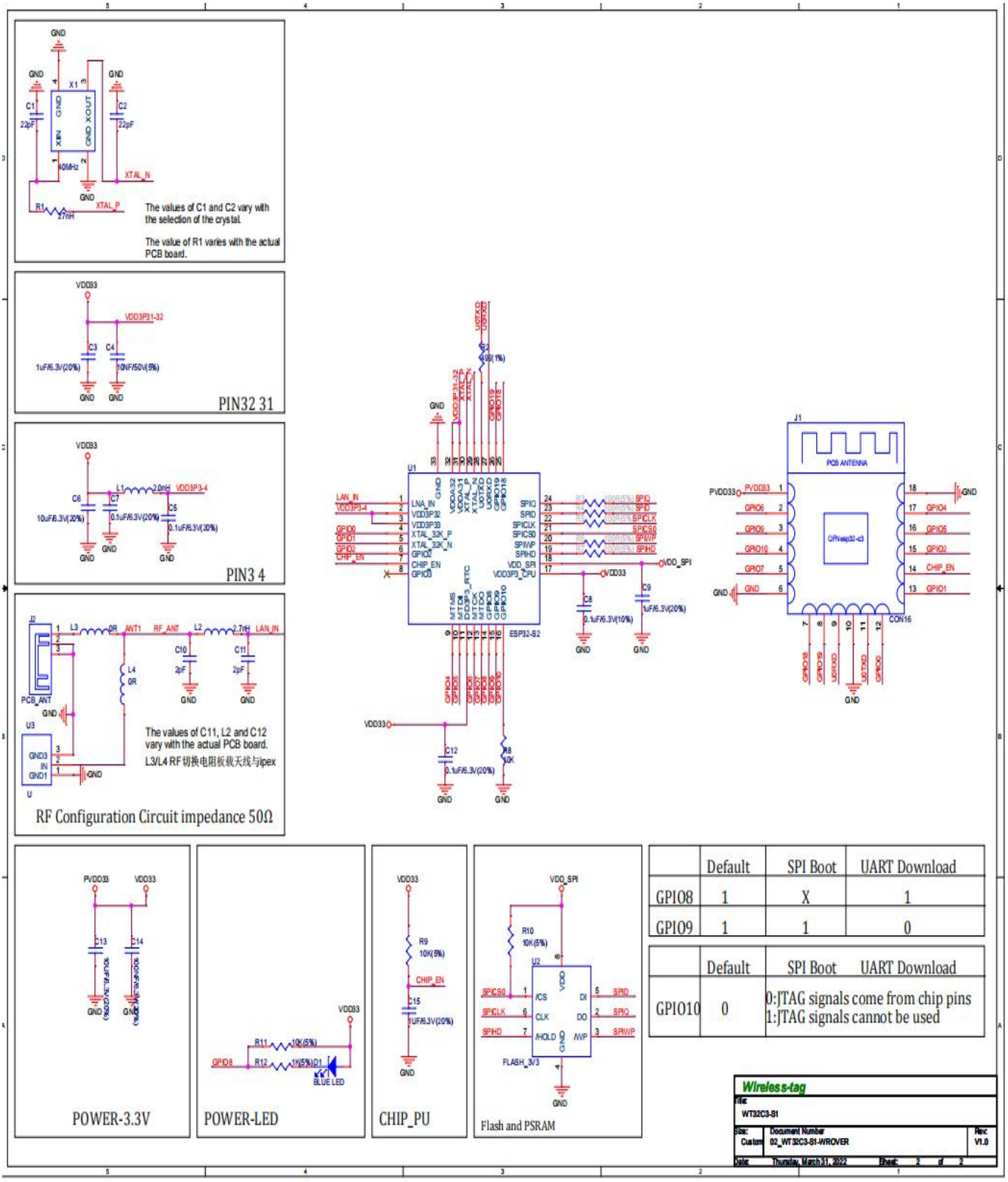
5.2 Reflow Profile

Figure 5 Reflow profile



5.3 Module Schematics

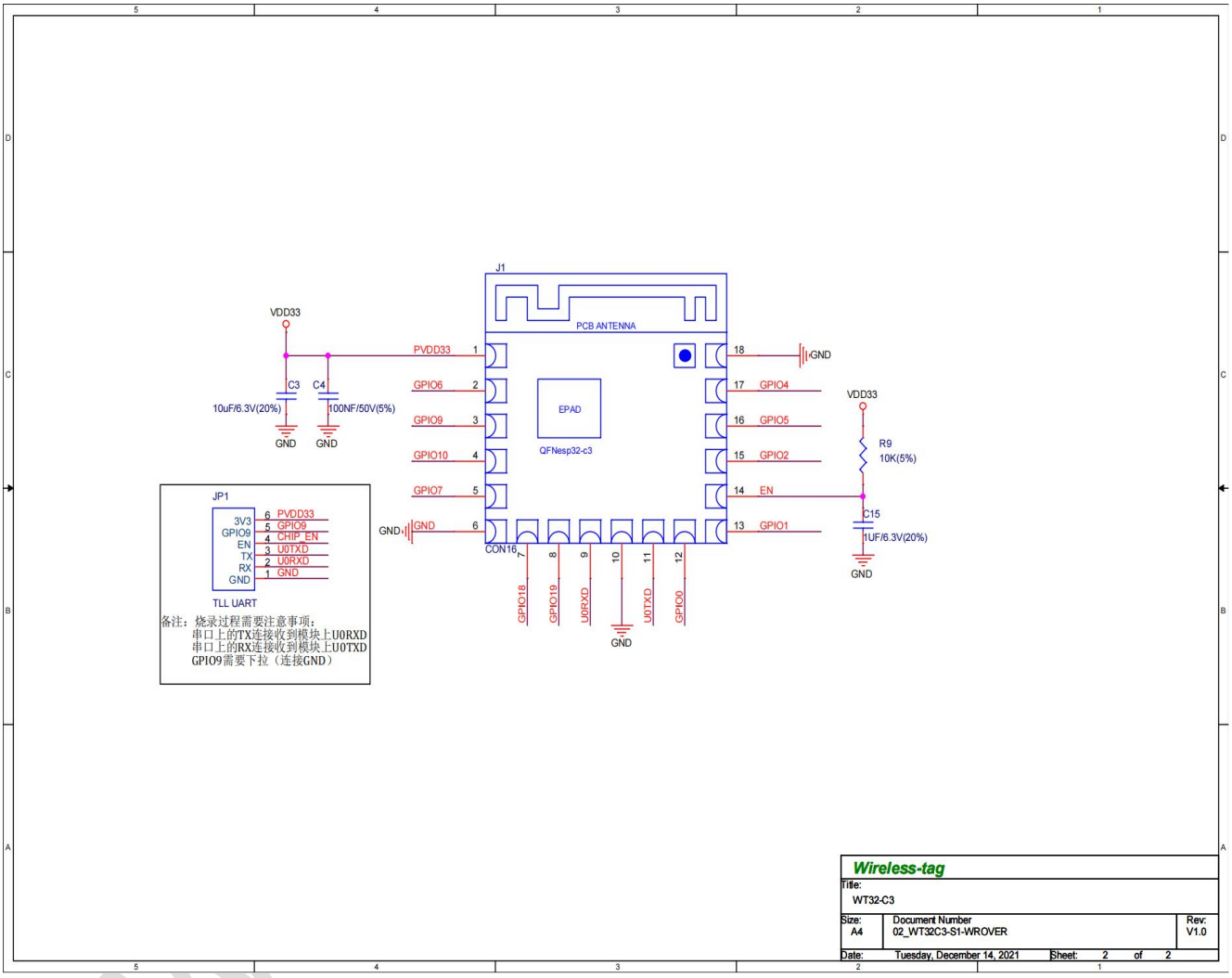
Figure 6 Module Schematics



5.4 Peripheral Schematic

This is the typical application circuit of the module connected with peripheral components (for example, power supply, antenna, reset button, JTAG interface, and UART interface).

Figure 7 Application Circuit



- Soldering the EPAD to the ground of the base board is not a must, though doing so can get optimized thermal performance. If you do want to solder it, please ensure that you apply the correct amount of soldering paste.
- To ensure the power supply to the ESP32-C3 family chip is stable during power-up, it is advised to add an RC delay circuit at the EN pin. The recommended setting for the RC delay circuit is usually R = 10 kΩ and C = 1 µF. However, specific parameters should be adjusted based on the power-up timing of the module and the power-up and reset sequence timing of the chip.

6 Product Trial

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