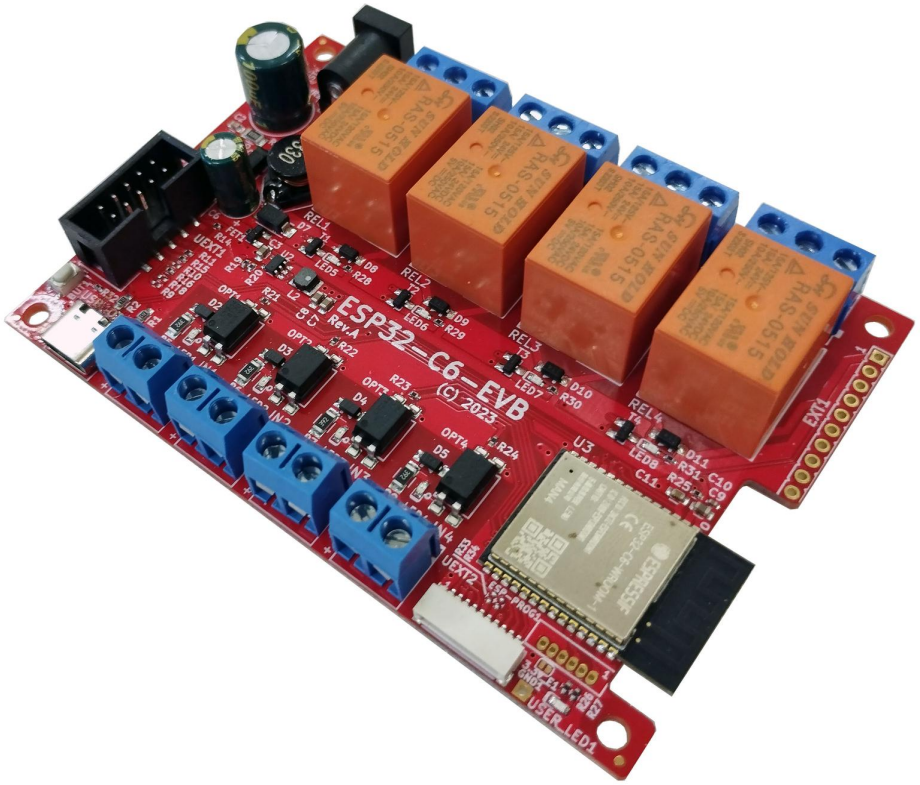



# ESP32-C6-EVB

## User Manual

**Revision 2.0 June 2024** **www.olimex.com**

# Table of Contents

# INTRODUCTION

## What is ESP32-C6-EVB?

ESP32-C6-EVB is a WIFI-enabled and Bluetooth-enabled development board that also has free GPIOs, analog, and digital inputs and outputs on boxed connector and more.

ESP32-C6-EVB uses ESP32-C6,  Espressif's first Wi-Fi 6 (IEEE 802.11ax) module.  It integrates 2.4 GHz Wi-Fi 6, Bluetooth 5 (LE), and the 802.15.4 low-rate wireless personal area network (LR-WPAN).

ESP32-C6-EVB is perfect for stand-alone usage but can also be attached to any existing hardware project to augment it with with 2.4GHz Wi-Fi 6 and Bluetooth LE 5.3 capabilities.

ESP32-C6-EVB requires only a USB cable for programming and powering; the board is equipped with USB type C connector, the type of cable used for charging most mobile phones.

ESP32-C6-EVB is an Open Source Hardware project, all CAD source files are available at our GitHub repositories. Files are released under CERN Open Hardware License Version 2 – strongly reciprocal and allows users to learn, study, edit, modify, manufacture, and sell same, or derivative products based on these designs. The only requirements is to open source their work under the same license.

The software environment for code development is free. There are a number of different software environments that can be used for the board.

Espressif chips and modules are very popular, with excellent chip documentation. The community around ESP chips is huge. This greatly eases both hardware and software development.

ESP32-C6-EVB is RoHS, REACH, CE, and UKCA compliant.

