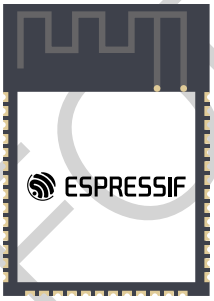
ESP32-S3-WROOM-1
ESP32-S3-WROOM-1U

Datasheet

2.4 GHz Wi-Fi (802.11 b/g/n) and Bluetooth® 5 (LE) module
Built around ESP32-S3 series of SoCs, Xtensa® dual-core 32-bit LX7 microprocessor
Flash up to 16 MB, PSRAM up to 8 MB
36 GPIOs, rich set of peripherals
On-board PCB antenna or external antenna connector



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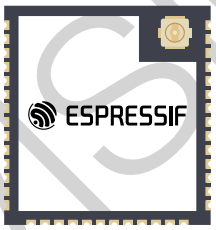

ESP32-S3-WROOM-1U

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Espressif Systems
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1 Module Overview

Note:

Check the link or the QR code to make sure that you use the latest version of this document:
https://www.espressif.com/sites/default/files/documentation/esp32-s3-wroom-1_datasheet_en.pdf

1.1 Features

CPU and On-Chip Memory

- ESP32-S3 series of SoCs embedded, Xtensa® dual-core 32-bit LX7 microprocessor, up to 240 MHz
- 384 KB ROM
- 512 KB SRAM
- 16 KB SRAM in RTC
- Up to 8 MB PSRAM

Wi-Fi

- 802.11 b/g/n
- Bit rate: 802.11n up to 150 Mbps
- A-MPDU and A-MSDU aggregation
- 0.4 μs guard interval support
- Center frequency range of operating channel: 2412 ~ 2484 MHz

Bluetooth

- Bluetooth LE: Bluetooth 5, Bluetooth mesh
- 2 Mbps PHY
- Long range mode
- Advertising extensions
- Multiple advertisement sets
- Channel selection algorithm #2

Peripherals

- GPIO, SPI, LCD interface, Camera interface, UART, I2C, I2S, remote control, pulse counter, LED PWM, USB 1.1 OTG, USB Serial/JTAG controller, MCPWM, SDIO host, GDMA, TWAI® controller (compatible with ISO 11898-1), ADC, touch sensor, temperature sensor, timers and watchdogs

Integrated Components on Module

- 40 MHz crystal oscillator
- Up to 16 MB SPI flash

Antenna Options

- On-board PCB antenna (ESP32-S3-WROOM-1)
- External antenna via a connector (ESP32-S3-WROOM-1U)

Operating Conditions

- Operating voltage/Power supply: 3.0 ~ 3.6 V
- Operating ambient temperature:
  - 85 °C version: –40 ~ 85 °C
  - 105 °C version: –40 ~ 105 °C
- Dimensions: See Table 1

1.2 Description

ESP32-S3-WROOM-1 and ESP32-S3-WROOM-1U are two powerful, generic Wi-Fi + Bluetooth LE MCU modules that have a rich set of peripherals. They provide acceleration for neural network computing and signal processing workloads. They are an ideal choice for a wide variety of application scenarios related to AI and

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Artificial Intelligence of Things (AIoT), such as wake word detection, speech commands recognition, face detection and recognition, smart home, smart appliances, smart control panel, smart speaker, etc.

ESP32-S3-WROOM-1 comes with a PCB antenna. ESP32-S3-WROOM-1U comes with an external antenna connector. A wide selection of module variants are available for customers as shown in Table 1. All the module variants operate at –40 ~ 85 °C ambient temperature, except for ESP32-S3-WROOM-1-H4 and ESP32-S3-WROOM-1U-H4 that operate at –40 ~ 105 °C ambient temperature.

Table 1: Ordering Information

Ordering Code	Chip Embedded	Flash (MB)	PSRAM (MB)	Dimensions (mm)
ESP32-S3-WROOM-1-N4	ESP32-S3	4	0	18 × 25.5 × 3.1
ESP32-S3-WROOM-1-N8	ESP32-S3	8	0	
ESP32-S3-WROOM-1-N16	ESP32-S3	16	0	
ESP32-S3-WROOM-1-H4 (105 °C)	ESP32-S3	4	0	
ESP32-S3-WROOM-1-N4R2	ESP32-S3R2	4	2 (Quad SPI)	
ESP32-S3-WROOM-1-N8R2	ESP32-S3R2	8	2 (Quad SPI)	
ESP32-S3-WROOM-1-N16R2	ESP32-S3R2	16	2 (Quad SPI)	
ESP32-S3-WROOM-1-N4R8	ESP32-S3R8	4	8 (Octal SPI)	
ESP32-S3-WROOM-1-N8R8	ESP32-S3R8	8	8 (Octal SPI)	
ESP32-S3-WROOM-1-N16R8	ESP32-S3R8	16	8 (Octal SPI)	
ESP32-S3-WROOM-1U-N4	ESP32-S3	4	0	18 × 19.2 × 3.2
ESP32-S3-WROOM-1U-N8	ESP32-S3	8	0	
ESP32-S3-WROOM-1U-N16	ESP32-S3	16	0	
ESP32-S3-WROOM-1U-H4 (105 °C)	ESP32-S3	4	0	
ESP32-S3-WROOM-1U-N4R2	ESP32-S3R2	4	2 (Quad SPI)	
ESP32-S3-WROOM-1U-N8R2	ESP32-S3R2	8	2 (Quad SPI)	
ESP32-S3-WROOM-1U-N16R2	ESP32-S3R2	16	2 (Quad SPI)	
ESP32-S3-WROOM-1U-N4R8	ESP32-S3R8	4	8 (Octal SPI)	
ESP32-S3-WROOM-1U-N8R8	ESP32-S3R8	8	8 (Octal SPI)	
ESP32-S3-WROOM-1U-N16R8	ESP32-S3R8	16	8 (Octal SPI)	

At the core of the modules is an ESP32-S3 series of SoC *, an Xtensa® 32-bit LX7 CPU that operates at up to 240 MHz. You can power off the CPU and make use of the low-power co-processor to constantly monitor the peripherals for changes or crossing of thresholds.

ESP32-S3 integrates a rich set of peripherals including SPI, LCD, Camera interface, UART, I2C, I2S, remote control, pulse counter, LED PWM, USB Serial/JTAG controller, MCPWM, SDIO host, GDMA, TWAI® controller (compatible with ISO 11898-1), ADC, touch sensor, temperature sensor, timers and watchdogs, as well as up to 45 GPIOs. It also includes a full-speed USB 1.1 On-The-Go (OTG) interface to enable USB communication.

Note:

* For more information on ESP32-S3 series of SoCs, please refer to *ESP32-S3 Series Datasheet*.

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1.3 Applications

- Generic Low-power IoT Sensor Hub
- Generic Low-power IoT Data Loggers
- Cameras for Video Streaming
- Over-the-top (OTT) Devices
- USB Devices
- Speech Recognition
- Image Recognition
- Mesh Network
- Home Automation
- Smart Building
- Industrial Automation
- Smart Agriculture
- Audio Applications
- Health Care Applications
- Wi-Fi-enabled Toys
- Wearable Electronics
- Retail & Catering Applications

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