



# ESP32 and Python

2025-03-27

PyVo - Brno



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# Espressif team

Juraj Michálek

- Wokwi and MicroPython on-line
- Thonny - IDE
- Jupyter notebook with ESP32
- How to build custom MicroPython with new extensions like SDL3

Eren Terzioğlu

- NuttX and Python

Andrej Šimkovič

- FriStack at UNIZA
- Reliability of ESP-NOW in IoT networks



# Developer Portal

[developer.espressif.com](https://developer.espressif.com)

GitHub: <https://github.com/espressif/developer-portal/>

The screenshot displays the Espressif Developer Portal's Blog section. At the top, the navigation bar includes the Espressif logo, the text "Developer Portal", and links for "Blog", "Workshops", "Events", and "Quick Links". A search icon is also present. The main content area is titled "Blog" and features a grid of article cards. Each card includes a featured image, a title, a date and duration, a list of tags, and a short introductory paragraph. The visible articles are: "Security in ESP RainMaker" (20 March 2025, 8 mins), "Espressif part numbers explained: A complete guide - Modules" (19 March 2025, 7 mins), "Working with ESP-IDF in CLion" (13 March 2025, 7 mins), "ESP32-H2 Upgrade: Enhanced Security and Protection" (12 March 2025, 2 mins), "ESP32 Undocumented Bluetooth Commands: Clearing the Air" (10 March 2025, 5 mins), and "Running Python on ESP32-S3 with NuttX" (7 March 2025, 8 mins).

**ESPRESSIF** Developer Portal Blog Workshops Events Quick Links

## Blog

**Security in ESP RainMaker**  
20 March 2025 · 8 mins  
ESP32 ESP-RainMaker Espressif IoT  
RainMaker  
This article provides a high level overview of the security architecture of the ESP RainMaker IoT platform, covering all aspects like device hardware and network security, client network security, authentication and access control, user-device mapping, cloud data security and certifications.

**Espressif part numbers explained: A complete guide - Modules**  
19 March 2025 · 7 mins  
ESP32 ESP32-S2 ESP32-S3  
ESP32-H2 ESP32-C3

**Working with ESP-IDF in CLion**  
13 March 2025 · 7 mins  
ESP32-S3 ESP-IDF CLion IDE  
Tutorial

**ESP32-H2 Upgrade: Enhanced Security and Protection**  
12 March 2025 · 2 mins  
Espressif has released ESP32-H2 v1.2, bringing significant cryptographic and hardware security improvements.

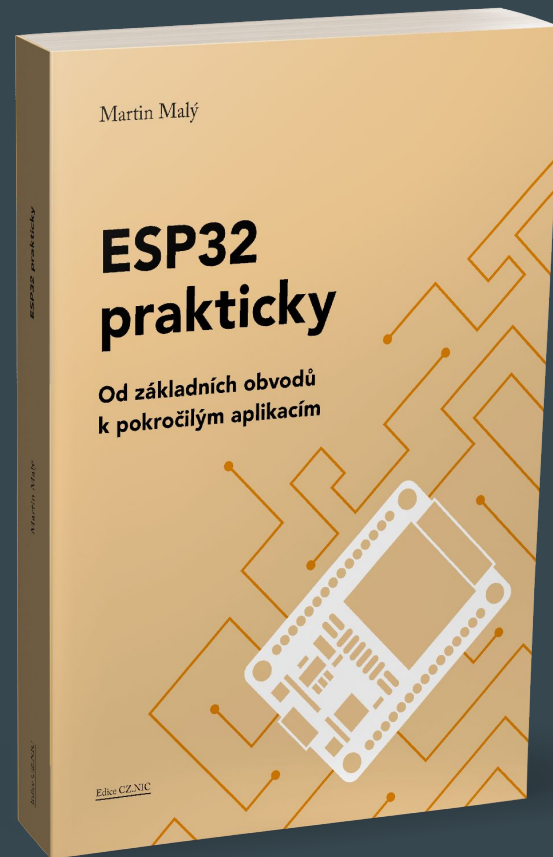
**ESP32 Undocumented Bluetooth Commands: Clearing the Air**  
10 March 2025 · 5 mins  
ESP32 Security IoT Bluetooth

