

# **ESP32-POE2**

## **User Manual**

**Document revision 2.3, August 2024**

**[www.olimex.com](http://www.olimex.com)**

# Table of Contents

Introduction to ESP32-POE2.....	3
ESP32-POE2 features.....	4
PoE standard.....	5
The differences between ESP32-POE2 and ESP32-POE-ISO:.....	6
Order codes for ESP32-POE2 and accessories:.....	7
HARDWARE.....	8
ESP32-POE2 layout:.....	8
ESP32-POE2 GPIOs:.....	9
Power sense and battery level measurement:.....	10
GPIO Buttons:.....	11
SD card connector (1-bit SD interface):.....	12
UEXT connector:.....	13
EXT1 connector:.....	14
POWER SUPPLY:.....	15
GPIOs:.....	15
ESP32-POE2 schematics:.....	16
ESP32-POE2 power supply:.....	17
UEXT connector:.....	18
DIMENSIONS.....	19
SOFTWARE:.....	20
Document Revision History.....	21

# Introduction to ESP32-POE2

[ESP32-POE2](#) is an upgraded version of the popular [ESP32-PoE](#) board with more power output capabilities. ESP32-POE2 is an IoT based on ESP32-WROVER-E WIFI/BLE/Ethernet development board with Power-Over-Ethernet feature. The [ESP32-POE2](#) allows 25W power negotiation and can provide 24V/12V/5V/3.3V to additional equipment connected to it.

The PoE in [ESP32-POE2](#) is handled by TPS2378 chip that is IEEE 802.3af-compliant, including pre-standard (legacy) PoE support.

The PoE powering requires at least 37V DC to operate successfully. The board takes power from the Ethernet cable and can be expanded with sensors and additional peripherals. Perfect solution for Internet-of-Things projects.

The board is considered Open Source Hardware, design files are released under CERN Open Hardware Licence Version 2 - Strongly Reciprocal. Design files can be found at our [GitHub](#).

Software is released under GPL V3 Licensee and documentation is released under CC BY-SA 4.

**+ Important notice:** [ESP32-POE2](#) has **no galvanic isolation** on Ethernet's power supply, this might be a problem for ground loops. This also means that when you program the board via the micro USB connector the Ethernet cable should be disconnected (if you have power over the Ethernet enabled)! Any board with own external power supply attached to ESP32-POE2 can be dangerous. Consider using Olimex [USB-ISO](#) to protect your computer and board from accidental short circuit.

## ESP32-POE2 features

- ESP32-WROVER-E-N4R8 - WiFi and bluetooth module with 4MB flash, 8MB PSRAM
- CE-RED and LVD certification
- Original design by OLIMEX Ltd
- Low power design - 200uA consumption in deep sleep
- Ethernet 100Mb interface with IEEE 802.3 PoE support
- USB-C connector for ESP32 programming
- MicroSD card working in 1 bit mode (3 more GPIOs)
- LiPo battery charger with LiPo battery connector
- Battery level monitor pin on ADC
- External power supply detection pin on ADC
- Total output for external circuits - 25W max, max power distributed as follows:
  - 0.75A at 24V or 1.5A at 12V (selectable by jumper);
  - 1.5A at 5V;
  - 1A at 3.3V.
- [UEXT](#) connector
- EXT connector
- User button
- Reset button
- PCB dimensions: (59 x 90)mm

## PoE standard

[ESP32-POE2](#) follow the original IEEE 802.3af PoE standard and provides up to 25 W of DC power (minimum 44 V DC and 350 mA). Only 23 W is assured to be available at the powered device as some power dissipates in the cables.

The board requires networking equipment that complies with IEEE 802.3af. It is **STRONGLY** recommended to use **isolated PoE equipment**.

## The differences between ESP32-POE2 and ESP32-POE-ISO:

ESP32-POE-ISO has limited output voltage range. There are only 5V and 3.3V outputs available, while ESP32-POE2 has also 12V DC or 24V DC.

[ESP32-POE2](#) is not galvanic isolated which means that it's not safe to connect it to other devices which use non isolated power supply.

