ESP32-C3-WROOM-02

Datasheet

DRAFT

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Espressif Systems
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About This Document

This document provides specifications for the ESP32-C3-WROOM-02 module.

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Revision History

For revision history of this document, please refer to the last page.

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1   Module Overview

1.1   Features

MCU

- ESP32-C3 embedded, 32-bit RISC-V single-core processor, up to 160 MHz

- 384 KB ROM

- 400 KB SRAM

- 8 KB SRAM in RTC

Wi-Fi

- IEEE 802.11 b/g/n-compliant

- 1T1R mode with data rate up to 150 Mbps

- A-MPDU and A-MSDU aggregation

- 0.4 μs guard interval

- Operating frequency: 2412 ~ 2484 MHz

Bluetooth®

- 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

- Interfaces: GPIO, SPI, UART, I2C, I2S, remote control peripheral, LED PWM controller, USB 1.1, general DMA controller, TWAI® controller (compatible with ISO 11898-1), temperature sensor, SAR ADC

- 40 MHz crystal oscillator

- 4 MB SPI flash

- Operating voltage/Power supply: 3.0 ~ 3.6 V

- Ambient temperature:

    - 85 °C version module: −40 ~ 85 °C

    - 105 °C version module: −40 ~ 105 °C

- Dimensions: (18.0 × 20.0 × 3.2) mm

Test

- HTOL/HTSL/uHAST/TCT/ESD/Latch-up

1.2   Description

ESP32-C3-WROOM-02 is a general-purpose Wi-Fi and Bluetooth LE module. This module features a rich set of peripherals and high performance, which makes it an ideal choice for smart home, industrial automation, health care, consumer electronics, etc.

The module comes in two versions:

- 85 °C version

- 105 °C version

The two versions both come with an on-board PCB antenna and a 4 MB external SPI flash. The information in this datasheet is applicable to both versions.

The ordering information ESP32-C3-WROOM-02 is as follows:

Table 1: ESP32-C3-WROOM-02 Ordering Information

Module	Chip embedded	Flash	Module dimensions (mm)
ESP32-C3-WROOM-02 (85 °C version)	ESP32-C3	4 MB	18.0 × 20.0 × 3.2
ESP32-C3-WROOM-02 (105 °C version)			

At the core of this module is ESP32-C3*, which has a 32-bit RISC-V single-core processor.

ESP32-C3 integrates a rich set of peripherals, ranging from UART, I2C, I2S, remote control peripheral, LED PWM controller, general DMA controller, TWAI® controller, temperature sensor, ADC, and up to 22 GPIOs. It also includes SPI, Dual SPI and Quad SPI interfaces.

> **Note:**
>
> * For more information on ESP32-C3, please refer to *ESP32-C3 Family Datasheet* .

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

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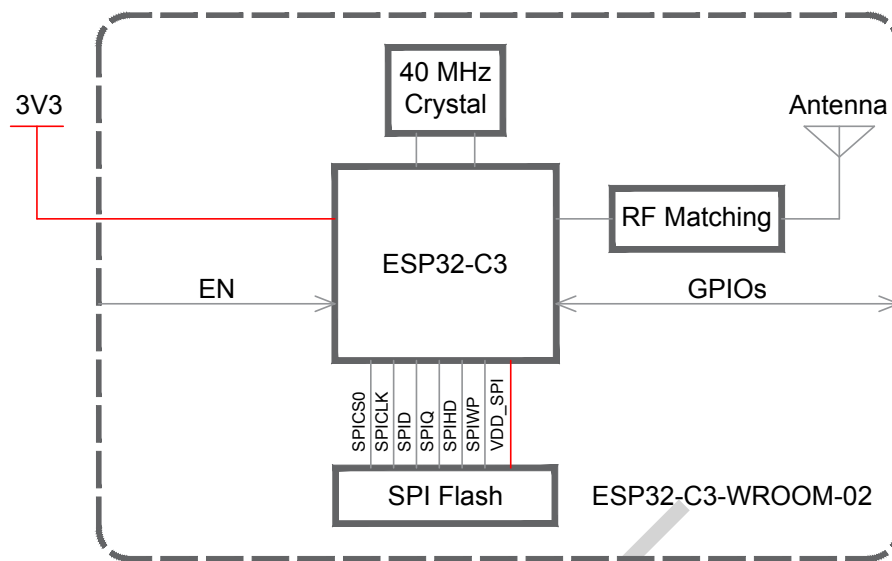# 2   Block Diagram