**Running Python on ESP32-S3 with NuttX**  
7 March 2025 · 8 mins  
NuttX Apache Python ESP32-S3  
POSIX

# ESP32 prakticky

<https://espx.cz>

<https://github.com/espx-cz>



# wokwi.com/micropython

Contribute: <https://github.com/wokwi>

EDC24: [Flash Less, Do More: The Magic of Virtual Hardware](#)

Hint: Hit pause to see state of GPIOs

**WOKWI**  
World's most advanced ESP32 simulator

[Discord Community](#) [LinkedIn Group](#)

Online Embedded Python Simulator

Use Wokwi to simulate embedded MicroPython projects and test your hardware projects.

### Basic Examples

- ESP32 + OLED (SSD1306)
- Neopixel Ring Rainbow

### IoT Examples

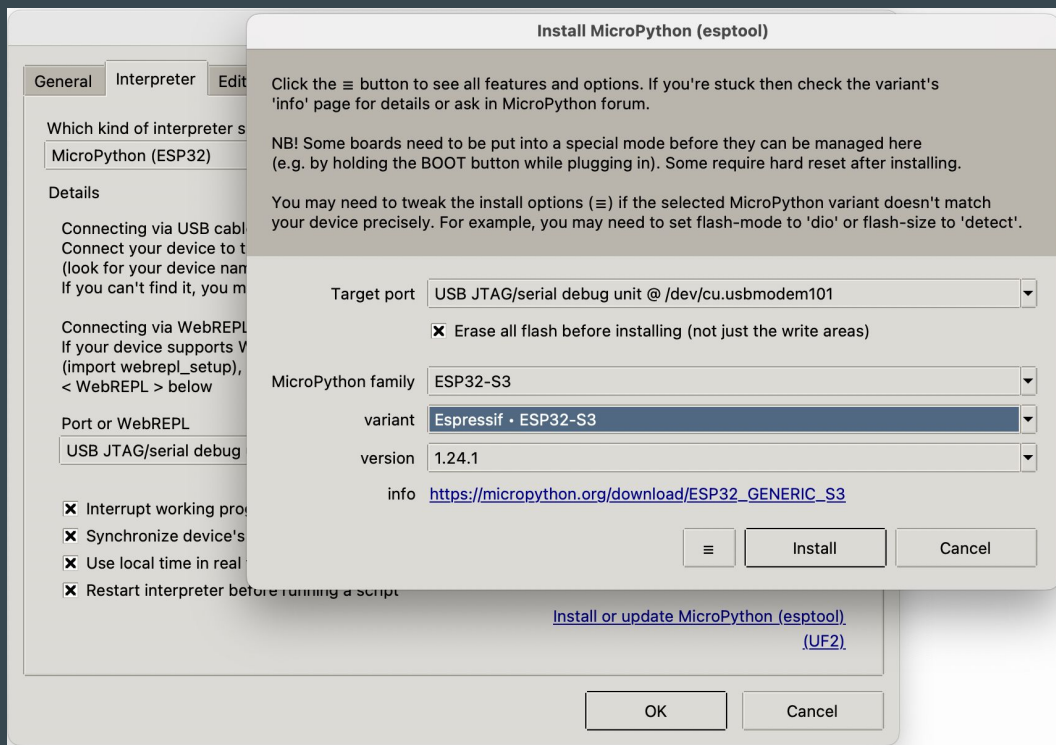
- MicroPython MQTT Weather Station
- MQTT NeoPixel Ring
- Jokes API Example