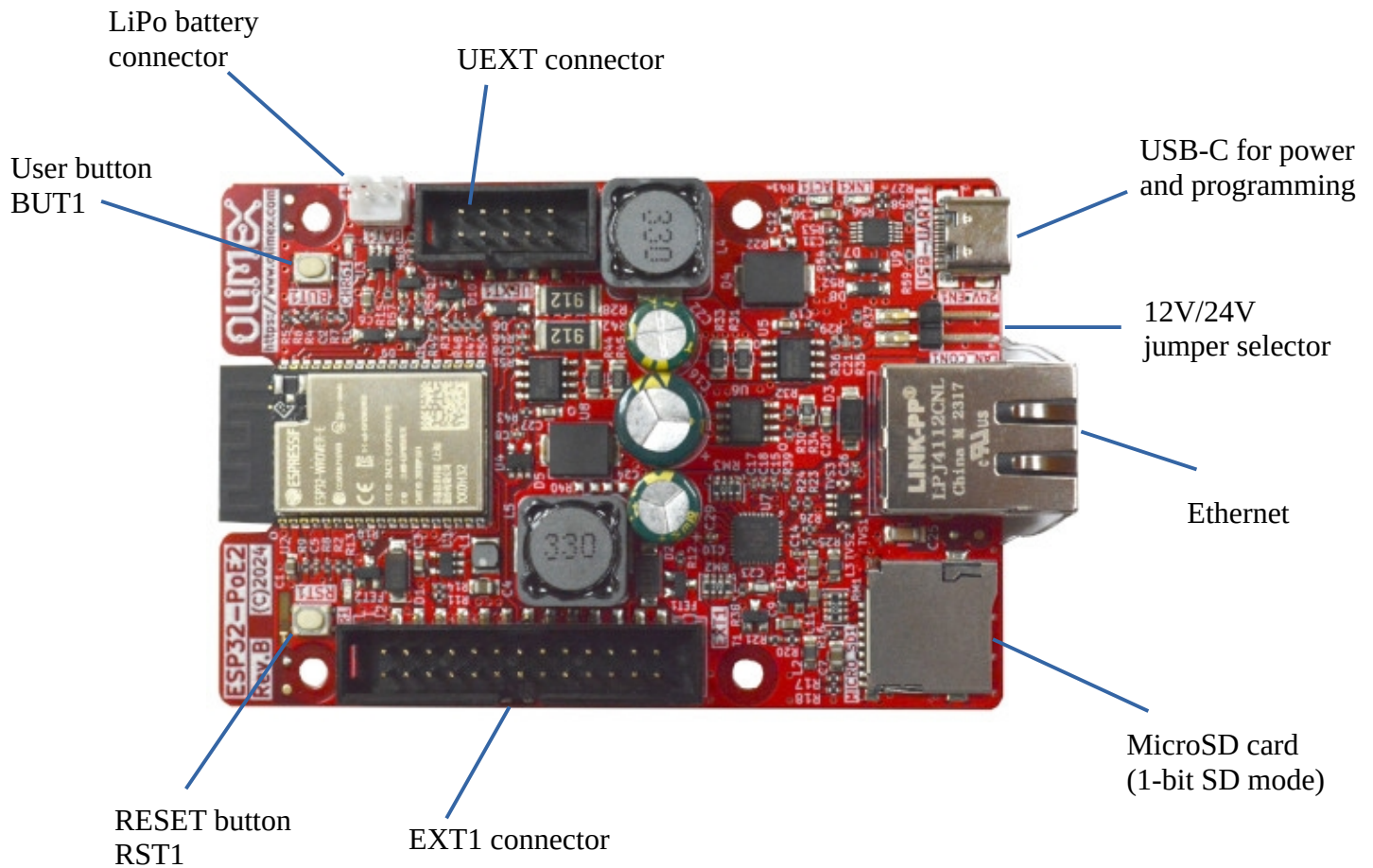
- + YOU SHOULD NOT CONNECT [ESP32-POE2](#) to computer's USB port while it's powered by Ethernet POE!!! If you connect USB while [ESP32-POE2](#) is powered by Ethernet you will damage the board or your computer or both. This also voids the warranty!
- + The board is susceptible to grounds loops. Make sure your PoE network equipment is isolated.
- + The most optimal setup for the board is being connected just to the PoE Ethernet cable and all attached peripherals are attached only to ESP32-POE2. No sources of power with different ground should be attached at the same time. Additional boards that are attached to ESP32-POE2 and are also attached to other sources of power supply (being powered from other sources) can also cause problems!