## ESP32-C6-EVB board features

ESP32-C6-EVB is Open Source Hardware design with the following features:

- ESP32-C6-WROOM-1-N4 module with 32-bit RISC-V single-core microprocessor, up to 160 MHz, Flash: 4MB, ROM: 320 KB, HP SRAM: 512 KB, LP SRAM: 16 KB
- USB-C connector for powering, programming, and JTAG debugging
- Power jack for optional external power (8-50)V DC
- Four Relays: 10A/240VAC
- Four opto-isolated inputs for DC voltage up to 30VDC
- Two UEXT connectors (0.1" step one and JST one)
- Extension GPIO connector
- Reset button
- User button
- Wide range of power supply: 8-50VDC
- Programming connector suitable for ESP-PROG
- Four mount holes
- Four rubber pads included

## Order codes and links for ESP32-C6-EVB and accessories:

| | |
|---|---|
| ESP32-C6-EVB | ESP32-C6 development and evaluation board with 4 relays, 4 opto-isolated inputs, and more. |
| CABLE-USB-A-C-1M | USB cable with USB type C and USB type A connectors, 1 meter |
| SY0612E | 12V DC power adapter for external powering, compatible with the power jack of ESP32-C6-EVB; notice that it comes with European-style socket plug, if you are located in UK or USB consider PWR-EU-EK or PWR-EU-US adapter |
| ESP-PROG | External USB-serial adapter that can be attached to ESP32-C6-EVB and used to program the ESP32-C6, or restore its firmware |
| CABLE-IDC10-15cm | 10-pin female-female UEXT cable |
| JW-200x10-FM | 10 pieces female-male jumper wires for breadboarding |
| JW-200x10 | 10 pieces male-male jumper wires for breadboarding |
| JW-200x10-FF | 10 pieces female-female jumper wires for breadboarding |
| UEXT modules | Different sensors, relays, LCDs, RTC, GSM, GPS etc accessories which can be connected to the UEXT connector |

## ESP32-C6 reference documents:

- ESP32-C6-WROOM-1U-N4 (the module used in ESP32-C6-EVB) datasheet:

https://www.espressif.com/sites/default/files/documentation/esp32-c6-wroom-1_wroom-1u_datasheet_en.pdf

- ESP32-C6 series (the chip in ESP32-C6-WROOM-1U-N4 and, respectively, in ESP32-C6-EVB) datasheet:

https://www.espressif.com/sites/default/files/documentation/esp32-c6_datasheet_en.pdf

- Getting started with ESP32-C6 and ESP-IDF software environment:

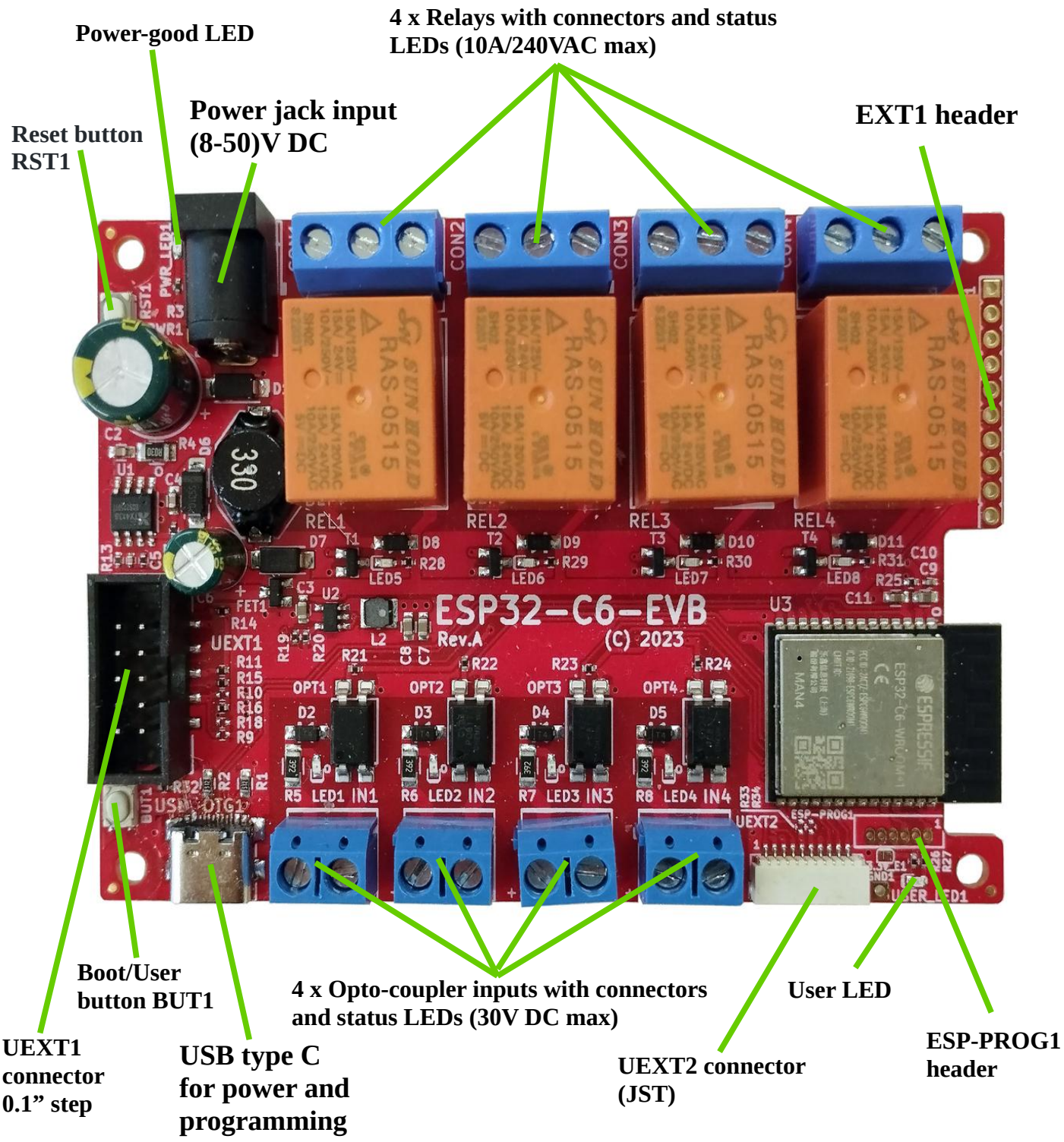
https://docs.espressif.com/projects/esp-idf/en/latest/esp32c6/get-started/

