WT32C3-01N Datasheet

V1.0.0

July 16, 2021

Wireless-Tag Technology Co., Ltd

About this document

This document provides users with the technical specifications for WT32C3-01N.

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	First release	Fiona	July 16, 2021

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

Contents

1 Module Overview

1.1 Features

MCU

- ESP32-C3 chip embedded, 32-bit RISC-V single-core microprocessor, up to 160MHz
  - SRAM 400KB（16 KB for cache)
  - RTC SRAM 8KB
  - ROM 384KB

WIFI

- IEEE 802.11b/g/n protocol
- Center frequency range of operating channel: 2412~2484 MHz
- Supports 20 MHz, 40 MHz bandwidth in 2.4 GHz band
- Supports 1T1R mode with data rate up to 150 Mbps
- Wi-Fi Multimedia (WMM)
- Frame aggregation (TX/RX A-MPDU, TX/RX A-MSDU)
- Immediate Block ACK
- Fragmentation and defragmentation
- Transmission opportunity (TXOP)
- Automatic Beacon monitoring (hardware TSF)
- 4 x virtual Wi-Fi interfaces
- Simultaneous support for Infrastructure BSS in Station mode, SoftAP mode, Station + SoftAP mode, and promiscuous mode
- Antenna diversity
- 802.11 mc FTM

BLE

- Bluetoooth LE: Bluetooth5, Bluetooth Mesh
- Speed: 125Kbps, 500Kbps, 1Mbps, 2Mbps
- Advertising Extension
- Multiple Advertisement Sets
- Channel Selection Algorithm #2

Hardware

- Interfaces: GPIO, SPI, UART, I2C, I2S, remote control peripheral, LED PWM controller, general DMA controller, TWAI® controller (compatible with ISO11898-1), USB

Serial/JTAG controller, temperature sensor, SAR ADC

- 40MHz crystal oscillator
- 4 MB SPI flash
- Operating voltage/Power supply: 3.0~3.6 V
- Operating ambient temperature: -40~85℃
- Adopts DIP-11 package

1.2 Description

WT32C3-01N is a general-purpose Wi-Fi and Bluetooth LE module. The rich set of peripherals and high performance make it an ideal choice for smart homes, industrial automation, health care, consumer electronics, etc.

The module's core processor ESP32-C3 integrates an industry-leading 32-bit RISC-V single-core microprocessor with a maximum clock speed of 160 MHz in a small-sized package. It comes with an on-board PCB antenna.

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.