# Thonny

Python IDE for beginners

<https://thonny.org/>

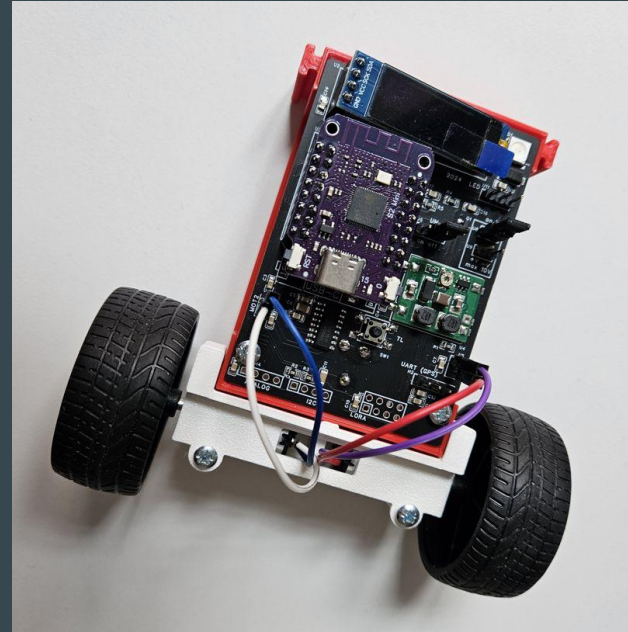
Flash MicroPython directly from IDE



# Racing Car in MicroPython

ESP32-S2 - WiFi controller car

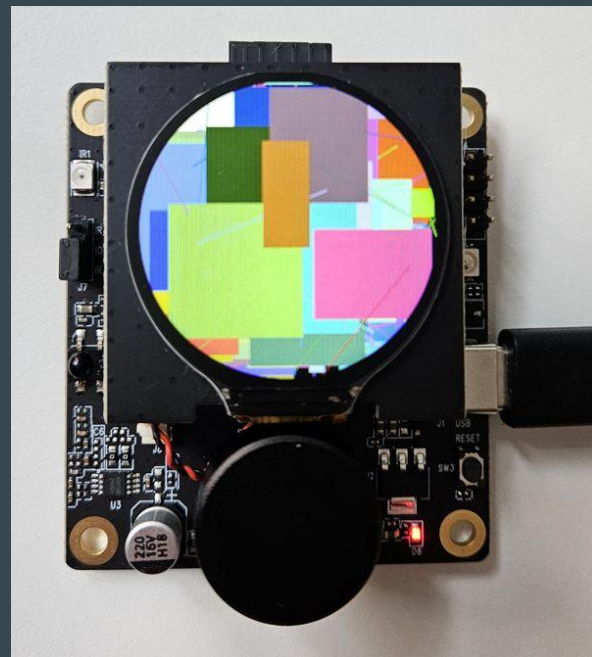
UNIZA



# Lines demo - ESP32-C3-lcdkit

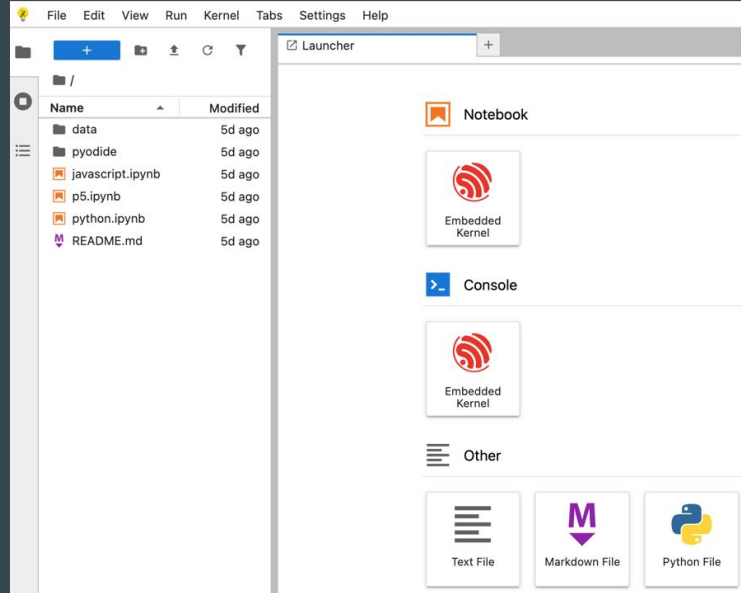
Graphical driver implemented in Python code

