WT32C3-S5

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Wireless-Tag

About this document

This document provides the user with the WT32C3-S5 specifications.

Document version

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Revision history (of a document, web page etc)

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Document Revision Log

serial number	version number	variable state	Change (+/-) description	author	dates
1	V1.0.0	C	Creating Documents	Fiona	2021-1-13
2	V1.0.1	M	Pin Definition Update	Fiona	2021-6-15
3	V1.0.2	A	increase power consumption	Fiona	2021-7-15
4	V1.0.4	M	Schematic Update	Zeng	2023-2-9
5	V1.0.6	A	Pin description added	Zeng	2023-7-28
5	V1.0.7	M	Temperature Update	Zeng	2024-3-27

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

Table of contents

1 Summarize

WT32C3-S5 Wi-Fi module is a low-power cost-effective embedded wireless network control module. It can meet the needs of smart grid, building automation, security, smart home, remote medical and other IoT applications.

The module's core processor, the ESP32-C3, integrates an industry-leading RISC-V 32-bit single-core processor in a small form factor package supporting up to 160 MHz and a PCB on-board antenna.

The module supports standard IEEE802.11 b/g/n protocols, low power Bluetooth 5.0 (Bluetooth LE), Bluetooth mesh. Users can use the module to add Bluetooth networking and networking capabilities to existing devices, or build standalone network controllers.

2 Main characteristics

- Available in SMD-22 package
- On-Board PCB Antenna
- Operating voltage: 3.3V
- Operating ambient temperature: -40-85°C
- Built-in ESP32-C3 chip, RISC-V 32-bit single-core microprocessor with up to 160MHz main frequency
  - SRAM 400KB
  - RTC SRAM 8KB
  - ROM 384KB
- Module Built-in Flash 4/8/16MB
- systems

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

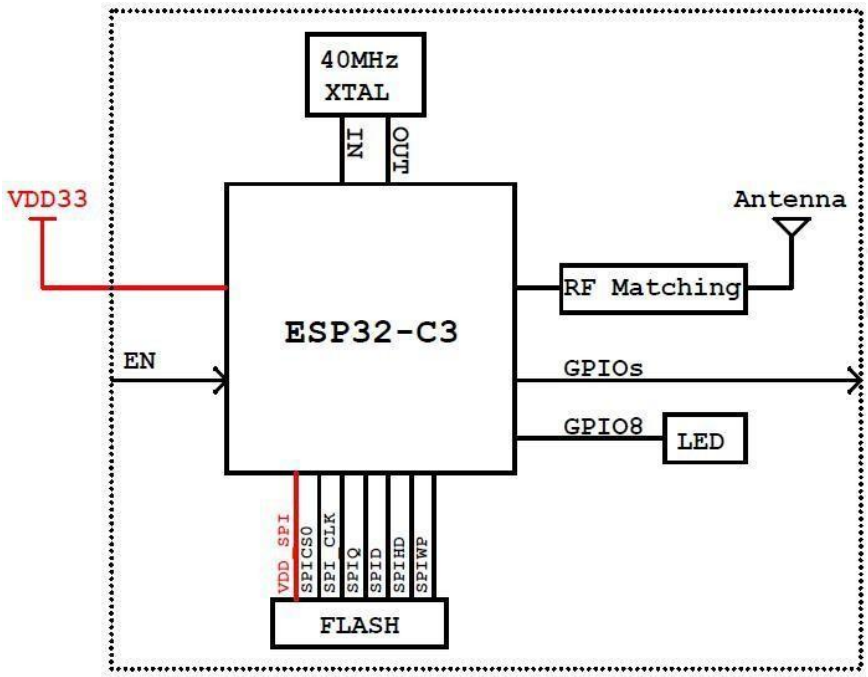
  bluetooth
  - Bluetooth 5.0 Low Power (Bluetooth LE):Bluetooth 5, Bluetooth mesh
  - Rate support 125 Kbps, 500 Kbps, 1 Mbps
  - Advertising Extensions
  - Multiple Advertisement Sets (MAS)
  - Channel Selection Algorithm #2

  software
  - Supports GPIO, SPI, UART, I2C, I2S, IR Transceiver, LED PWM Controller, USB JTAG Interface, General Purpose DMA Controller, TWAITM Controller (ISO11898-1 Compliant), Temperature Sensors, SAR Analog/Digital Converters
  - Supports STA/AP/STA+AP operating modes
  - Remote OTA support

