# ESP32-C3-MINI-1

# User Manual

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# Catalog

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# Ⅰ Functional Overview

## 1.1 Introduction

ESP32-C3-MINI-1 is a WIFI module based on the ESP32-C3 chip solution.

ESP32-C3-MINI-1 is a general-purpose Wi-Fi module, small in size, rich in peripheral interfaces, equipped with 4 MB embedded flash, and equipped with a RISC-V 32-bit single-core processor. The chip integrates a wealth of peripherals, including UART, I2C, I2S, infrared remote control module (remote control peripheral), LED PWM controller, general DMA controller, TWAI® controller, USB serial port/JTAG controller, temperature sensor and analog /Digital converter, also has a single-wire, two-wire, four-wire SPI interface.


It can be used in smart home, industrial automation, healthcare, consumer electronics and other fields.

## 1.2 Features

- 4 MB embedded flash;
- Support AT commands;
- Support serial communication and flow control. The baud rate is up to 128000.
- Support automatic and manual networking.

# Ⅱ Electrical Characteristics

## 2.1 Absolute maximum ratings

| Symbol | Parameter | Minimum | Maximum | Unit |
|---|---|---|---|---|
| **VDD33** | Power pin voltage | -0.3 | 3.6 | V |
| ***TSTORE*** | Storage temperature | -40 | 85 | °C |

Chart 2- 1 Absolute maximum ratings

## 2.2 Recommended working conditions

| Symbol | Parameter | Minimum | Typical | Maximum | Unit |
|---|---|---|---|---|---|
| **VDD33** | Power Pin Voltage | 3.0 | 3.3 | 3.6 | V |
| **IVDD** | Supply current of external power supply | 0.5 | — | — | A |

| | | | | | |
|---|---|---|---|---|---|
| T | Recommended working temperature | -40 | — | 85 | ° C |
| Humidity | Humidity | — | 85 | — | %RH |
| Imax | Peak current | | | 400 | mA |
| I | Average current | | | 100 | mA |

Chart 2- 2 Recommended working conditions

## 2.3 RF Characteristics

| | | |
|---|---|---|
| Working channel center frequency range | | 2412~2484MHz |
| Wi-Fi | | Protocol IEEE802.11b/g/n |
| Antenna type | | PCB |
| Distance | With router @Mercury MW305R | 200m |
| | Between Modules | 200m |