<https://github.com/russhughes/gc9a01py/blob/main/lib/gc9a01py.py>





# Jupyter Lite - MicroPython - ESP32



<https://espressif.github.io/jupyter-lite-micropython/lab/index.html>

# Expanding HW with esp-box

ESP32-S3-BOX-3

<https://www.espressif.com/en/news/ESP32-S3-BOX-3>

Open source

<https://github.com/espressif/esp-box>

Cool example:

[https://github.com/espressif/esp-box/tree/master/examples/esp\\_joystick/joystick\\_controller](https://github.com/espressif/esp-box/tree/master/examples/esp_joystick/joystick_controller)



# MicroPython - Conway's Game of Life

<https://github.com/georgik/esp32-conways-game-of-life-python>

Using MicroPython custom build with SDL3 API



# Custom build of MicroPython

Let's add some more functionality to MicroPython

- MicroPython - <https://github.com/micropython/micropython>
- Board Support Package (BSP) - <https://components.espressif.com/components?q=tags:bsp>
- SDL3 (port for ESP-IDF) - <https://components.espressif.com/components/georgik/sdl>
- ESP-IDF v5.3 - <https://github.com/espressif/esp-idf>

# The **ESP** Component Registry

Discover, download and publish components and examples for ESP-IDF



## Browse components

ALL Board Support Package

Compatible with ESP-IDF: v5.0 v5.1 v5.2 v5.3

By target: ESP32 ESP32-C2 ESP32-C3 ESP32-C5 ESP32-C6 ESP32-C61 ESP32-H2 ESP32-P4 ESP32-S2 ESP32-S3

## Featured

### espressif/mdns

v1.4.0

uploaded 2 months ago

mDNS

### lvgl/lvgl

v9.2.0

uploaded 1 month ago

LVGL - Light and Versatile Graphics Library

### espressif/esp-modbus

v1.0.16

uploaded 1 month ago

ESP-MODBUS is the official Modbus library for Espressif SoCs.

### joltwallet/littlefs

v1.14.8

uploaded 3 months ago

LittleFS is a small fail-safe filesystem for micro-controllers.

### espressif/arduino-esp32

v3.0.7

uploaded 23 hours ago

Arduino core for ESP32, ESP32-S and ESP32-C series of SoCs

### espressif/openai

v1.0.0

uploaded 5 months ago

OpenAI library compatible with ESP-IDF

### wolfssl/wolfssl

v5.7.2

uploaded 3 months ago

wolfSSL Embedded SSL/TLS Library

### slint/slint

v1.8.0

uploaded 1 month ago

Slint — declarative GUI toolkit

<https://components.espressif.com/>

Example: [https://components.espressif.com/components/espressif/i2c bus/](https://components.espressif.com/components/espressif/i2c_bus/)

# MicroPython - custom build

```
# ESP-IDF v5.3
```

```
./export.sh
```

```
# MicroPython repo + recursive submodules
```

```
cd ports/esp32
```

```
make BOARD=ESP32_GENERIC_S3 BOARD_VARIANT=SPIRAM_OCT
```

```
idf.py -B build-ESP32_GENERIC_S3_SPIRAM_OCT build flash monitor
```

# MicroPython - custom build

User Linux or macOS

Windows

- build on Windows suffers from build issues, reasonable alternative WSL2
- E.g. using Fedora Remix for WSL
- build of ESP-IDF app in WSL is way faster than build directly on Windows

# Exposing custom API to REPL - create binding

```
static mp_obj_t bridge_SDL_Init(mp_obj_t flags_obj) {  
  
    int flags = mp_obj_get_int(flags_obj);  
  
    if (!SDL_Init(flags)) {  
  
        mp_raise_msg_varg(&mp_type_RuntimeError, MP_ERROR_TEXT("SDL_Init Error: %s"), SDL_GetError());  
  
    }  
  
    return mp_obj_new_bool(true);  
  
}  
  
static MP_DEFINE_CONST_FUN_OBJ_1(bridge_SDL_Init_obj, bridge_SDL_Init);
```