- Getting started with ESP32-C6 and ESP32 package for Arduino IDE and PlatformIO software environments:

https://docs.espressif.com/projects/arduino-esp32/en/latest/getting_started.html

# HARDWARE

## ESP32-C6-EVB layout

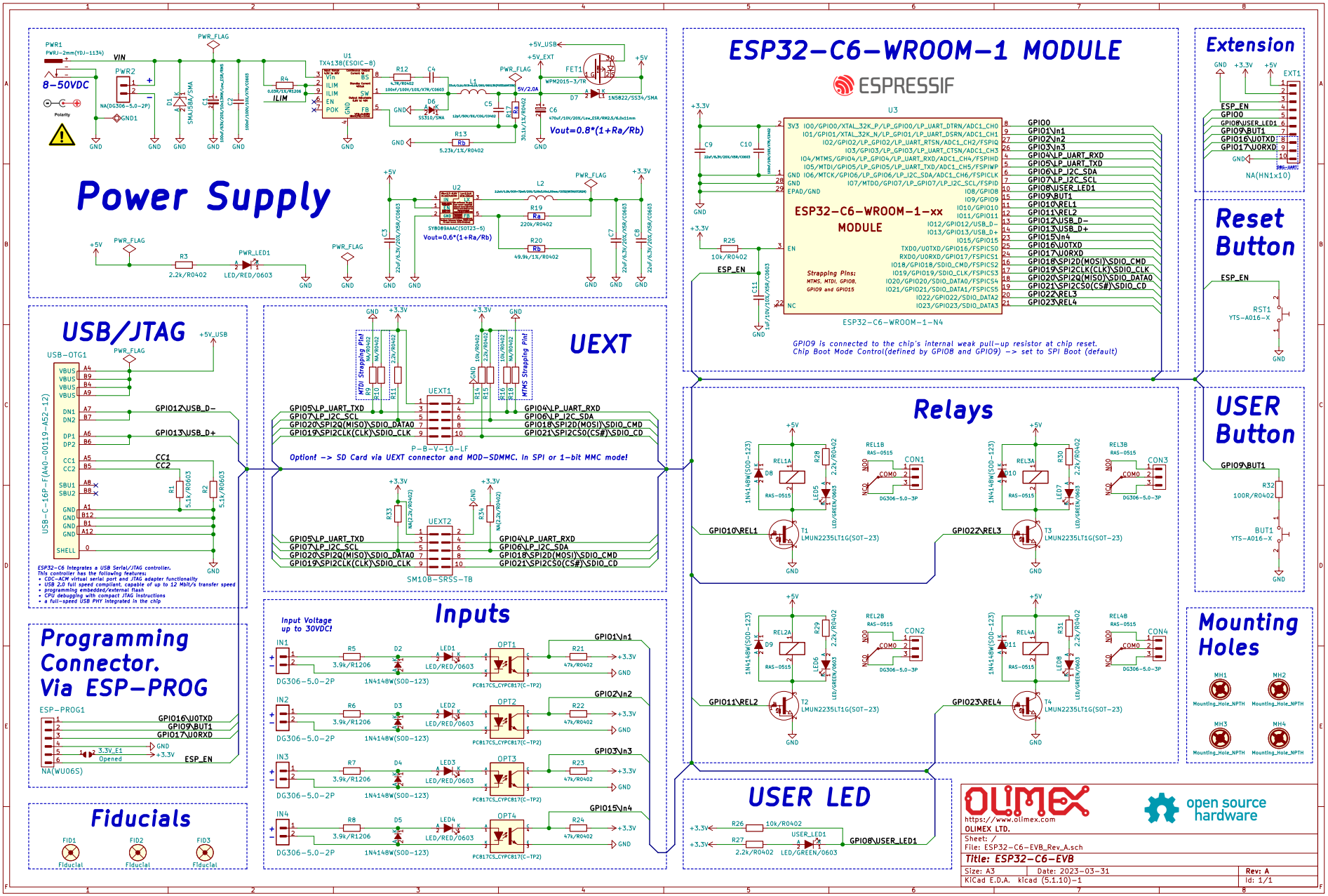


## ESP32-C6-EVB schematic

The latest ESP32-C6-EVB schematic is available on the next page.

You can also download PDF export from GitHub here

All design sources are available also at GitHub here


Power Supply
8–50VDC
VIN
Vout=0.8*(1+Ra/Rb)
Vout=0.6*(1+Ra/Rb)
ESP32–C6–WROOM–1 MODULE
ESPRESSIF
ESP32–C6–WROOM–1–xx
MODULE
ESP32–C6–WROOM–1–N4
GPIO9 is connected to the chip's internal weak pull–up resistor at chip reset.
Chip Boot Mode Control(defined by GPIO8 and GPIO9) –> set to SPI Boot (default)
Extension
Reset Button
USER Button
Mounting Holes
USB/JTAG