## Order codes for ESP32-POE2 and accessories:

<a href="#"><u>ESP32-POE2</u></a>	Commercial temperature grade 0-70C board with internal antenna
<a href="#"><u>USB-CABLE-A-TO-C-1M</u></a>	1 meter USB-A to USB-C cable for ESP32-POE2 power and programming
<a href="#"><u>Ethernet-CABLE-1M</u></a>	1 meter Cat 5e Gigabit Ethernet cable with not shielded RJ45 connectors
Box-ESP32-POE2-F	Plastic box for ESP32-POE2
<a href="#"><u>BATTERY-LIPO1400mAh</u></a>	Lipo battery 3.7V 1400mAh – note these batteries can be shipped only by ground so we can deliver only to EU destinations.
<a href="#"><u>UEXT modules</u></a>	Different sensors, relays, LCDs, RTC, GSM, GPS, accessories which can be connected to UEXT connector

# HARDWARE

## ESP32-POE2 layout:

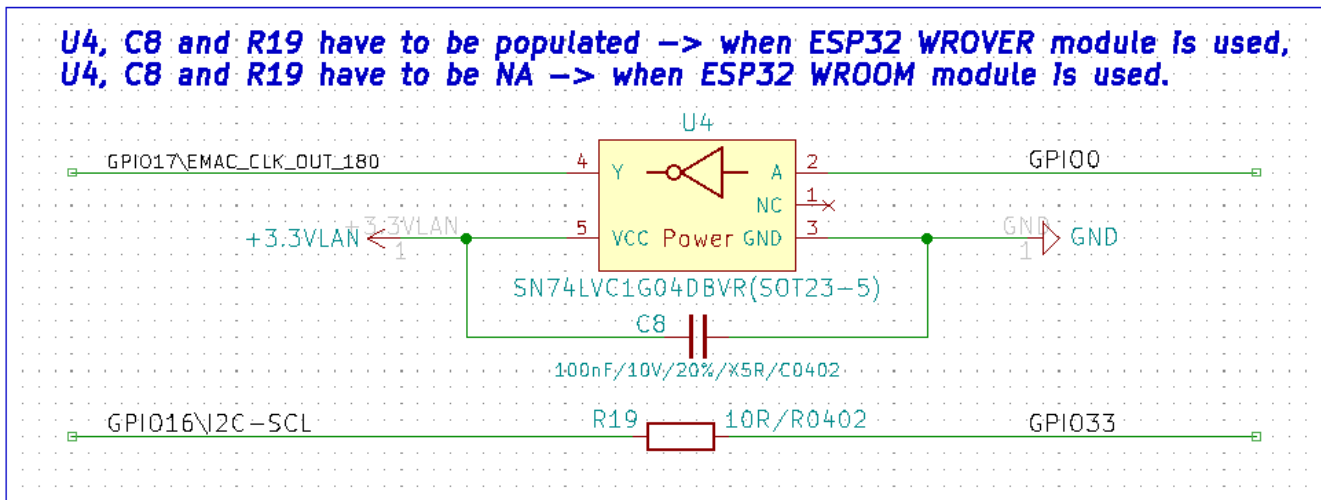




## ESP32-POE2 GPIOs:

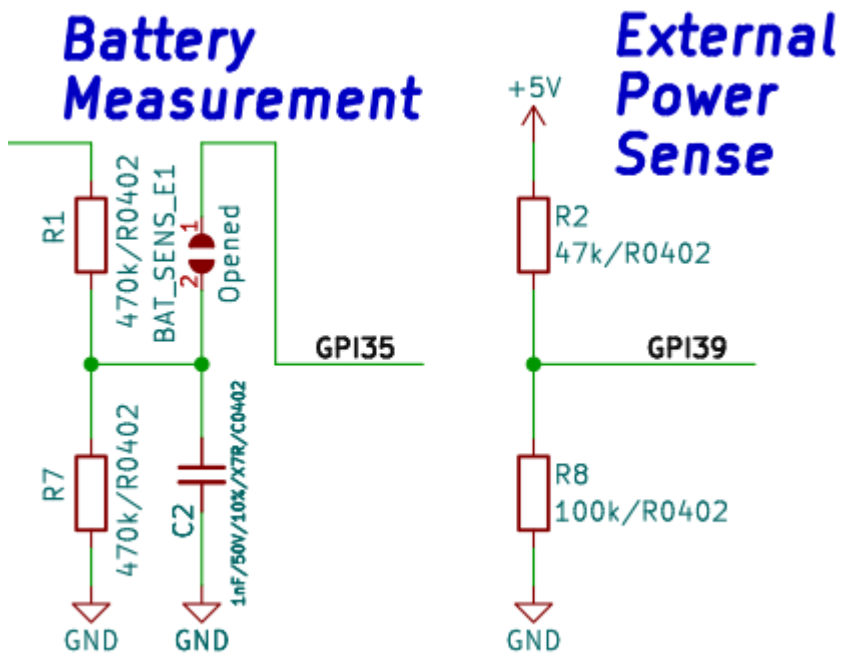
- + ESP32 chip and modules have very good pin multiplexing. You can define any free GPIO pin for almost any goal.
- + ESP32-POE2 uses WROVER chip, and it uses GPIO16 and GPIO17 for PSRAM.