3 Hardware Specifications

3. 1 Hardware block diagram

Figure 1 Hardware Block Diagram



3. 2 Pin Description

Fig. 2 Physical pinout of the product

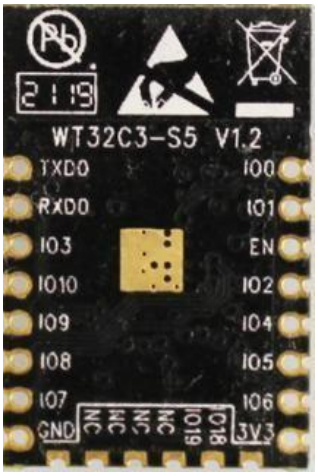


Table 1 Pin Definitions and Descriptions

Pinout	Name (of a thing)	descriptive
1	IO0	GPIO0, ADC1_CH0, XTAL_32K_P (32.768 kHz crystal input)
2	IO1	GPIO1, ADC1_CH1, XTAL_32K_N (32.768 kHz crystal output)
3	EN	Chip Enable Terminal: High level: valid, the chip works normally; Low level: the chip is off, the current is very small. Attention: Can't let the EN foot hang in the air
4	IO2	GPIO2, ADC1_CH2, FSPIQ
5	IO4	GPIO4, MTMS, ADC1_CH4, FSPIHD
6	IO5	GPIO5, MTDI, ADC2_CH0, FSPIWP
7	IO6	GPIO6, MTCK, FSPICLK
8	VCC	3.3V supply; 500mA or more output current recommended for external power supplies
9	IO18	GPIO18, USB_D
10	IO19	GPIO19, USB_D+
11-14	NC	NC
15	GND	GND
16	IO7	GPIO7, MTDO, FSPID
17	IO8	GPIO8
18	IO9	GPIO9
19	IO10	GPIO10, FSPICS0
20	IO3	GPIO3, ADC1_CH3
21	RXD0	U0RXD, GPIO20
22	TXD0	U0TXD, GPIO21

Table 2 Factory Default AT Command Communication Pins

Pinout	Name (of a thing)	Functionality
7	GPIO6	RX

16	GPIO7	TX

3.3 Strapping Pins

The ESP32-C3 series has three Strapping pins.

- GPIO2
- GPIO8
- GPIO9

The software can read the value of strapping of these pins in the register "GPIO_STRAPPING".

During the system reset of the chip (power-on reset, RTC watchdog reset, undervoltage reset, analog super watchdog reset, crystal clock burr detection reset), the Strapping pin samples the level on its own pin and stores it into a latch with the value of "0" or "1" and keeps it until the chip is powered down or shut down. The latch value is "0" or "1" and will be maintained until the chip is powered down or turned off.

GPIO9 is connected to internal pull-up by default. If there is no external connection on this pin or the connected external line is in high impedance state, the latch value is "1".

To change the value of Strapping, you can apply an external pull-down/pull-up resistor, or apply the GPIO control of the host MCU.

Strapping pin level at power-on reset for the ESP32-C3 series.

After reset release, the Strapping pin functions the same as a normal pin. Refer to Table 2 for details on configuring the startup mode of the Strapping pin. note:

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

Table 3 Strapping Pins

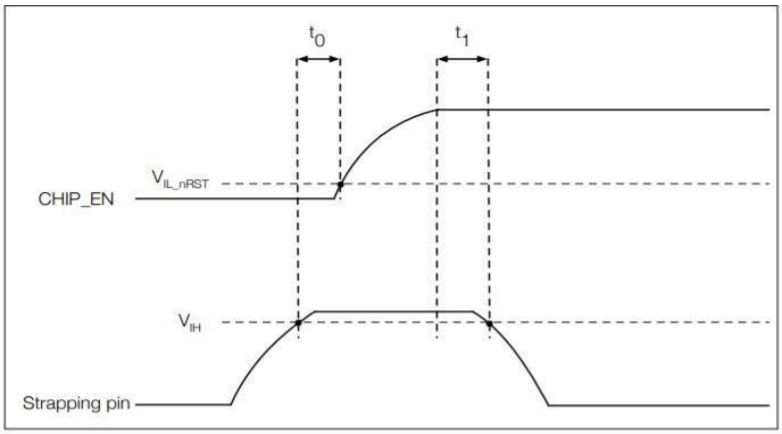
System boot mode 1			
pin	**default (setting)**	**SPI Boot Mode**	**Download Launch Mode**
GPIO2	not have	1	1
GPIO8	not have	irrelevant item	1
GPIO9	Internal pull-up	1	0
Controls ROM Code printing during system startup			
pin	**default (setting)**	**functionality**	
GPIO8	not have	The UART_PRINT_CONTROL for eFuse is 0 When it is powered on, it prints normally and is not controlled by GPIO8. 1 If GPIO8 is 0, power-on will print normally; if GPIO8 is 1, power-on will not print.	