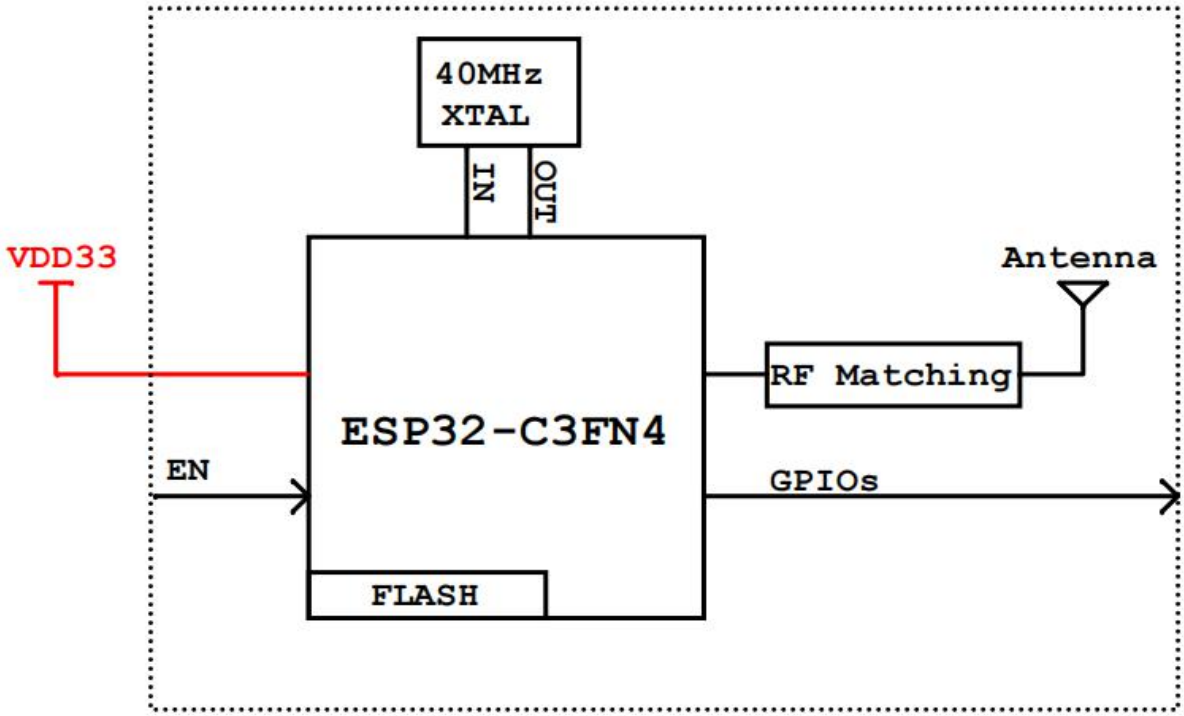
1.3 Applications

- Smart Home
  - Light control
  - Smart button
  - Smart plug
  - Indoor positioning
- Industrial Automation
  - Industrial robot
  - Mesh network
  - Human machine interface (HMI)
  - Industrial field bus
- Health Care
  - Health monitor
  - Baby monitor
- Consumer Electronics
  - Smart watch and bracelet
  - Over-the-top (OTT) devices
  - Wi-Fi and Bluetooth speaker
  - Logger toys and proximity sensing toys
- Smart Agriculture
  - Smart greenhouse
  - Smart irrigation
  - Agriculture robot
- Retail and Catering
  - POS machines
  - Service robot
- Audio Device
  - Internet music players
  - Live streaming devices
  - Internet radio players

- Generic Low-power IoT Sensor Hubs
- Generic Low-power IoT Data Loggers

2 Block Diagram

Figure 1 Block Diagram



3 Pin Definitions

3.1 Pin Layout

Figure 2 Pin Layout

The pin descriptions are as follows.

Table 1 Pin Definitions and Descriptions

Pin	Name	Description
1	EN	Chip Enable pin: High level: on, enables the chip. Low level: off, the chip powers off, low current. Note: Do not leave the EN pin floating.
2	IO1	GPIO1, ADC1_CH1, XTAL_32K_N (32.768 kHz crystal output)
3	IO6	GPIO6, MTCK, FSPICLK
4	IO10	GPIO10, FSPICS0
5	IO3	GPIO3, ADC1_CH3
6	3V3	Power supply
7	GND	Ground
8	RX	U0RXD, GPIO20
9	TX	U0TXD, GPIO21
10	IO5	GPIO5, MTDI, ADC2_CH0, FSPIWP
11	IO4	GPIO4, MTMS, ADC1_CH4, FSPIHD

3.2 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.

