STEMinds

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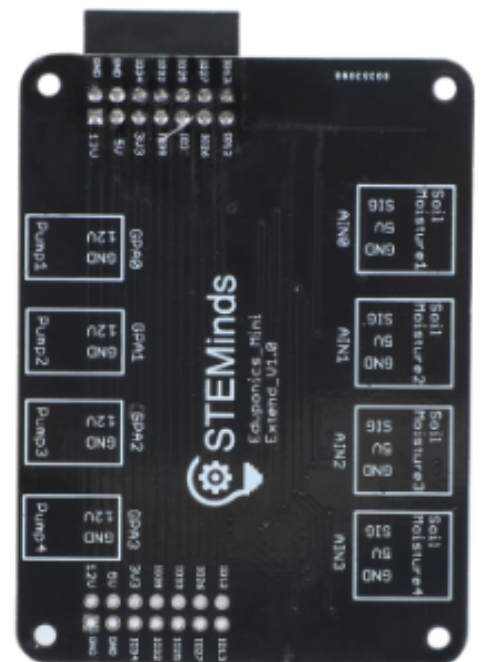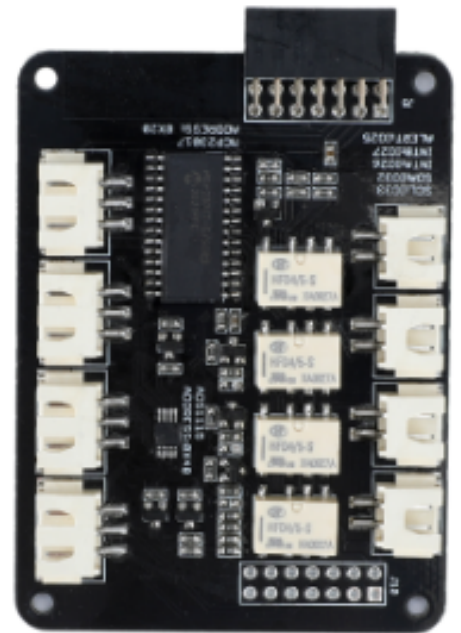## Eduponics Mini Extension board V1.0
## Data-sheet

# Eduponics Mini Extension board V1.0

The STEMinds Eduponics Mini extension board allows to extend the already existing capabilities of the Eduponics Mini Dev board. The Extension board includes extra 4 analog input and extra 4 relay output to control lights, pumps and receive data from sensors such as pH, EC and many more.

The Board integrates super low power capabilities with internal MOSFETs that can be turned on/off accordingly, the board is based on the I2C protocol and requires only 2 wires to operate.



## Features

* Compatible with the Eduponics mini dev board

* Compatible with Arduino / Raspberry Pi / other boards

* ADS1115 4 channel accurate ADC chip

* MCP23017 I2C 8 channel IO extension

* Control IO power individually (i.e allows to use EC and PH at the same time without conflict)

* Board power/shutdown using IO12, low power consumption.

# ADS1115

For microcontrollers without an analog-to-digital converter or when you want a higher-precision ADC, the ADS1115 provides 16-bit precision at 860 samples/second over I2C.

The chip can be configured as 4 single-ended input channels, or two differential channels. As a nice bonus, it even includes a programmable gain amplifier, up to x16, to help boost up smaller single/differential signals to the full range.

We like this ADC because it can run from 2V to 5V power/logic, can measure a large range of signals and its super easy to use. It is a great general purpose 16 bit converter.

Interfacing with the chip is done via I2C. The address can be changed to one of four options, so you can have up to 4 ADS1115's (extension boards) connected on a single 2-wire I2C bus for 16 single ended inputs

**Some features the ADS1115 has:**

- Resolution: 16 Bits.
- Programmable Sample Rate: 8 to 860 Samples/Second.
- Power Supply/Logic Levels: 2.0V to 5.5V.
- Low Current Consumption: Continuous Mode: Only 150µA Single-Shot Mode: Auto Shut-Down.
- Internal Low-Drift Voltage Reference.
- Internal Oscillator.
- Internal PGA: up to x16.

# MCP23017

The MCP23017 uses two i2c pins (these can be shared with other i2c devices), and in exchange gives you 8 general purpose pins. You can set each of 4 pins to be input, output, or input with a pull-up. There's even the ability to get an interrupt via an external pin when any of the inputs change so you don't have to keep polling the chip.

The MCP23017 on the extension board is wired directly to 4 relays which means it cannot be modified to use independently, the first 4 channels of the MCP23017 chipset are used to control each of the 4 relays and the rest 4 channels are used to control the MOSFETs to turn on / off the power for the ADS1115 sensors.

By combining this ability it allows super low consumption and powering multiple sensors without interruption (i.e ph and EC together, each time we use one of the sensor we will need to turn on / off the MOSFET)

**Some features of the MCP23017:**

- 16-bit input/output port expander with interrupt output.
- Cascadable for up to 8 devices on one bus.
- 25mA sink/source capability per I/O.
- Supports 100kHz, 400kHz and 1.7MHz I2C™Compatible compatible modes.