ESP32–C6 Integrates a USB Serial/JTAG controller.
This controller has the following features:
• CDC–ACM virtual serial port and JTAG adapter functionality
• USB 2.0 full speed compliant, capable of up to 12 Mbit/s transfer speed
• programming embedded/external flash
• CPU debugging with compact JTAG instructions
• a full–speed USB PHY integrated in the chip
UEXT
Option! –> SD Card via UEXT connector and MOD–SDMMC. In SPI or 1–bit MMC mode!
Relays
Programming Connector. Via ESP–PROG
Inputs
Input Voltage up to 30VDC!
USER LED
Fiducials
OLIMEX
https://www.olimex.com
OLIMEX LTD.
open source hardware
Sheet: /
File: ESP32–C6–EVB_Rev_A.sch
Title: ESP32–C6–EVB
Size: A3
Date: 2023–03–31
Rev: A
KiCad E.D.A. kicad (5.1.10)–1
Id: 1/1

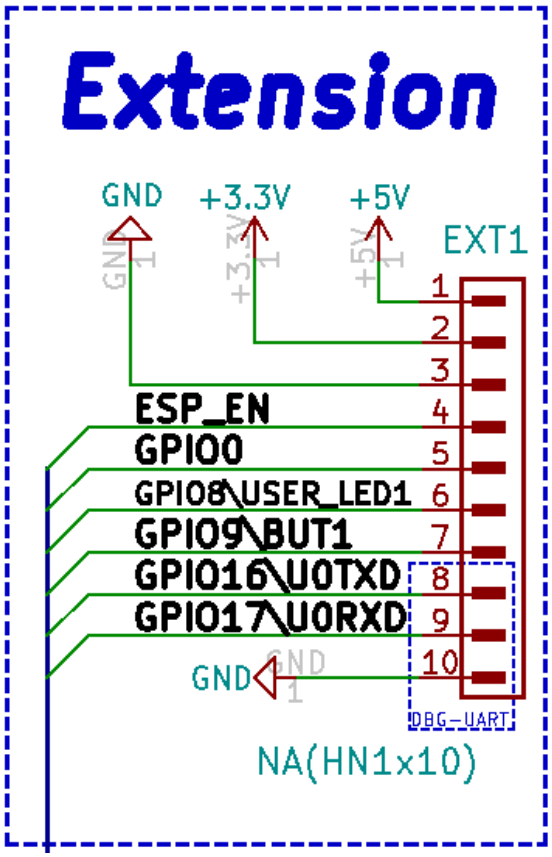
## ESP32-C6-EVB power supply and consumption:

ESP32-C6-EVB can be powered by 3 sources:

- USB-C connector;
- Power jack connector;
- EXT1.pin1 (+5V) note that this wire is connected to the 5V of the USB so when you power ESP32-C6-EVB from EXT1.pin1 – you should not have USB cable attached at the same time!!!

The typical power consumption is under 1W. Current consumption of ESP32-C6-EVB is approximately 0.06A when powered by 12V DC (applied to the power jack).

## EXT1 connector (GPIO)




**EXT1 pin #1** is +5V pin; it is usually used as output you can also power the board from this pins **BUT ONLY IF** the USB-C is not connected! It must be regulated 5V power supply, applying more than 5V will damage the board;

**EXT1 pin #2** is +3.3V DC output, it is not recommended to be used as input since you can't fully power the board with 3.3V DC (relays require 5V DC);

**EXT1 pin #3, EXT1 pin #10** are GND pins, the board has common ground;

**EXT1 pin #4** is ESP_EN also known as reset;

**EXT1 pin #5** is GPIO0, which a free pin;

**EXT1 pin #6** is GPIO8\USER_LED1 – wired to GPIO8, notice that the user LED is on the same wire

**EXT1 pin #7** is GPIO9\BUT1 – wired to GPIO9, notice that the button is on the same wire

**EXT1 pin #8 and EXT1 pin #9** are GPIO16\U0TXD and GPIO16\U0RXD they can be used for attaching external USB-serial converter (like ESP-PROG, USB-SERIAL-CABLE-M, or BB-CH340T) to debug the board; same pins are also routed to the ESP-PROG1 header.

**All GPIOs operate at +3.3V levels. This means you should not connect signals with voltage higher than 3.3V to these ports as this will damage the board.**