ESP32-POE2 with WROVER module remaps GPIO16 to GPIO33 (so, for example, at UEXT pin #5 you have GPIO33 instead of GPIO16) and GPIO17 to GPIO0 (this is Ethernet clock source).



## Power sense and battery level measurement:

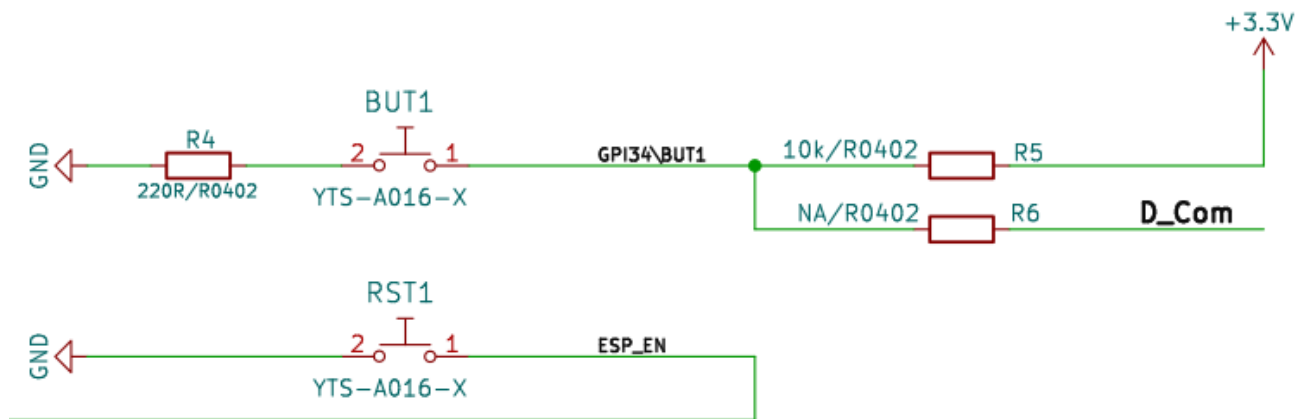
- External power sense available on GPI39
- Battery measurement disabled by default (for additional free GPIO), but can be enabled by SMT jumper change
- Close SMT jumper BAT\_SENS\_E1 to enable battery measurement on GPI35.