Figure 1: ESP32-C3-WROOM-02 Block Diagram

3   Pin Definitions

3.1   Pin Layout

The pin diagram below shows the approximate location of pins on the module. For the actual diagram drawn to scale, please refer to Figure 6.1 *Physical Dimensions*.
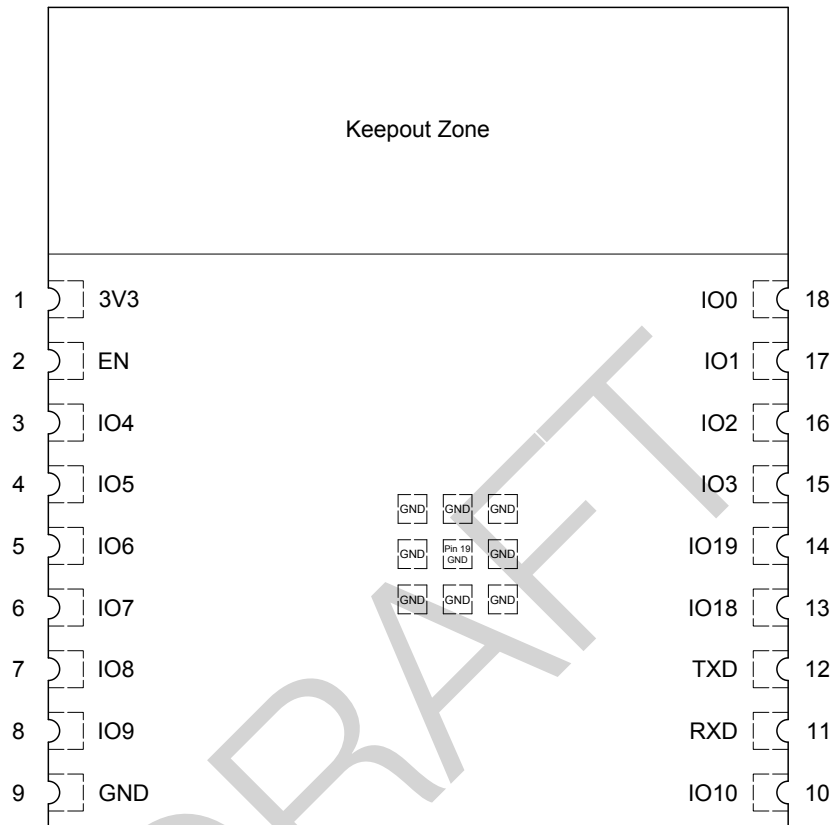

Figure 2: Pin Layout (Top View)

3.2   Pin Description

The module has 19 pins. See pin definitions in Table 2.

For peripheral pin configurations, please refer to *ESP32-C3 Family Datasheet* .

Table 2: Pin Definitions

Name	No.	Type	Function
3V3	1	P	Power supply
EN	2	I	High: on, enables the chip. Low: off, the chip powers off. Note: Do not leave the EN pin floating.
IO4	3	I/O/T	GPIO4, ADC1_CH4, FSPIHD, MTMS
IO5	4	I/O/T	GPIO5, ADC2_CH0, FSPIWP, MTDI
IO6	5	I/O/T	GPIO6, FSPICLK, MTCK