Chart 2- 3 RF Characteristics

# III Hardware Description

## 3.1 Mechanical size and pin definition

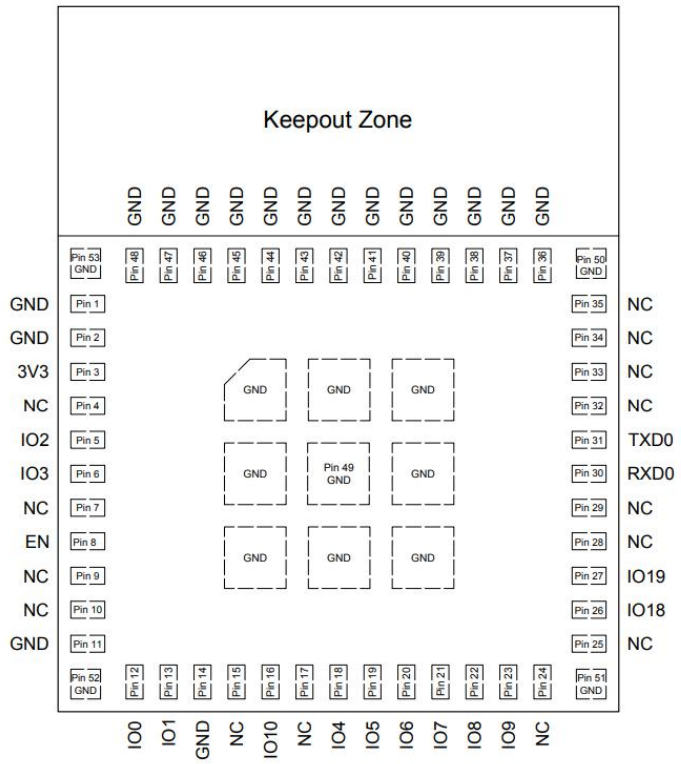



Chart 3- 1 Pin layout diagram

| Name | Serial number | Type | Function |
|---|---|---|---|
| GND | 1, 2, 11, 14, 36-53 | P | Grounded |
| 3V3 | 3 | P | Powered by |
| NC | 4, 7, 9, 10, 15, 17, 24, 25, 28, 29, 32-35 | — | Empty pin |
| IO2 | 5 | I/O/T | GPIO2, ADC1_CH2, FSPIQ |
| IO3 | 6 | I/O/T | GPIO3, ADC1_CH3 |
| EN | 8 | I | High level: chip enable;<br>low level: chip off;<br>Be careful not to let the EN pin float. |
| IO0 | 12 | I/O/T | GPIO0, ADC1_CH0, XTAL_32K_P |
| IO1 | 13 | I/O/T | GPIO1, ADC1_CH1, XTAL_32K_N |
| IO10 | 16 | I/O/T | GPIO10, FSPICS0 |
| IO4 | 18 | I/O/T | GPIO4, ADC1_CH4, FSPIHD, MTMS |
| IO5 | 19 | I/O/T | GPIO5, ADC2_CH0, FSPIWP, MTDI |
| IO6 | 20 | I/O/T | GPIO6, FSPICLK, MTCK |
| IO7 | 21 | I/O/T | GPIO7, FSPID, MTDO |
| IO8 | 22 | I/O/T | GPIO8 |
| IO9 | 23 | I/O/T | GPIO9 |
| IO18 | 26 | I/O/T | GPIO18, USB_D- |
| IO19 | 27 | I/O/T | GPIO19, USB_D+ |
| RXD0 | 30 | I/O/T | GPIO20, U0RXD |
| TXD0 | 31 | I/O/T | GPIO21, U0TXD |
| | | | |