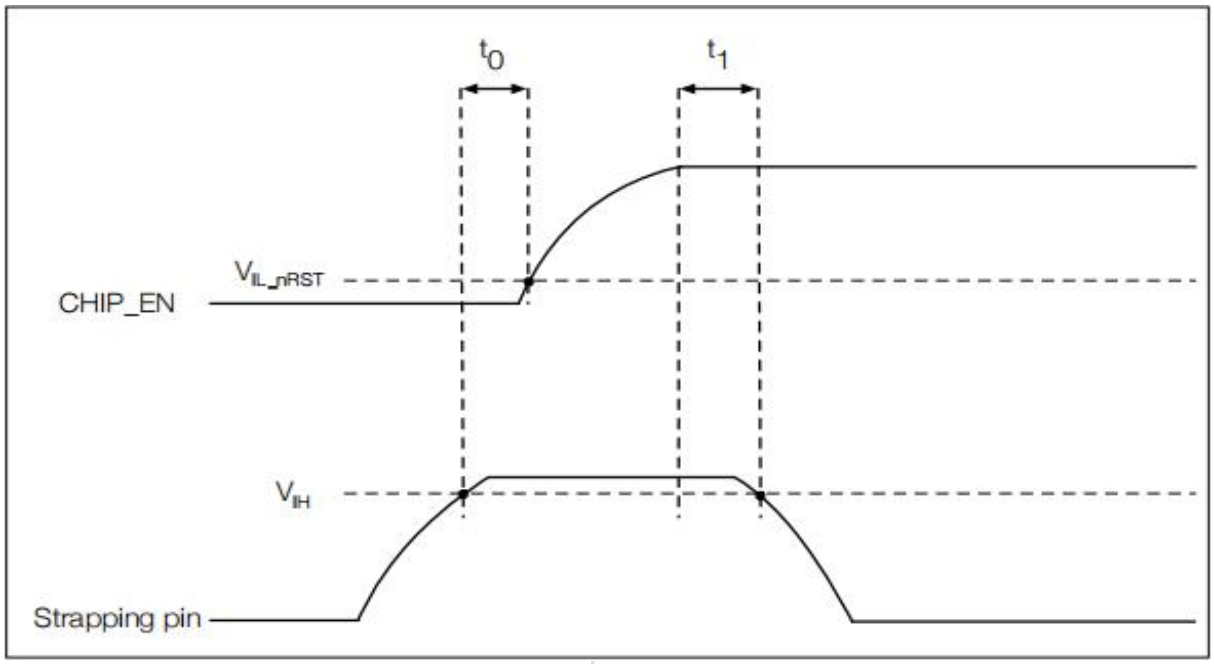
Note: Some pins have been internally pulled up, please refer to the schematic diagram.

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 (Refer to the figure below)			
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.

Symbol	Parameter	Min	Max	Unit
VDD33	Power supply voltage	-0.3	3.6	V
TSTORE	Storage temperature	-40	105	℃

4.2 Recommended Operating Conditions

Table 4 Recommended 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 Characteristics

With the use of advanced power-management technologies, the module can switch between different power modes. For details on different power modes, please refer to the tables below.

Table 5 Current Consumption Depending on RF Modes

Work mode	Description	Peak (mA)

Active(RF working)	TX	802.11b, 1Mbps, @20.5dBm	367
		802.11g, 54Mbps, @18dBm	284
		802.11n, HT20, MCS7, @17.5dBm	276
		802.11n, HT40, MCS7, @17dBm	252
	RX	802.11b/g/n, HT20	84
		802.11n, HT40	87

Note:

1. The current consumption measurements are taken with a 3.3 V supply at 25 °C of ambient temperature at the RF port. All transmitters' measurements are based on a 100% duty cycle.

2. The current consumption figures in RX mode are for cases when the peripherals are disabled and the CPU is idle.

Table 6 Current Consumption Depending on Work Modes

Work mode	Description		Typ	Unit
Modem-sleep[1, 2]	The CPU is powered on[3]	802.11b, 1Mbps, @20.5dBm	23.7	**mA**
		802.11g, 54Mbps, @18dBm	20.6	**mA**
Light-sleep	—		0.3	**mA**
Deep-sleep	RTC timer + RTC memory		6.5	**mA**
Power-sleep			0	**mA**

Note:

1. The current consumption figures in Modem-sleep mode are for cases where the CPU is powered on and the cache idle.

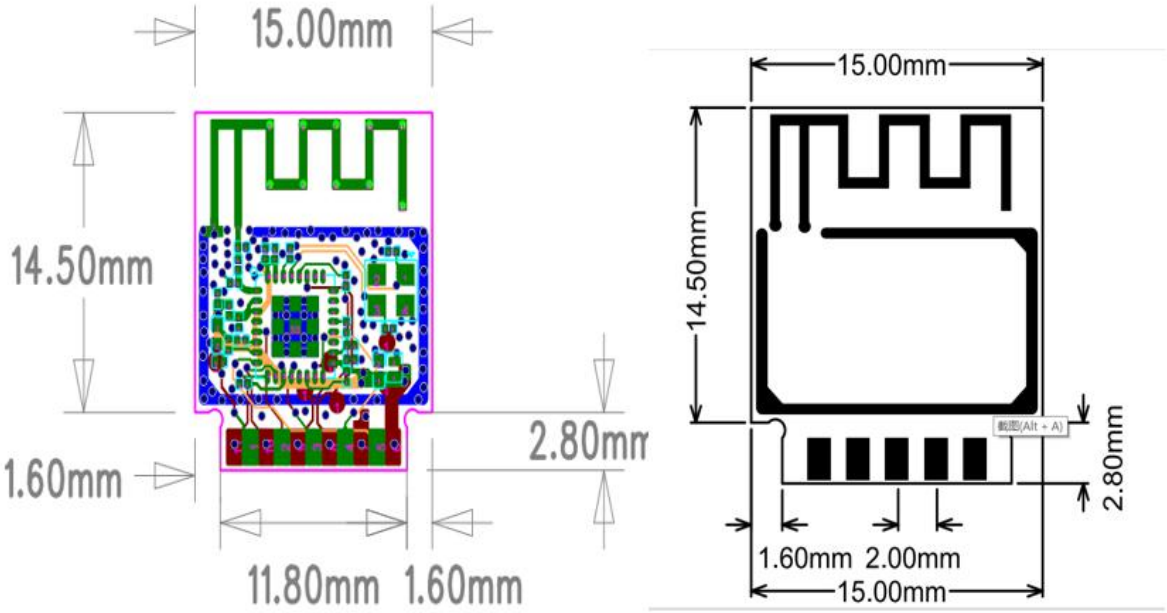
2. When Wi-Fi is enabled, the chip may switch between Active and Modem-sleep modes. Therefore, current consumption changes accordingly.