Cont'd on next page

Table 2 – cont'd from previous page

Name	No.	Type	Function
IO7	6	I/O/T	GPIO7, FSPID, MTDO
IO8	7	I/O/T	GPIO8
IO9	8	I/O/T	GPIO9
GND	9,19	P	Ground
IO10	10	I/O/T	GPIO10, FSPICS0
RXD0	11	I/O/T	GPIO20, U0RXD
TXD0	12	I/O/T	GPIO21, U0TXD
IO18	13	—	GPIO18
IO19	14	I/O/T	GPIO19
IO3	15	I/O/T	GPIO3, ADC1_CH3
IO2	16	I/O/T	GPIO2, ADC1_CH2, FSPIQ
IO1	17	I/O/T	GPIO1, ADC1_CH1, XTAL_32K_N
IO0	18	I/O/T	GPIO0, ADC1_CH0, XTAL_32K_P

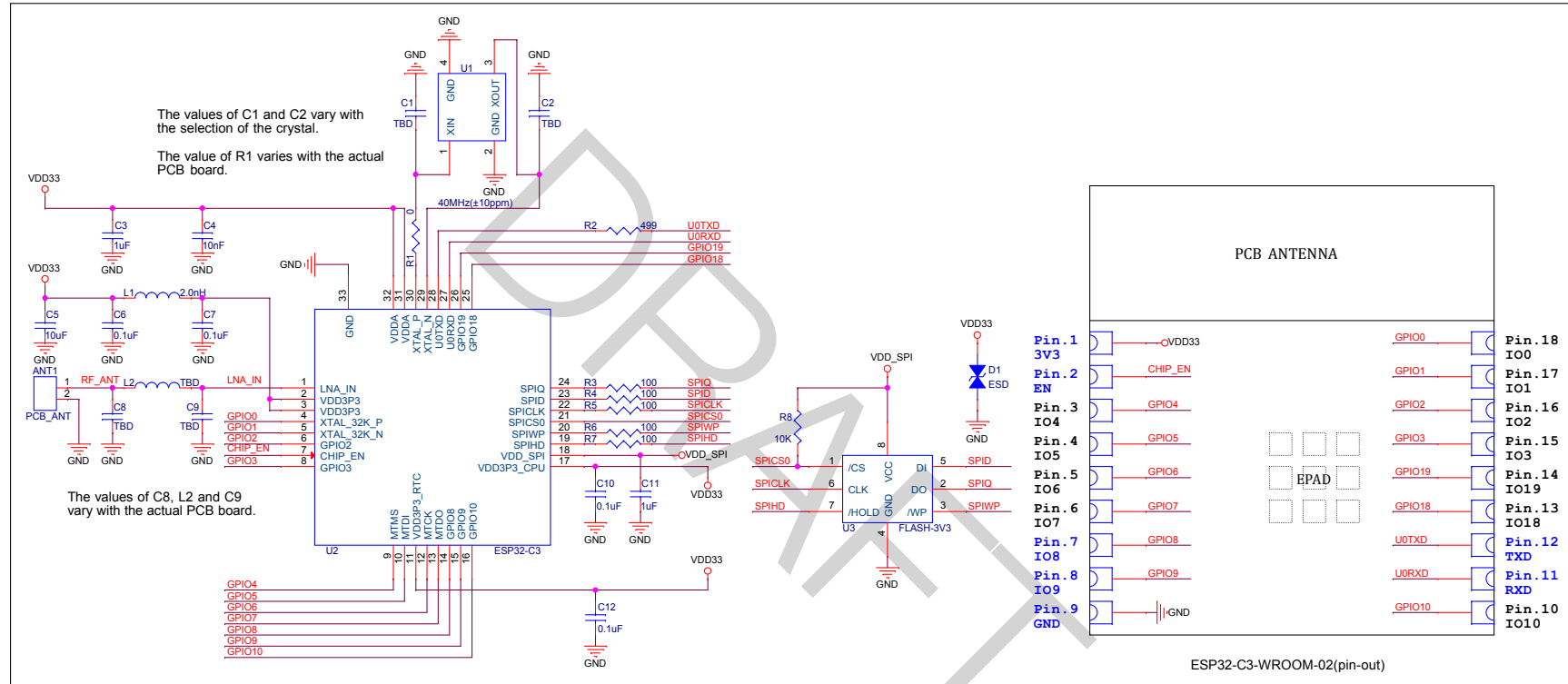# 4 Module Schematics

This is the reference design of the module.