1 P: power supply; I: input; O: output; T: can be set to high impedance.

Chart 3- 2 Pin definition list

## 3.2 Minimal Schematic

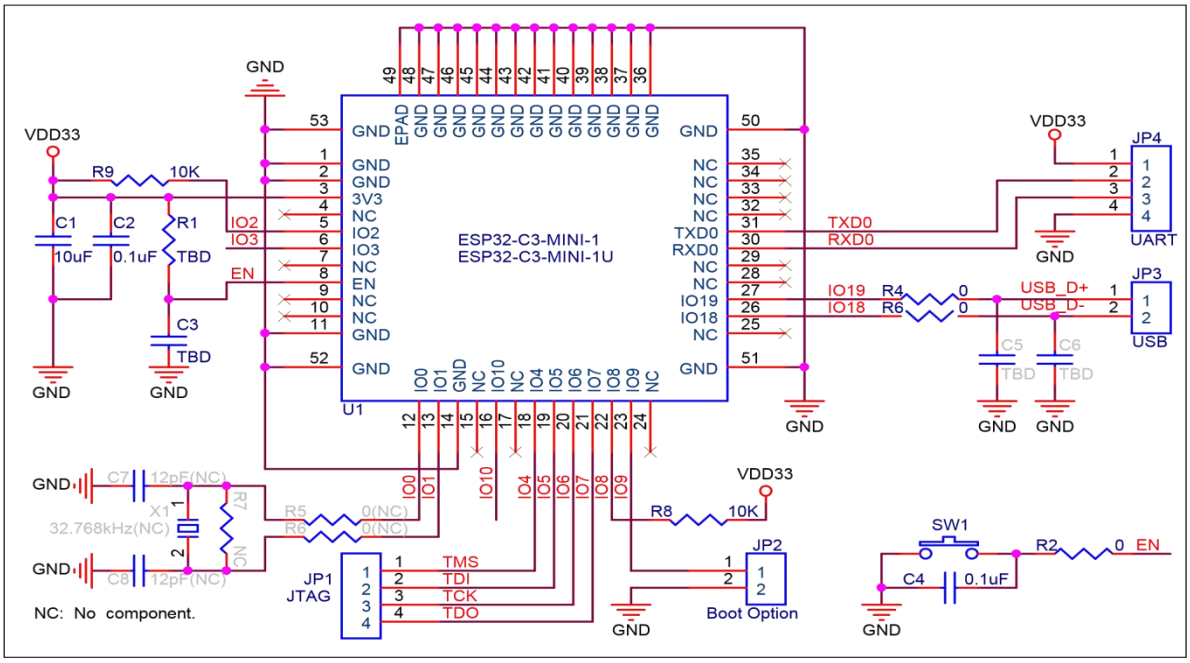



Chart 3- 3 Minimal Schematic

## 3.3 Module size

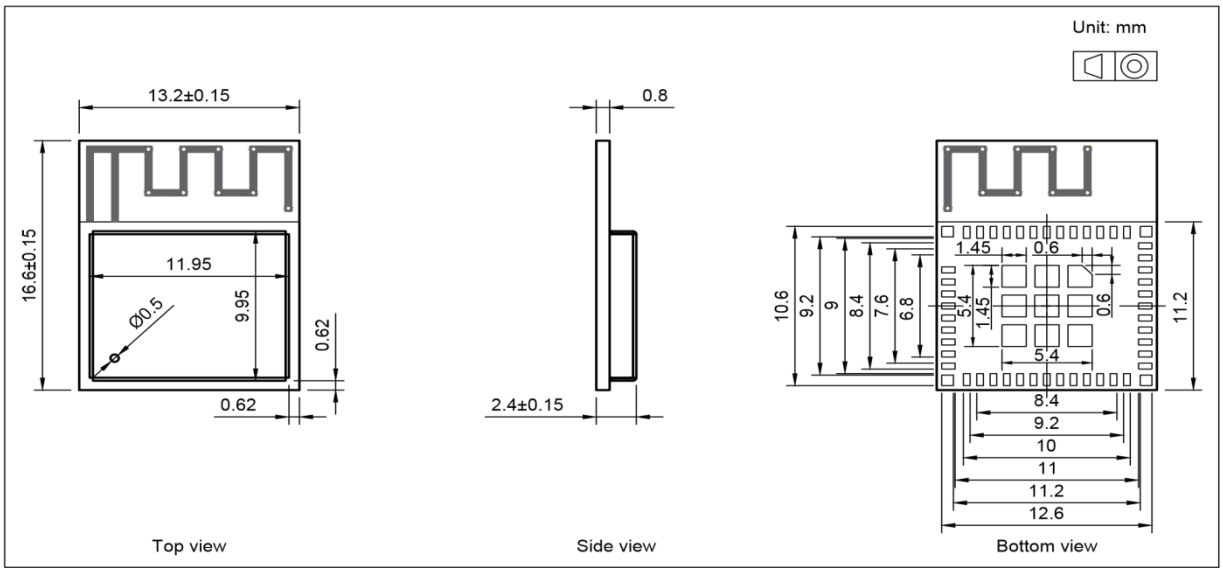



Chart 3- 4 Module size

## 3.4 PCB package pattern

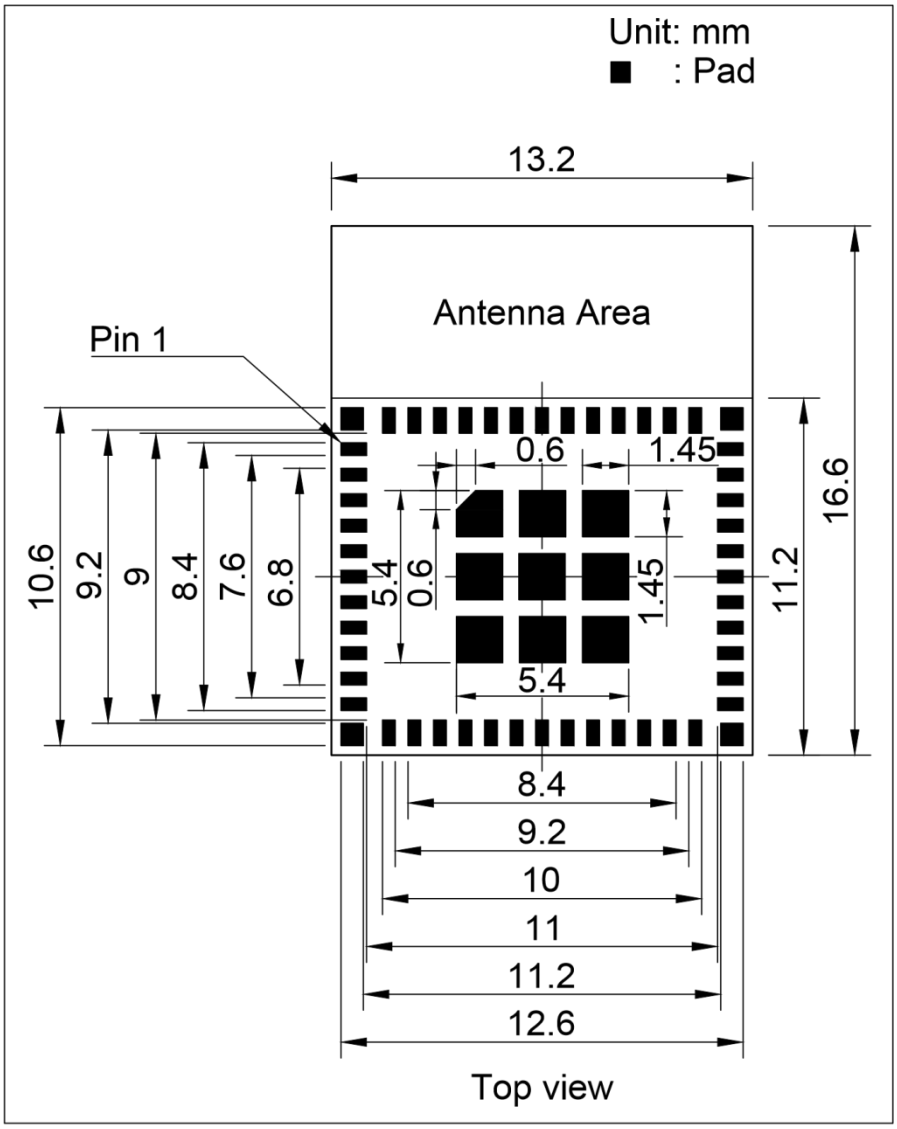



Chart 3- 5 PCB package

# Ⅳ AT Command

For AT commands, please refer to the download page <ESP32-C3-MINI-1_AT_Bin_V2.2.0.0>

# V Common Questions

## 5.1 Unsatisfactory transmission distance

- When there is a straight line communication obstacle, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-frequency interference will increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect is poor when it is close to the ground;
- Sea water has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there is a metal object near the antenna or placed in a metal shell, the signal attenuation will be very serious;
- The power register is set incorrectly, and the air speed is set too high (the higher the air speed, the closer the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, the lower the voltage, the lower the power output.

## 5.2 Module is easily damaged

- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, it will cause permanent damage to the module;
- Please check the stability of the power supply, and the voltage should not fluctuate greatly and frequently;
- Please ensure that the installation and use process is anti-static, and high-frequency components are electrostatically sensitive;
- Please ensure that the humidity should not be too high during installation and use, and some components are humidity sensitive devices;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