		2 If GPIO8 is 0, power-on does not print; if GPIO8 is 1, power-on prints normally. 3 When it is powered on, it does not print and is not controlled by GPIO8.

Parameter descriptions for the build-up and hold times of the Strapping pin (refer to the following figure)		
parameters	**clarification**	**minimum value**
t0	CHIP_EN Establishment time before power-up	0ms
t1	CHIP_EN Hold time after power up	3ms

As shown in Figure 3, the build-up and hold times of the Strapping pin before and after powering up CHIP_EN are shown.

Fig. 3 Establishment time and hold time



Description:
1. GPIO8=0 and GPIO9=0

4 Electrical Characteristics

4.1 Absolute maximum rating

Exceeding the absolute maximum ratings may result in permanent damage to the device. This is an emphasized rating only and does not address the functional operation of the device under these or other conditions beyond those indicated in this technical specification. Prolonged exposure to absolute maximum ratings may affect module reliability.

4.2 Recommended

Table 4

notation	parameters		minimum value	typical value	maximum values	unit (of measure)
VDD	Power Pin Voltage		3.0	3.3	3.6	V
IVDD	Supply current from external power supply		0.5	-	-	A
T_A	environmental temperature	85°C version	-40	-	85	℃
		105°C version			105	
Humidity	humidity level		-	-	85	%RH

4.3 Power

Table 5 RF Power Consumption

RF Power Consumption			
	operating mode	descriptive	Peak (mA)
Active (RF operation)	TX	802.11b, 1 Mbps, @18dBm	367
		802.11g, 54 Mbps, @15.4dBm	284
		802.11n, HT20, MCS 7, @15 dBm	276
		802.11n, HT40, MCS 7, @14 dBm	252
	RX	802.11b/g/n, HT20	84
		802.11n, HT40	87

Description:

Room Temperature, 3.3V Supply, TX Continues Mode, DC Supply Accuracy 100 microamps

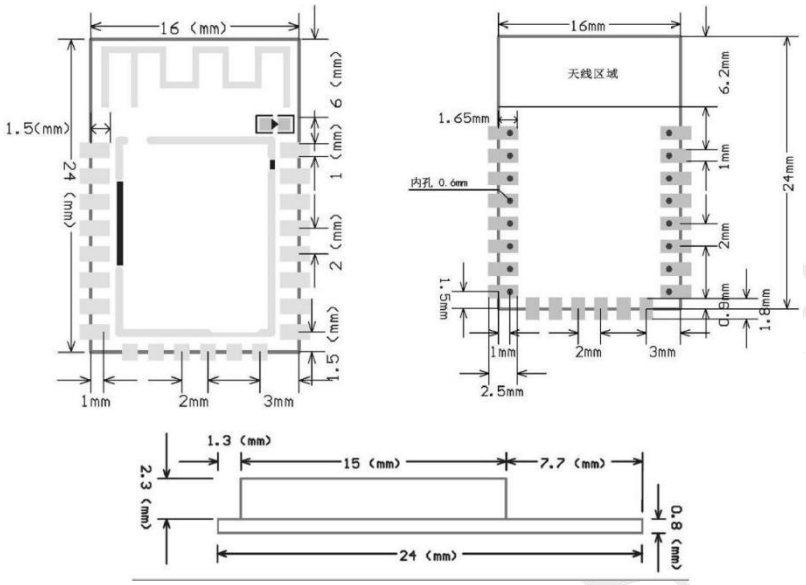
Table 6 Power Consumption Modes

power consumption mode	descriptive		typical value
Modem-sleep	CPU is active attitude	160MHz	23.7mA
		80MHz	20.6mA
Light-sleep			0.3mA
Deep-sleep			6.5uA
Power off	EN Pull down		0