Figure 3: ESP32-C3-WROOM-02 Schematics

5   Peripheral Schematics

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 4: Peripheral Schematics

- 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. For power-up and reset sequence timing diagram of the ESP32-C3 family chip, please refer to Section *Power Scheme* in *ESP32-C3 Family Datasheet* .

6   Physical Dimensions and PCB Land Pattern

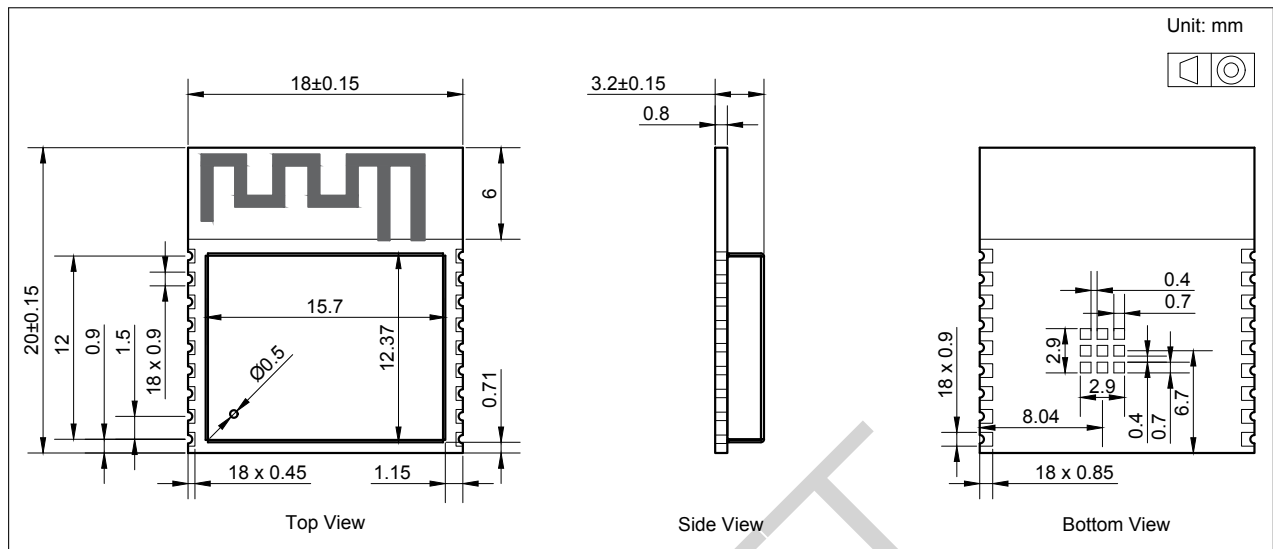## 6.1   Physical Dimensions

Figure 5: Physical Dimensions
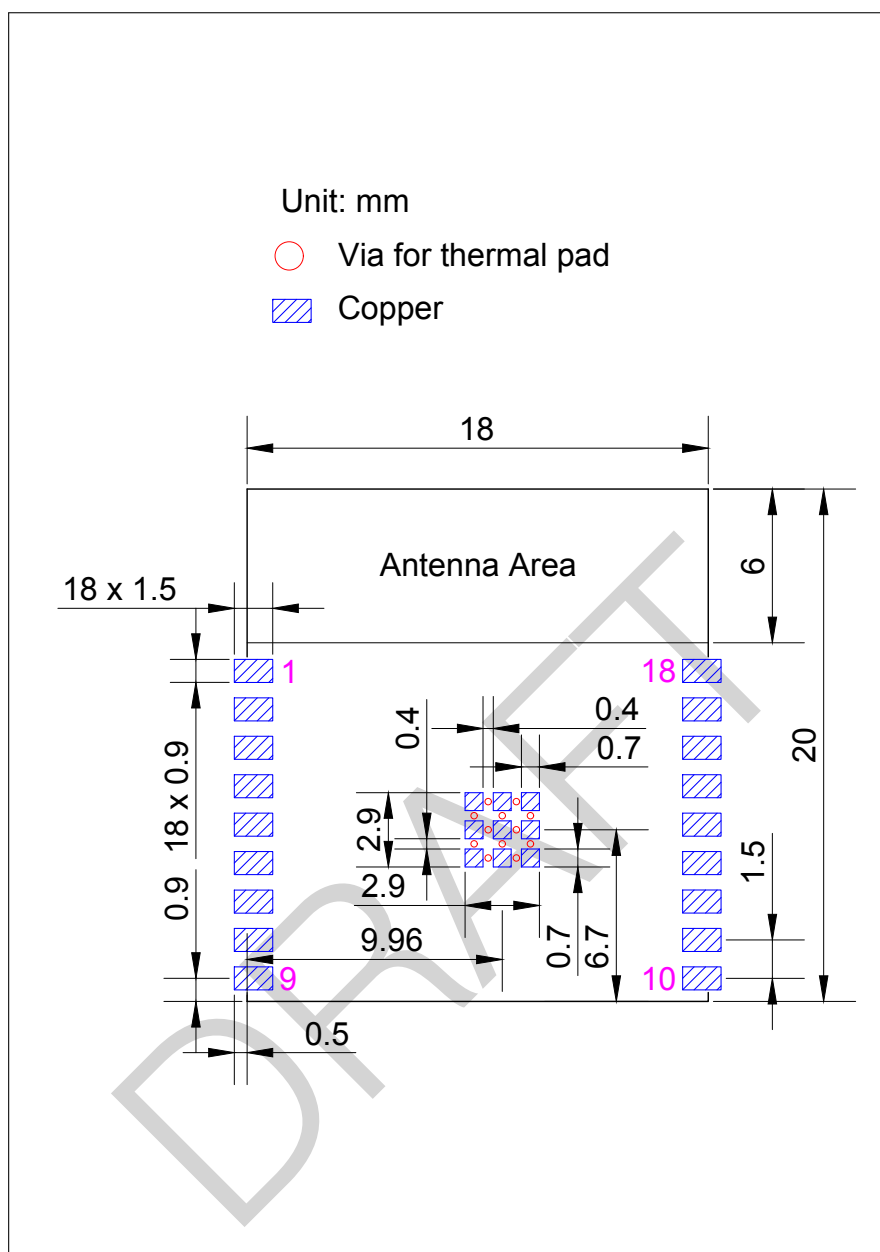
6.2   Recommended PCB Land Pattern

Figure 6: Recommended PCB Land Pattern

7   Product Handling

7.1   Storage Conditions

The products sealed in moisture barrier bags (MBB) should be stored in a non-condensing atmospheric environment of < 40 °C and /90%RH. The module is rated at the moisture sensitivity level (MSL) of 3.

After unpacking, the module must be soldered within 168 hours with the factory conditions 25±5 °C and /60%RH. If the above conditions are not met, the module needs to be baked.

7.2   Electrostatic Discharge (ESD)

- Human body model (HBM): 2000 V
- Charged-device model (CDM): 500 V

7.3   Reflow Profile

Solder the module in a single reflow.