## GPIO Buttons:

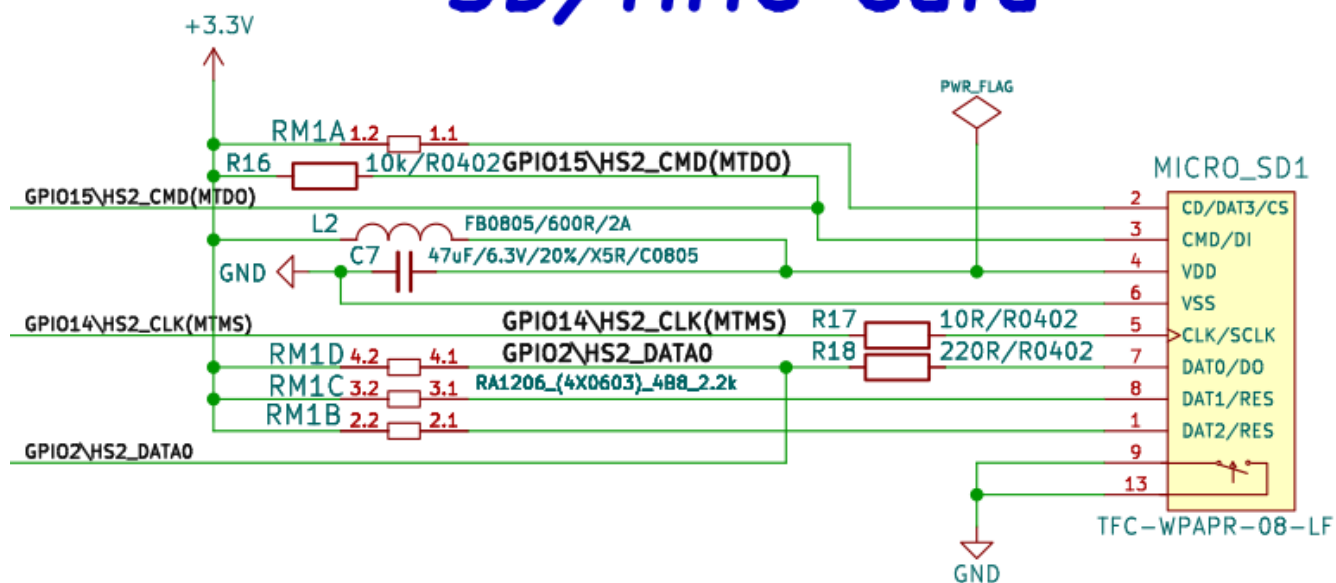
By default button BUT1 is user button since the board automatically enters bootloader mode. However, BUT1 can be configured as BOOT button if you solder R6 pads together (or if you solder 0R resistor in 0402 package on same R6 pads). BOOT button might be needed if you need to manually force boot mode.

# Buttons



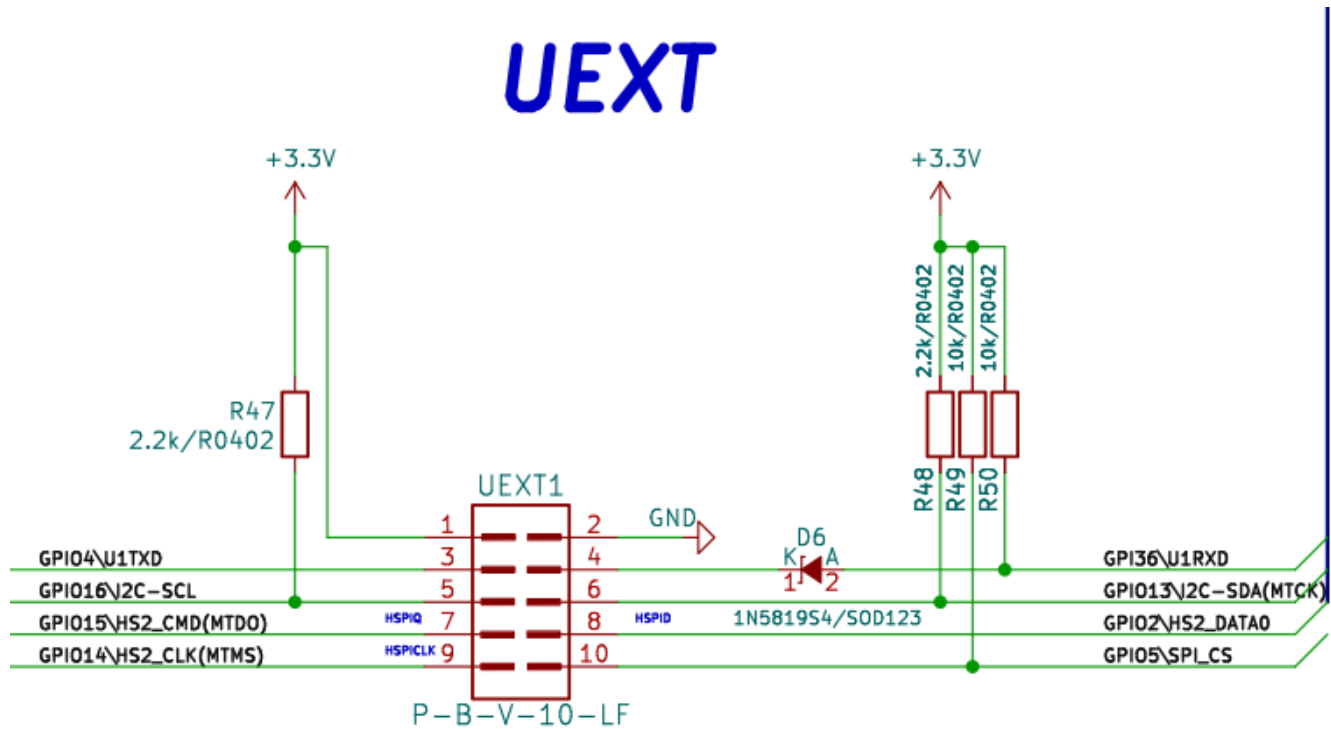
SD card connector (1-bit SD interface):