## UEXT connectors

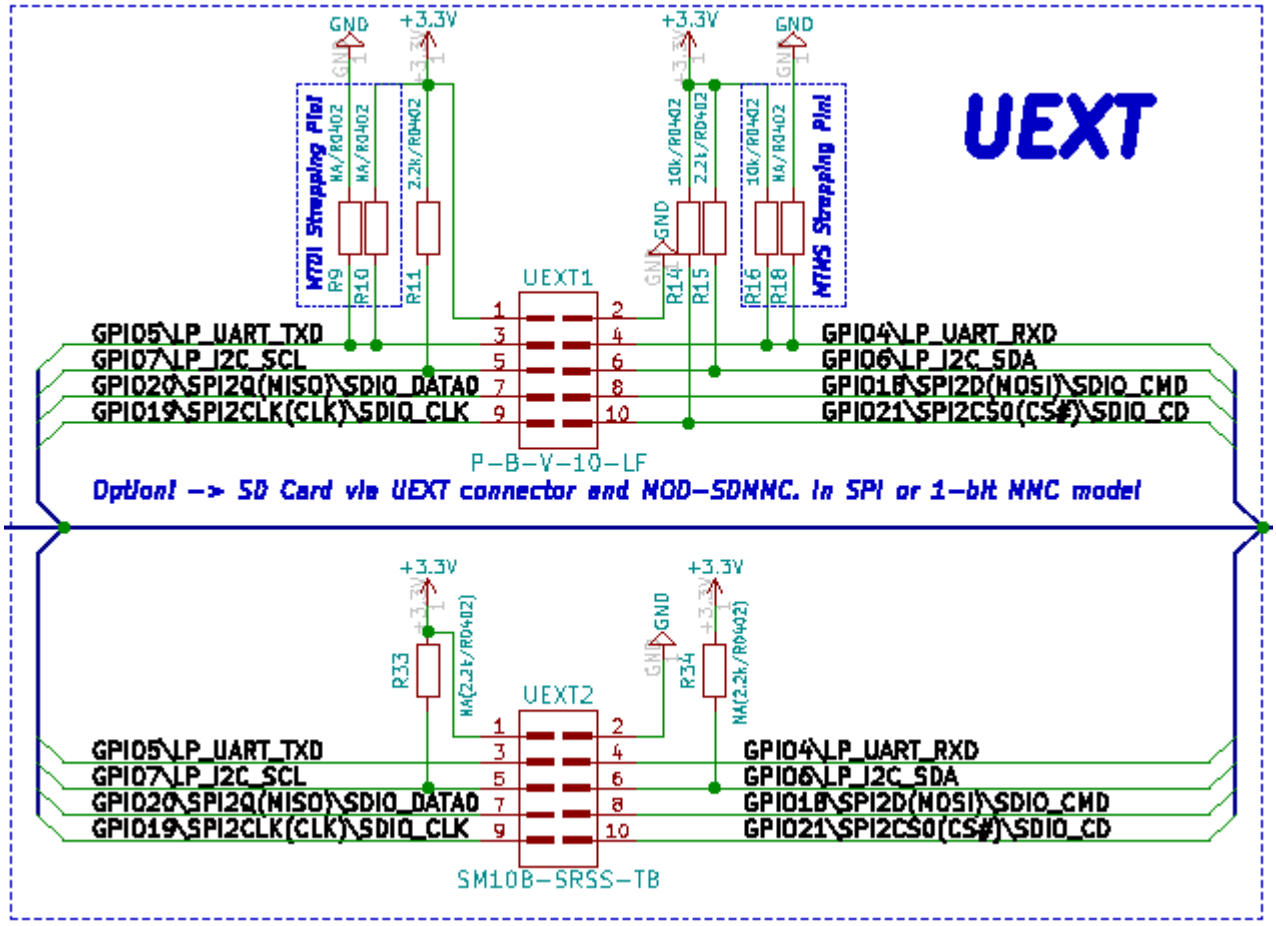
UEXT connector stands for Universal EXTension connector and contains +3.3V output and GND power wires, and I2C, SPI, UART data signals. All signals are at 3.3V levels.

ESP32-C6-EVB has two UEXT connectors – UEXT1 and UEXT2, they have the same signals just different connector.

UEXT1 uses 0.1” 2.54mm step 2-row boxed plastic connector.

UEXT2 uses the smallest pUEXT which is 1.0mm single row JST connector.

Excerpts for UEXT1 and UEXT2 connectors can be seen below:




Olimex has developed number of extension MODULES compatible with connector UEXT1. There are temperature, humidity, pressure, magnetic field, light sensors. Modules with LCDs, extra GPIOs, LED matrices, relays, Bluetooth, GSM, GPS, RFID, RTC, EKG, etc.

If you decide to use UEXT2 you might need adapter for the connector pUEXT.  Expect adapter boards and wires for the JST UEXT2 connector.

## Relays

The board has 4 electro-mechanical relays for analog output, each relay has own status LED. Relay connectors have Normal open, Normal closed, and Common contacts.

Relay REL1 is connected to **GPIO10**
Relay REL2 to **GPIO11**
Relay REL3 goes to **GPIO22**
Relay REL4 to **GPIO23**

## Inputs

The board has 4 optocouplers for analog input and each input has own status LED. The inputs have + and – printed under the connector – make sure to first check the polarity or you might damage the board.

Opto OPT1 is connected to **GPIO1**
Opto OPT2 goes to **GPIO2**
Opto OPT3 is routed to **GPIO3**
Opto OPT4 is connected to **GPIO15**