Ramp-up zone — Temp.: 25 ~ 150 °C Time: 60 ~ 90 s Ramp-up rate: 1 ~ 3 °C/s
Preheating zone — Temp.: 150 ~ 200 °C Time: 60 ~ 120 s
Reflow zone — Temp.: >217 °C Time: 60 ~ 90 s; Peak Temp.: 235 ~ 250 °C Time: 30 ~ 70 s
Cooling zone — Peak Temp. ~ 180 °C Ramp-down rate: −1 ~ −5 °C/s
Solder — Sn-Ag-Cu (SAC305) lead-free solder alloy
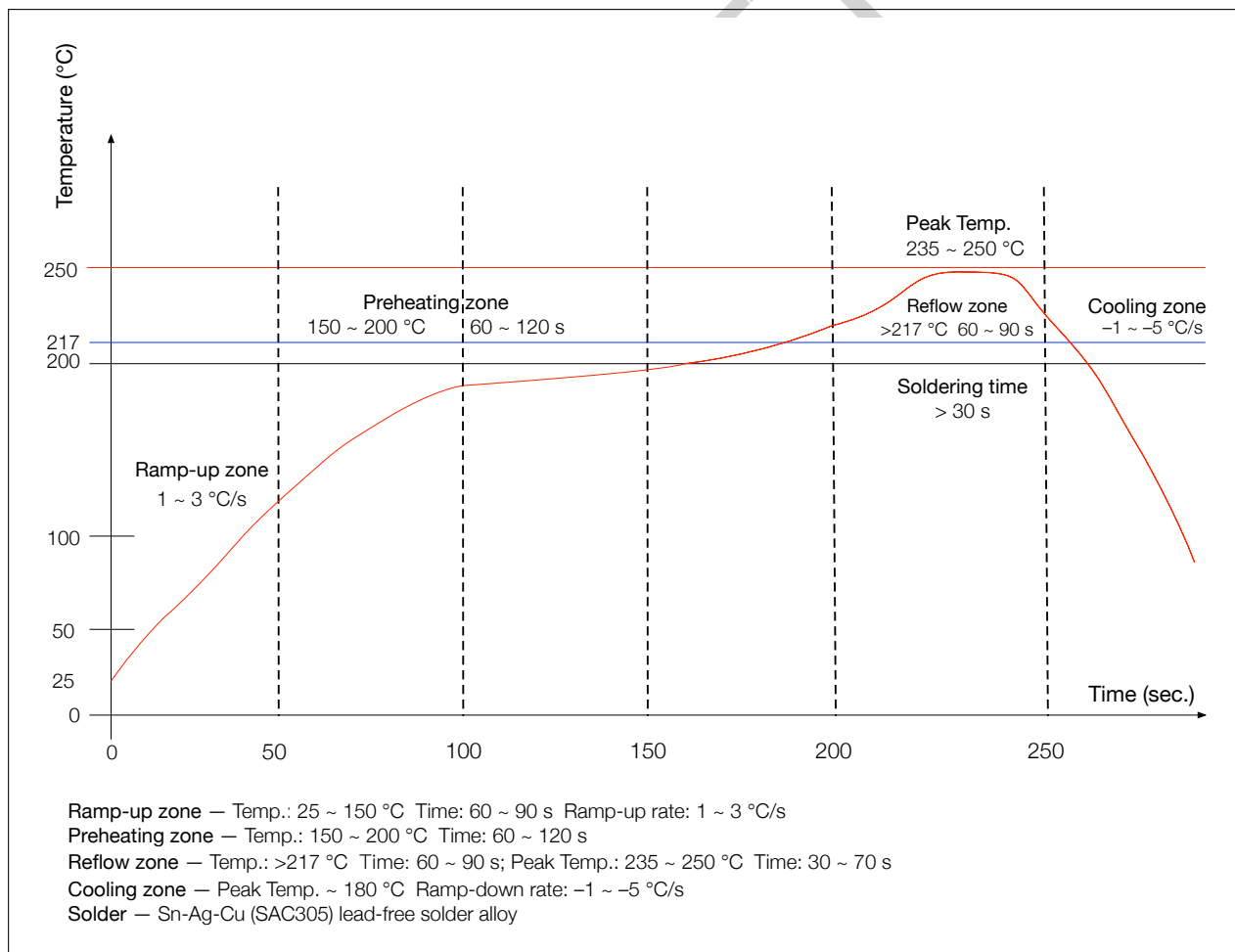
Figure 7: Reflow Profile

Revision History

Date	Version	Release notes
2021-02-05	V0.3	Module name updated to ESP32-C3-WROOM-02
2020-12-25	V0.2	• Updated information about 85°C version and 105 °C version of the module • Updated pin type in Table 2 *Pin Description* • Updated Chapter 4 *Module Schematics* • Updated Chapter 5 *Peripheral Schematics* • Other formatting adjustment
2020-10-19	V0.1	Draft

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