## SD/MMC Card

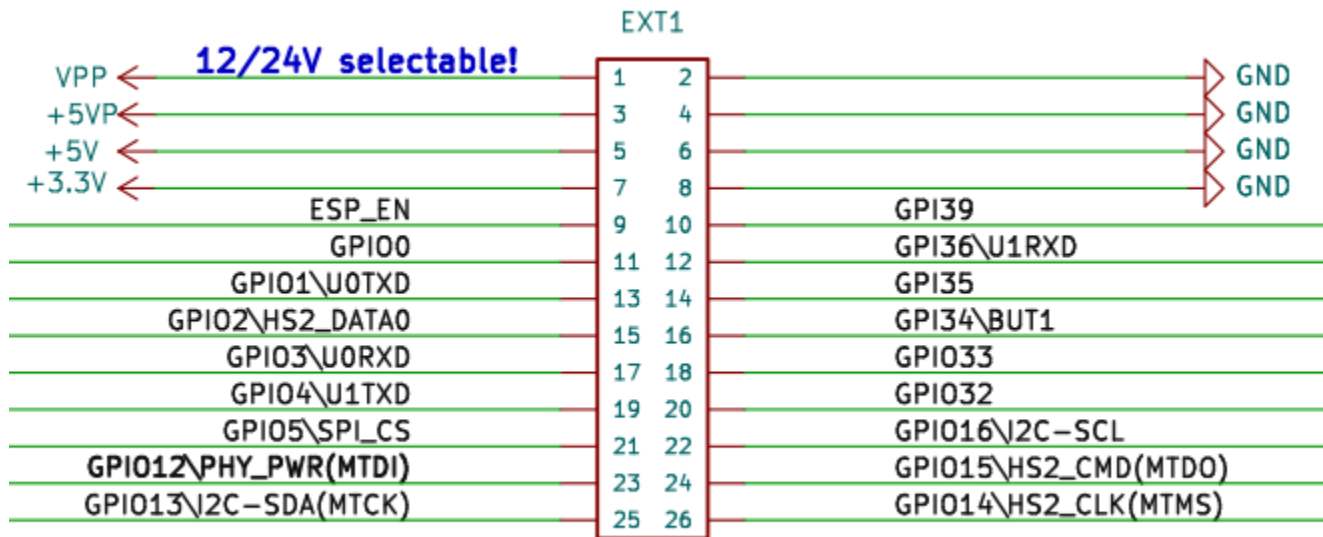


## UEXT connector:

Notice that GPIO16 is replaced by GPIO33 in boards with ESP32-WROVER-E module.



## EXT1 connector:



B-V-26-LF(GBH254SMT-26)

## POWER SUPPLY:

**VPP** selectable 12V/1.5A or 24V/0.75A output from PoE, depending on 24V\_E1 PTH jumper state

**+5VP** 5V/1.5A output from PoE

**+5V** 1. can be output or input;

2. when board is connected to USB or to Ethernet PoE this line can be used as output and power other circuits;

3. if you want to use as input i.e. to power the board from external 5V on this pin sure board is not connected to the USB!

**+3.3V** output which can source up to 0.5A @ 3.3V i.e. (1.65W)

## GPIOs:

**ESP\_EN** resets ESP32 module;

**GPIO0** is used for Ethernet clock;

**GPIO16, GPIO17** are used for the PSRAM;

**GPIO1** is used for the serial line and programming;

**GPIO2, GPIO14, GPIO15** are used for the SD-card, if no SD card is present these are free to use

**GPIO2, GPIO4, GPIO5, GPIO13, GPIO14, GPIO15, GPIO33, GPIO36** are shared on both UEXT and EXT1,2 headers so if you use them at one connector do not use at the other

**GPIO39** is used to measure external power supply voltage

**GPIO34** is connected to used button and have 10K pullup

**GPIO35** is free to use but can be connected to measure the LiPo battery voltage if SENS\_BAT\_E1 solder jumper

Notice that pins named GPI\* can only be inputs (unlike GPIO\*).