5 Application Notes

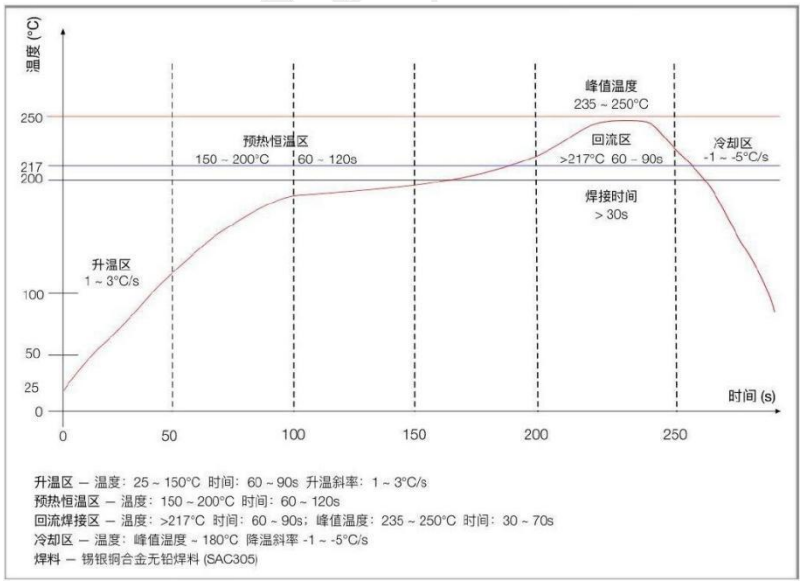
5.1 Module Size

Figure 4 Module Dimensions



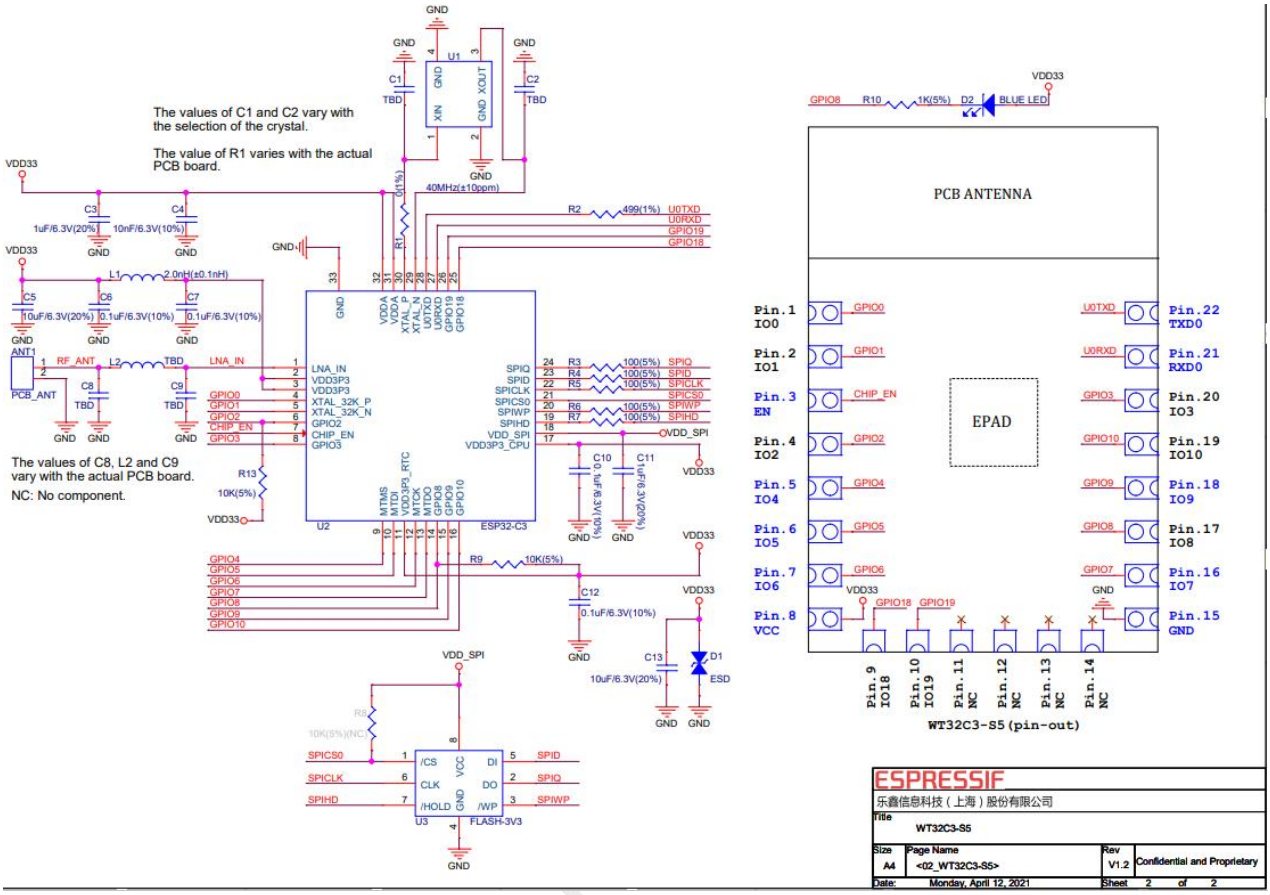
5.2 Reflow Profile

Figure 5 Reflow Profile



5. 3 Module Schematic

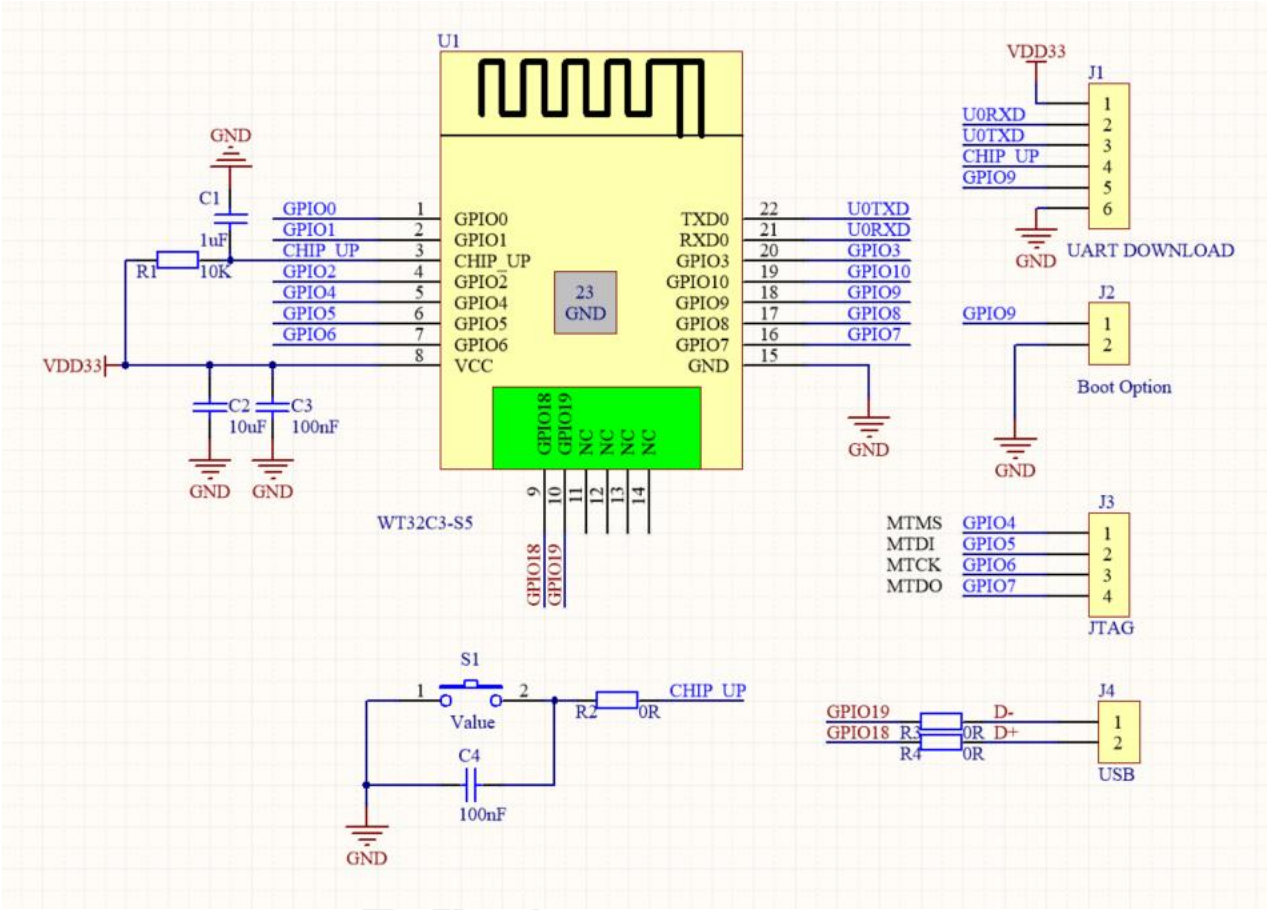
Fig. 6 Module schematic



5.4 Peripheral Design Schematic

Application circuit diagram for connecting the module to peripheral devices (e.g., power supply, antenna, reset button, JTAG interface, UART interface, etc.).

Figure 7 Application Circuit Diagram



- The EPAD can be left unsoldered to the baseboard, but better thermal characteristics can be obtained by soldering to the GND of the baseboard. If you want to solder the EPAD to the backplane, make sure you use the correct amount of solder paste.
- To ensure that the ESP32-C3 series chips are powered up properly, an RC delay circuit should be added to the EN pin. RC is usually recommended to be R = 10 kΩ and C = 1 μF, but the exact values should be adjusted according to the power-up timing of the module power supply and the power-up reset timing of the chips.

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