

μES3 (MicroES3) - A Tiny ESP32-S3 Microcontroller Development Board

μES3 Product Details

1. Overview

μES3 is a high-performance, tiny microcontroller development board based on ESP32-S3 WROOM 1 N16R8 module. The board runs on LX7 Xtensa dual core 32-bit microprocessor with a maximum frequency of 240 MHz. The module has 16 MB flash memory and 8 MB PSRAM which is specifically targeted for memory intensive applications like AI, speech/audio and image processing.

The module is equipped with a PCB antenna trace which facilitates 2.4 GHz WiFi and Bluetooth (BLE) communication. Board programming is done via on-chip/native USB without using an external USB-UART bridge chip.

2. Applications

μES3 is an embedded edge category high performance device that is highly suited for:

- Offline AI/ML
- Neural network acceleration
- Speech/Voice recognition
- Face recognition
- USB On-the-Go (OTG)
- Human-machine interface (HMI)
- Smart IOT applications

Combined with edge category performance, the μES3 board is only tiny (2.7 x 2.4 cm) unlike other dev boards which makes it highly suitable for wearable applications too. μES3 board supports firmware development on ESP-IDF, Arduino IDE, Micro Python/Circuit Python and similar.

3. Board Specifications

Board dimension	2.7 x 2.4 cm
Processor	Xtensa Dual core 32-bit LX7 microprocessor
Max processor frequency	240 MHz
ROM/SRAM	384 KB ROM/512 KB SRAM on-chip
Flash Memory	16 MB
PSRAM	8 MB
Wireless Communication	2.4 GHz Wi-Fi (802.11b/g/n), Bluetooth 5.0 (BLE)
Antenna	On-board PCB antenna
USB Programming	USB-C port with native USB programming
GPIO Pins	14 pins with flexible IO configuration
Interface support	I2C, SPI, 12-bit ADC - 2 channels, Touch sensor, PWM, LCD, UART, USB 2.0 On-the-Go (OTG) support
Switches	On-board BOOT and RESET buttons
LEDs	Separate LEDs for power and control