## ESP32-POE2 schematics:

[ESP32-POE2](#) latest schematic is on [GitHub](#)



## ESP32-POE2 power supply:

[ESP32-POE2](#) can be powered by 4 sources:

- Ethernet PoE
- USB-C connector
- LiPo battery
- EXT1 pin 5 (+5V) note that this signal is connected to USB 5V signal so when you power with this pin you should not connect the board to the USB!

Power consumption of [ESP32-POE2](#) is between 50 and 200mA depend on the operation mode.

A LiPo battery gets charged automatically from other sources of power with about 100mA.

When the LiPo battery is attached and external power supply is missing internal DCDC step-up converter and switching circuit automatically powers ESP32-POE2 from the battery. 1400mAh battery will provide about 8 hours of stand alone operation.

+ The LiPo battery connector is JST 2.0 mm connector and with Olimex's battery polarity. If you use batteries from other manufacturers please make PLUS and MINUS are connected properly as you may damage the board!!!

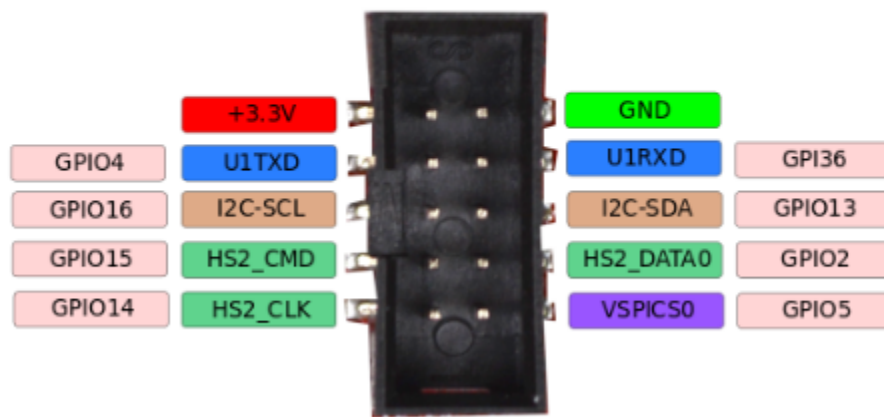
## UEXT connector:

UEXT connector stands for Universal EXTension connector and contain +3.3V, GND, I2C, SPI, UART signals. It is usually used to attach external modules without soldering.

UEXT is 0.1" 2.54mm step boxed plastic connector. All signals are with 3.3V levels.