3. In practice, software can adjust CPU's frequency according to CPU load to reduce current consumption.

5 Application Note

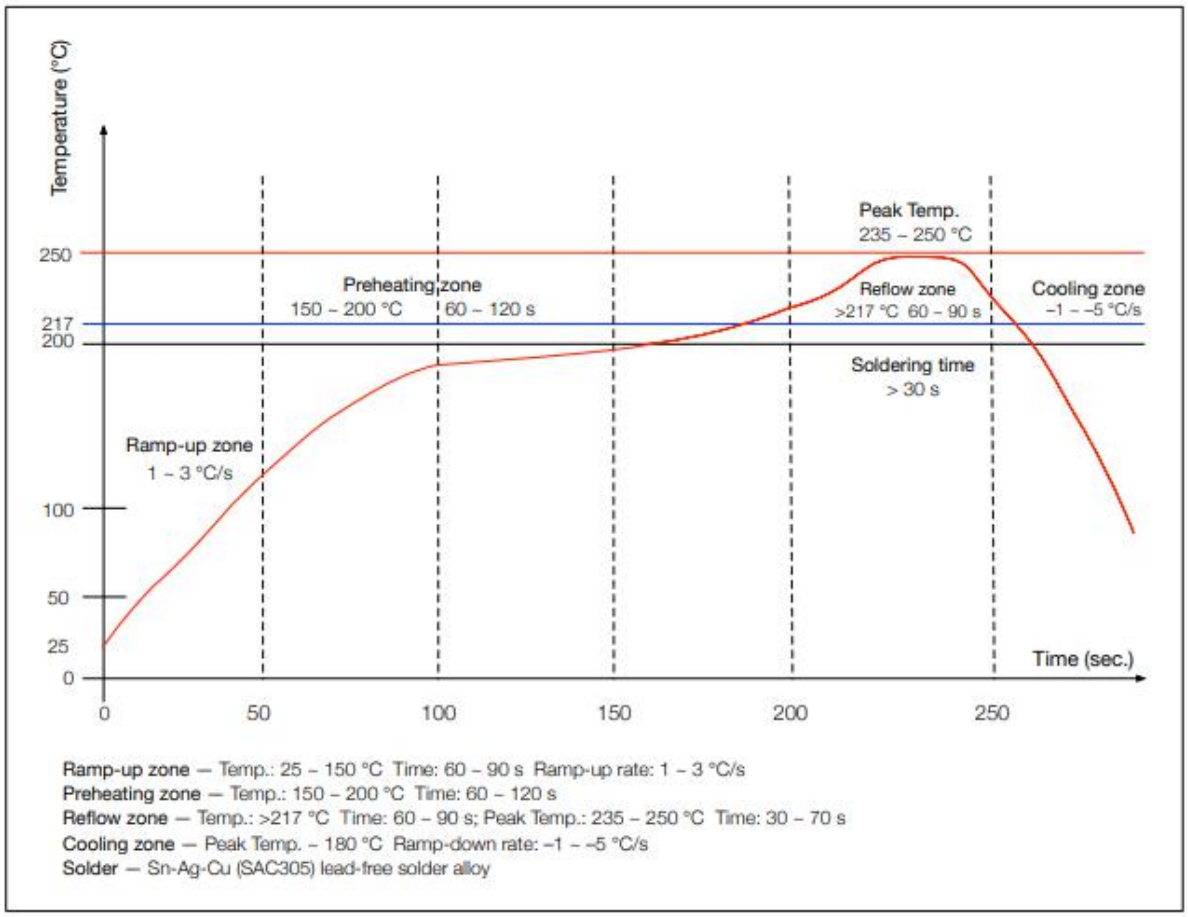
5.1 Module Dimensions

Figure 4 Module Dimensions



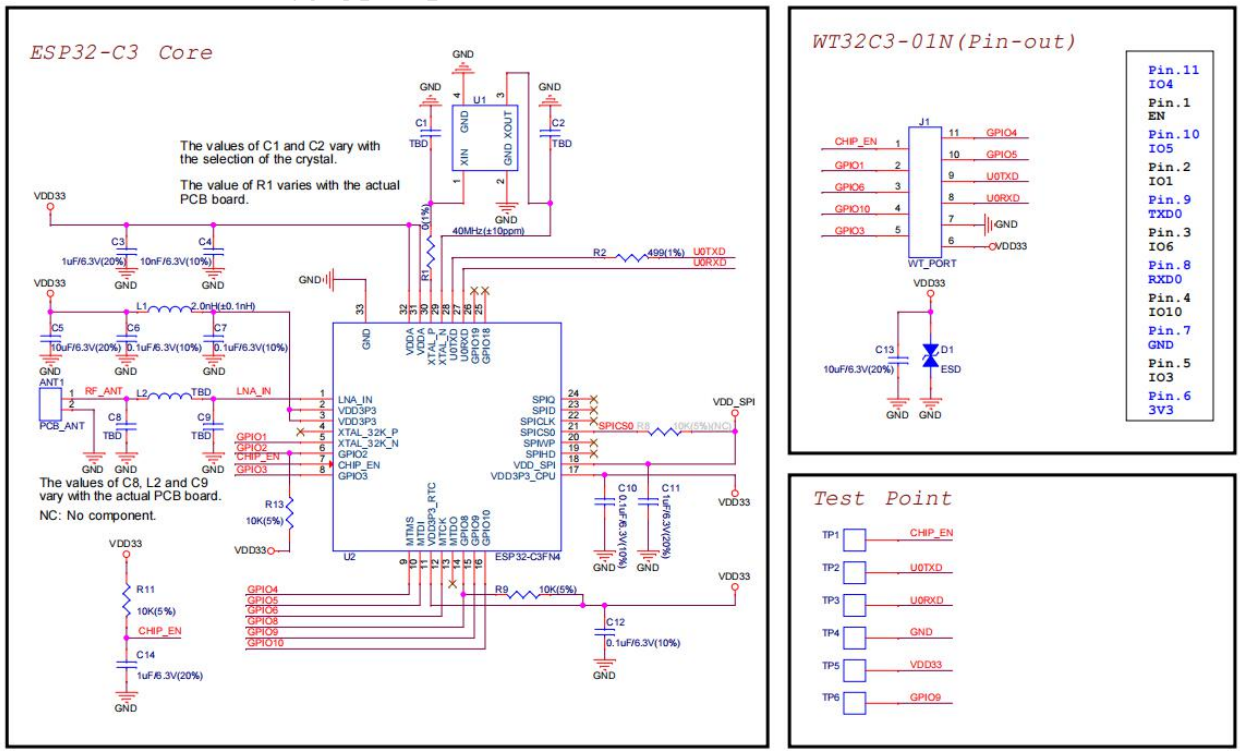
5.2 Reflow Profile