4. μES3 Product Image

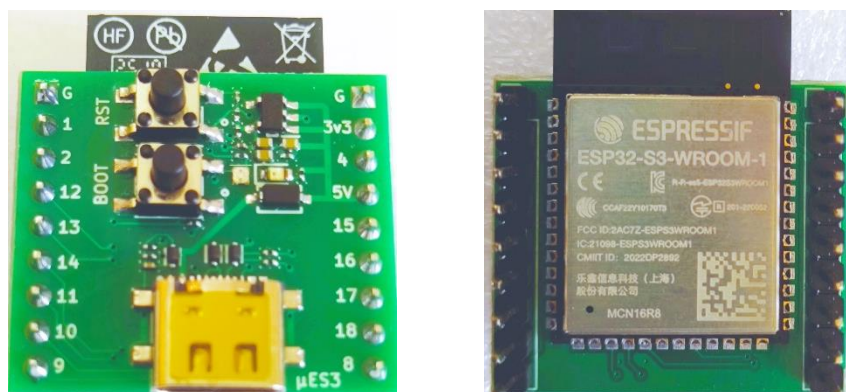


Fig. 1 Front and Back Images of μES3 Board

5. Pinout Diagram

Board dimension: 2.7 x 2.4 cm

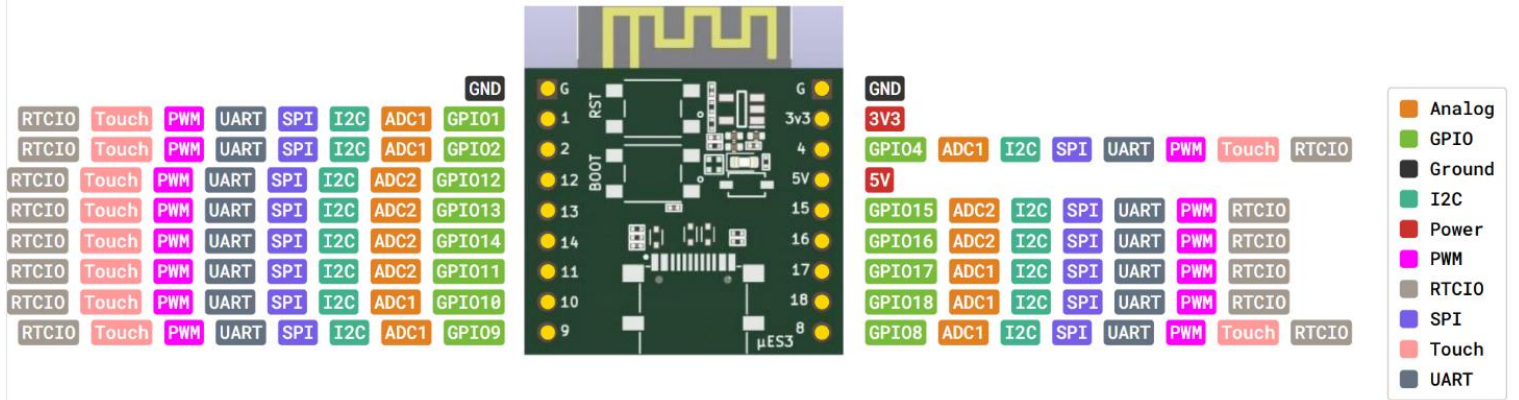


Fig. 2 μES3 Pin-out illustration

6. Description

μES3 has an on-board control LED which is connected to GPIO 5 for blinking and other control purposes. In addition to the control LED, there is a separate LED for power indication.

The current capability of the on-board LDO is 800 mA. The regulated output of LDO is exposed as 3.3V pin on-board which can be used to drive to external circuits if needed. The 5V pin on-board is the USB power pin that is shielded from VBUS of USB-C through a Schottky diode.

The USB-C peripheral provides power as well as programming of the chip. There is no on-board USB-UART chip and hence the programming/flashing is done directly via the native USB peripheral of ESP32-S3 SOC.

Pinout details and functionality of all exposed pins are shown in Fig. 2.

7. References

- ESP32-S3 Datasheet

https://www.espressif.com/sites/default/files/documentation/esp32-s3_datasheet_en.pdf

- ESP32-S3-WROOM-1 Datasheet

https://www.espressif.com/sites/default/files/documentation/esp32-s3-wroom-1_wroom-1u_datasheet_en.pdf

- ESP32-S3 Development Solutions

<https://documentation.espressif.com/en/documentList?c=ACS+Solution&c=ACK+Solution&c=ESP+Smart+Switch+Solution&c=ESP-Skainet&c=ESP+HMI+Smart+Displays&c=ESP-DSP&c=ESP-Jumpstart&c=ESP-TOUCH&c=ESP-SR&c=ESP-NOW+latest&c=ESP-NOW+v2.0&c=ESP-WHO+latest&c=ESP-WHO+v1.1.0&c=ESP-IoT-Solution+latest&c=ESP-IoT-Solution+v2.0&c=ESP-Drone&c=ESP-Brookesia&c=ESP-DL&c=ESP-BOX&c=ESP-IoT-Bridge&c=ESP32-Camera&s=ESP32-S3&eol=false>

- Native USB driver installation guide

<https://docs.espressif.com/projects/esp-techpedia/en/latest/esp-friends/get-started/try-firmware/try-firmware-usb-driver.html>

https://docs.espressif.com/projects/esp-iot-solution/en/latest/usb/usb_overview/usb_serial_jtag.html#id1

8. Arduino IDE programming

1. Download the latest version of Arduino IDE
2. Include the ESP board package link in the Additional board manager URL under File-Preferences “https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_dev_index.json”.
2. As next step, install the esp32 library from the “Tools-Board-Board Manager” by typing esp32 in the search box and choosing the latest library version.
3. Once ESP32 library is installed, connect the development board and choose the “**ESP32 S3 Dev Module**” under “Tools – Board – esp32”.
4. Upload the code and start working with the board.



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