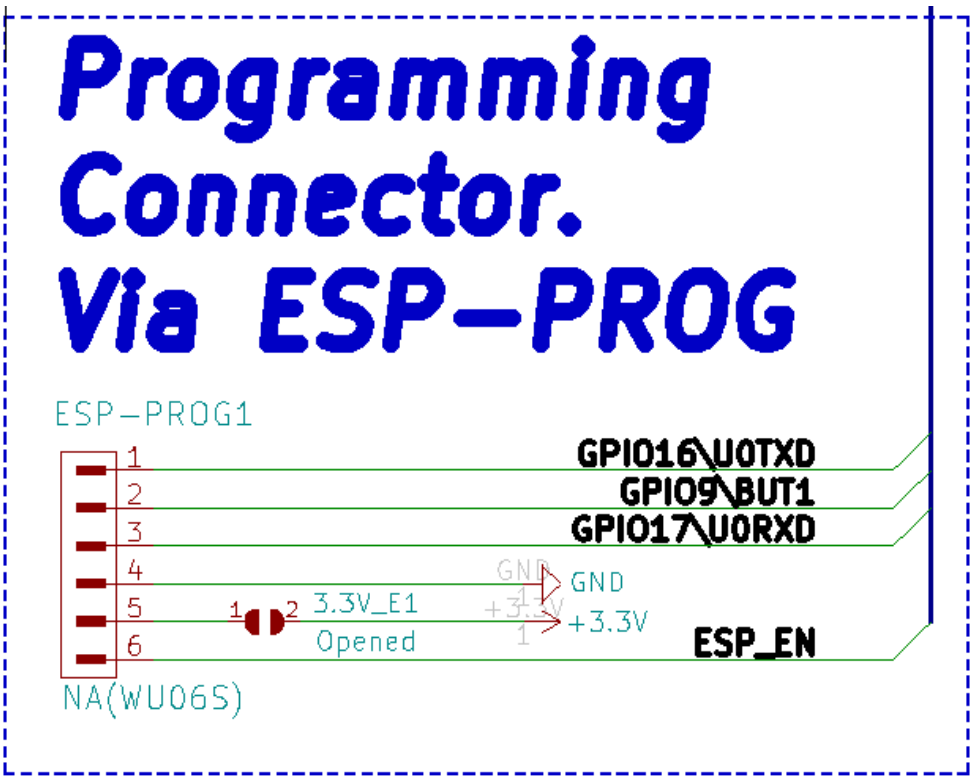
## User LED and button BUT1

The board has user LED and a button that can be used as boot button but also can be used as user button after initial boot sequence.

LED is connected to GPIO8
Button BUT1 is connected to GPIO9

## ESP32-PROG header

Used to program the board with external serial-USB programmer like  (like ESP-PROG)




## Jumper 3.3V_E1

ESP32-C6-EVB has a single SMT jumpers on-board. SMT jumpers are pads that can be separated (open) or soldered together (closed) to alter the hardware connections of the board and alter the behavior. The SMT jumpers require basic soldering tools and experience, to separate them you need to cut between the pads and to close them you need to solder the pads together. SMT jumpers can also be used for measuring and testing purposes.

Typically you don’t need to change the positions of the jumpers to use the board. It is not recommended to alter the SMT jumpers unless you know exactly how they alter the board.

**3.3V_E1** – enable 3.3V input on pin #5 of ESP-PROG1 connector – risky to leave 3.3V on the ESP-PROG1 connector, this might lead to short-circuit, if the board is already powered and you attach ESP-PROG.

**Default state:** Open (no 3.3V on pin #5 of ESP-PROG1 connector).

# SOFTWARE

## First time start up or how to program the board

The first time setup is pretty straight-forward and the general approach is the following:

1) Install compatible software on your computer (your computer should meet the requirements of the software); the official and recommended software is ESP-IDF; but you can also use ESP32 package for Arduino IDE

2) Attach the ESP32-C6-EVB to the computer via USB cable, the cable needs to have USB type C connector at one end and usually USB type A at the other to fit your computer; a lot of devices use similar cables so you might already have such cable at home;

3) Force the board in upload/bootloader mode manually:

- Press and hold button BUT1

- Press and release button RST1

- Release button BUT1;

4) Download code. If you are unhappy with the default demos. Maybe check our ESP-IDF demo software for the relays, user LED, button – Olimex ESP32-C6-EVB demo code and there is some extra info about it here in this text file;

5) After download is complete you might need to reboot the board to have the user code execute. Future downloads would require entering upload/bootloader mode again (refer to 3).

## Olimex tested firmware and examples

These can be found in the repository here:

https://github.com/OLIMEX/ESP32-C6-EVB

# DOCUMENT REVISION

**Revision 2.0 June 2024**

- minor improvements

- added links to ESP32 package for Arduino

**Revision 1.0 August 2023**

- initial release