## UEXT connector

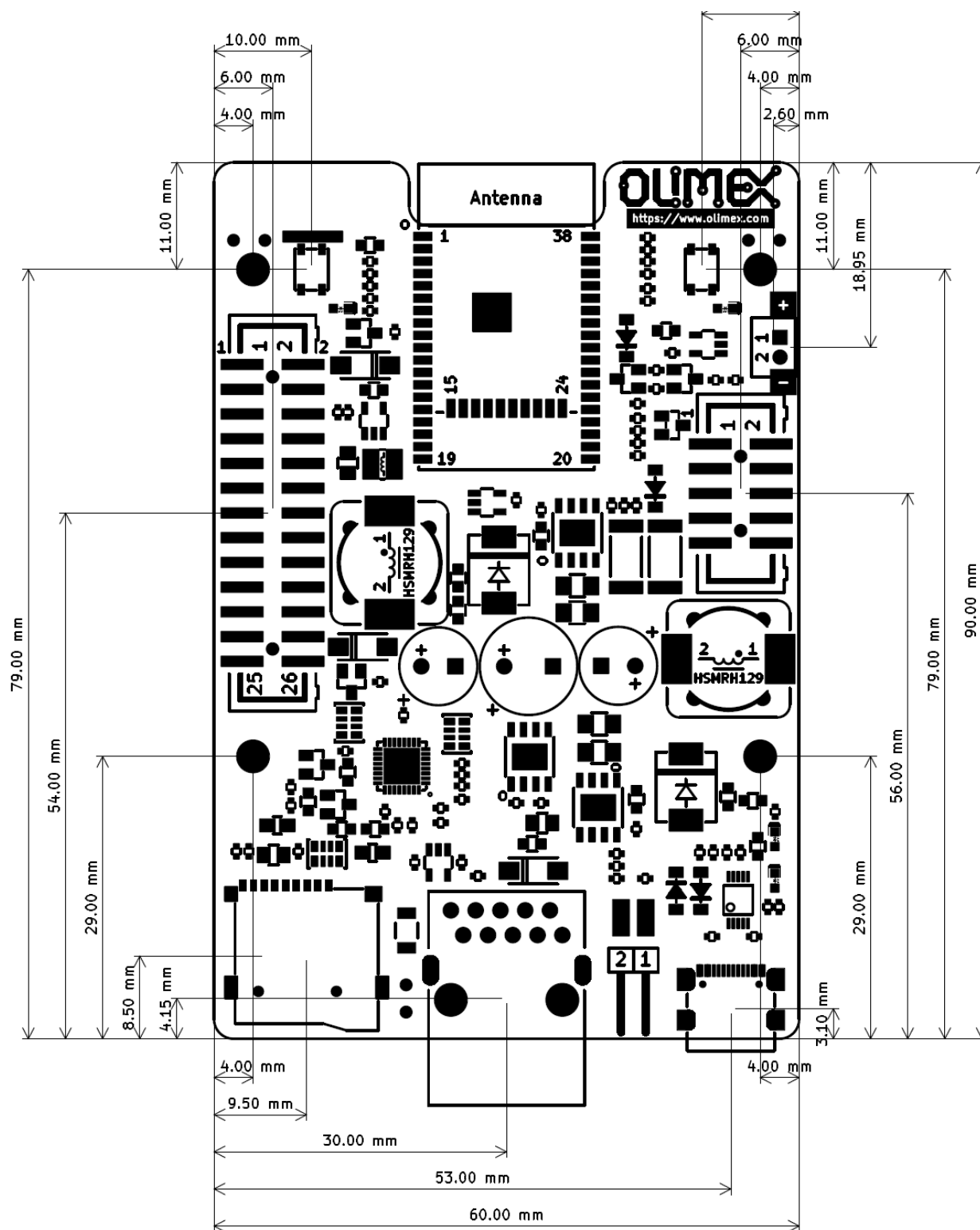
note it share same pins with EXT1 and EXT2



GPIO16 is replaced by GPIO33 in boards with ESP32 WROVER module.

Olimex has developed number of [MODULES](#) with this connector. There are temperature, humidity, pressure, magnetic field, light sensors. Modules with LCDs, LED matrix, Relays, Bluetooth, Zigbee, WiFi, GSM, GPS, RFID, RTC, EKG, sensors and etc.

# DIMENSIONS



# SOFTWARE:

[ESP32-POE2](#) uses same software as ESP32-POE which is very popular board and supported by

- [Espressif ESP-IDF](#)
- [MicroPython](#)
- [Arduino IDE](#)
- [Esphome](#)
- [PlatformIO](#)

In Arduino IDE make sure to enable the PSRAM in the board selector (when board is with ESP32-WROVER-E)!

For the Ethernet operation make sure to properly set the GPIO for the Ethernet clock and the pin for the power enable pin! GPIO12 is used as PHY power pin and GPIO0 is used as clock output pin (when board uses ESP32-WROVER-E module). Under Arduino defines should be like (must be defined before ETH.h):

```
#ifndef ETH_PHY_TYPE
#define ETH_PHY_TYPE ETH_PHY_LAN8720
#define ETH_PHY_ADDR 0
#define ETH_PHY_MDC 23
#define ETH_PHY_MDIO 18
#define ETH_PHY_POWER 12
#define ETH_CLK_MODE ETH_CLOCK_GPIO0_OUT
#endif

#include <ETH.h>
```

# Document Revision History

Revision 2.3 August 2024

Additional notes about software setup for Ethernet and board selection

---

Revision 2.2 May 2024

Fixed mistakes in GPIO descriptions

---

Revision 2.2 May 2024

Fixed mistakes in GPIO descriptions

---

Revision 2.1 May 2024

- Added dimensions

- Spelling improvements

---

Revision 2.0 May 2024

- Fixed wrong info about ESP32 module - the board is manufactured with WROVER module, not WROOM;

- Clarified warnings about isolation;

- Added some extra info about different GPIOs;

- Spelling improvements.

---

Revision 1.0 April 2024