Figure 5 Reflow Profile



5.3 Module Schematics

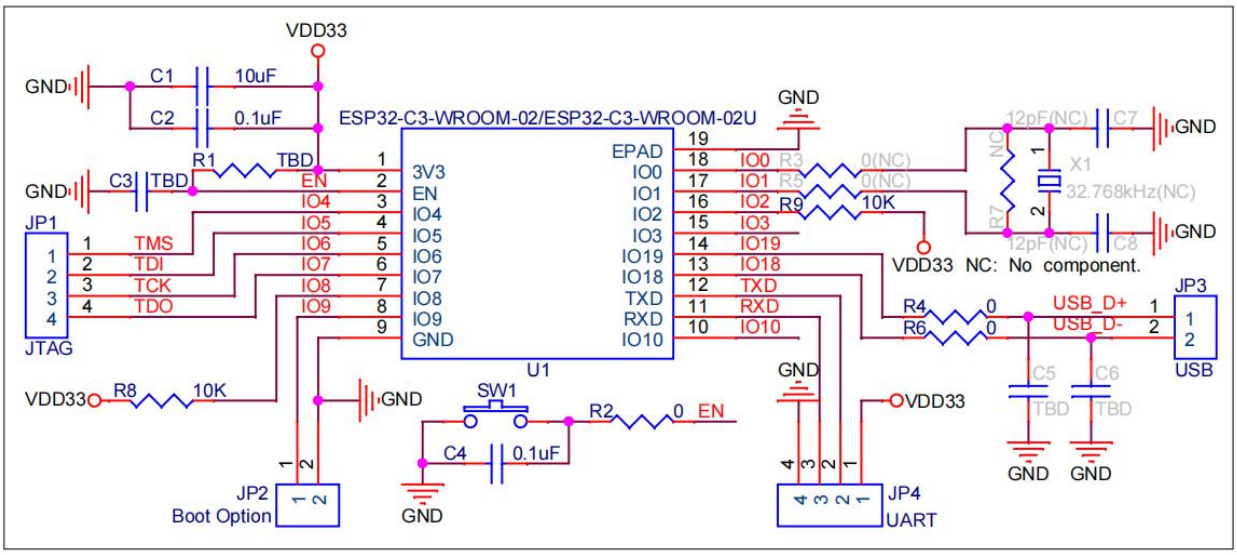
Figure 6 Module Schematics



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



Note:

- 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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