# Useful applications

* Extending the abilities of Eduponics mini board (or any other board such as Raspberry, Pi, Arduino) with extra 4 highly accurate analog input and 4 digital output relays.

* Control analog sensors using Raspberry Pi (and other boards that don't support ADC).

* Low power applications that require IDLE time.

* Using multiple sensors at once that could conflict (such as pH and EC together)

## Support & Documentation

STEMinds offers complete support and documentation, the documentation is officially available at wiki.steminds.com and the software is open source and available at the official STEMinds GitHub repository: https://github.com/steminds/eduponics-mini
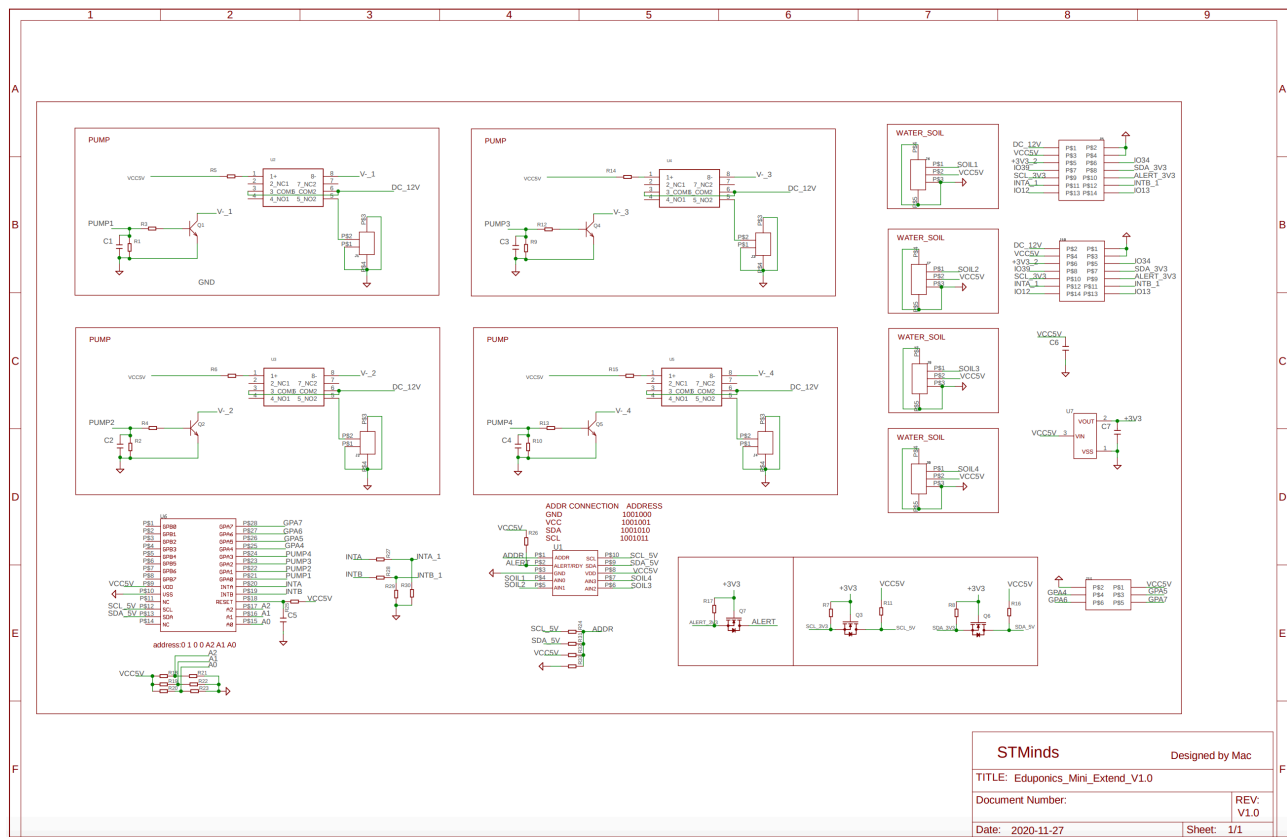
## Hardware pinout

| PIn name | I/O | IO Pin |
|----------|--------|--------|
| VCC 12V  |        |        |
| VCC 5V   |        |        |
| SCL      | I2C    | IO33   |
| SDA      | I2C    | IO13   |
| INTA     | INPUT  | IO26   |
| INTB     | INPUT  | IO27   |
| ALERT    | INPUT  | IO25   |
| POWER    | Output | IO12   |

# Schematic

For the complete schematic at high resolution, please refer to our GitHub repository:

https://github.com/STEMinds/Eduponics-Mini/raw/main/hardware/
Eduponics_Mini_Extension_board_V1.0_schematic.pdf

# Related data sheets

Here we attach some extra data sheets of components that we use in our Eduponics Mini extension board, those data-sheets and websites **are not** affiliated to STEMinds in anyway and provided for <u>educational purpose only</u>.

ADS1115 - <u>https://www.ti.com/lit/ds/symlink/ads1115.pdf</u>

MCP23017 - <u>https://ww1.microchip.com/downloads/en/devicedoc/20001952c.pdf</u>