## 5.3 Bit error rate is too high

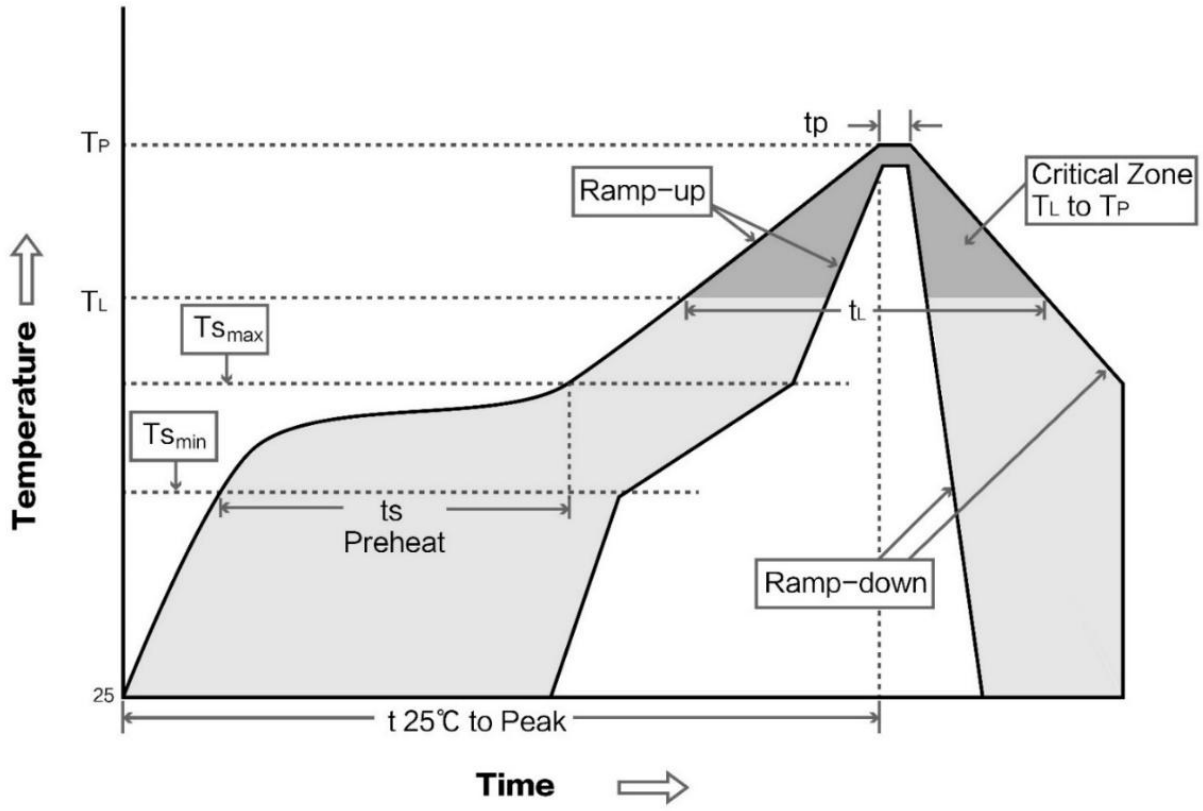
- There is co-frequency signal interference nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- The clock waveform on the UART is not standard, check whether there is interference on the UART line;
- Unsatisfactory power supply may also cause garbled codes, so the reliability of the power supply must be ensured;

# Ⅵ Welding Operation Guidance

## 6.1 Reflow temperature

| Profile Feature | Curve characteristics | Sn-Pb Assembly | Pb-Free Assembly |
|---|---|---|---|
| Solder Paste | Tin paste | Sn63/Pb37 | Sn96.5/Ag3/Cu0.5 |
| Preheat Temperature min （Tsmin） | Minimum preheating temperature | 100℃ | 150℃ |
| Preheat temperature max （Tsmax） | Maximum preheating temperature | 150℃ | 200℃ |
| Preheat Time （Tsmin to Tsmax）（ts） | Preheat time | 60-120 sec | 60-120 sec |
| Average ramp-up rate（Tsmax to Tp） | Average ascent rate | 3℃/second max | 3℃/second max |
| Liquidous Temperature （TL） | Liquidus temperature | 183℃ | 217℃ |
| Time （tL） Maintained Above （TL） | Time above liquidus | 60-90 sec | 30-90 sec |
| Peak temperature （Tp） | Peak temperature | 220-235℃ | 230-250℃ |
| Aveage ramp-down rate （Tp to Tsmax） | Average rate of descent | 6℃/second max | 6℃/second max |
| Time 25℃ to peak temperature | Time from 25℃ to peak temperature | 6 minutes max | 8 minutes max |

## 6.2 Reflow soldering curve



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# Revise History

| Version | Revision Date | Revision Description | Maintainer |
|---|---|---|---|
| 1.0 | 2021-03-18 | Initial version | - |

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