# Bridging REPL and C call

```
static const mp_rom_map_elem_t sdl_module_globals_table[] = {  
  
    { MP_ROM_QSTR(MP_QSTR_SDL_Init), MP_ROM_PTR(&bridge_SDL_Init_obj) },  
  
    { MP_ROM_QSTR(MP_QSTR_SDL_INIT_VIDEO), MP_ROM_INT(SDL_INIT_VIDEO) },  
  
    ...  
  
};  
  
static MP_DEFINE_CONST_DICT(sdl_module_globals, sdl_module_globals_table);
```

# Register for import sdl3

```
const mp_obj_module_t sdl_user_cmodule = {  
  
    .base = { &mp_type_module },  
  
    .globals = (mp_obj_dict_t *)&sdl_module_globals,  
  
};  
  
  
// Module registration  
  
MP_REGISTER_MODULE(MP_QSTR_sdl3, sdl_user_cmodule);
```

# Exposing Rust to Python REPL

<https://github.com/georgik/micropython/commits/experimenta/nmea/>

Rust no\_std code - as ESP-IDF component (library)

Bridge code - similar like exposing API from C

Sample code:

- [https://github.com/georgik/esp32-conways-game-of-life-python/blob/main/rust-no\\_std-nmea/nmea.py](https://github.com/georgik/esp32-conways-game-of-life-python/blob/main/rust-no_std-nmea/nmea.py)

**NMEA altitude: 61.70**

**Data:**

- **Latitude: 53°21.6801' N**

- **Longitude: -7°29.6628' W**

**Tips**

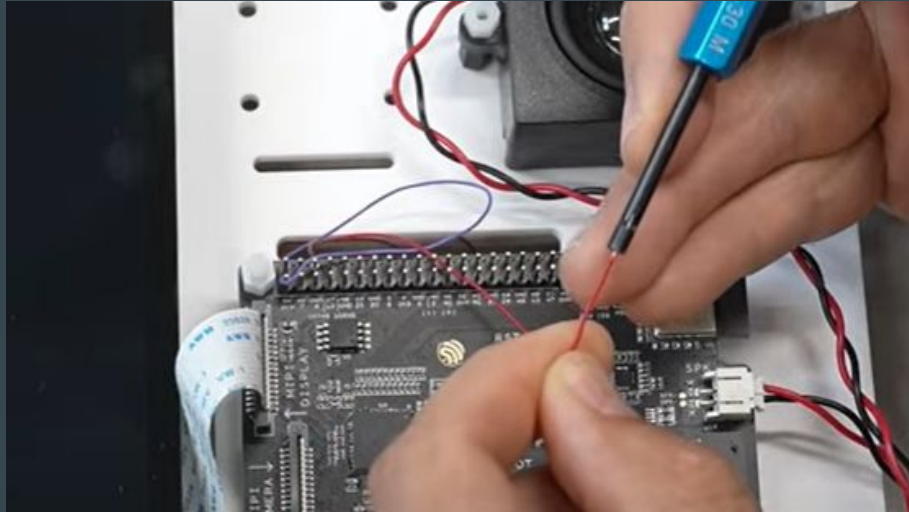
# How to “unbrick” ESP32

Many people incorrectly thinks that ESP32 is bricked, in many cases the custom firmware just does not receive UART or USB signals.

Solution: hold BOOT button and press RESET to switch to boot mode

After flashing, just press RESET to return to normal mode.

# Wire Wrap Tool



Espressif DevCon 2024 - Tips and Tricks

# flow3r

Powered by MicroPython

<https://flow3r.garden/>



# Espressif in Brno

Vlněna Office Park

Espressif Systems (Czech) s.r.o.

Přízova 3, 602 00 Brno

Czechia, Europe





# Espressif Developer Conference 2022-2024 - recording



<https://www.youtube.com/@EspressifSystems>

<https://devcon.espressif.com/>

# Embedded World 2026

Meet us in Nuremberg, Germany



**embeddedworld**

Exhibition&Conference

# Old games ported to ESP32-P4

OpenTyrian - <https://github.com/georgik/OpenTyrian/>

Doom / FreeDoom - <https://github.com/espressif/esp32-doom>

Quake 1 / LibreQuake - <https://github.com/espressif/esp32-quake>

