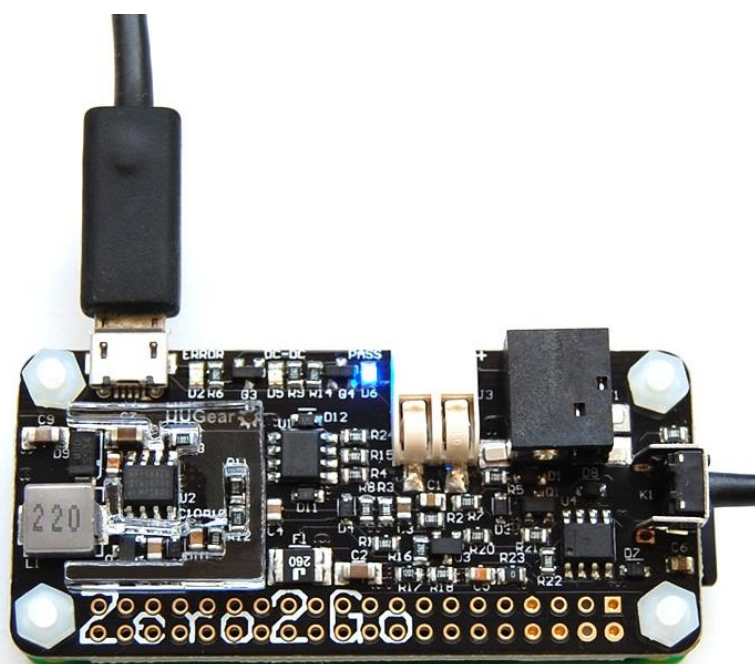


# Zero2Go

Wide Input Range Power Supply for Your Raspberry Pi

## User Manual (revision 1.03)

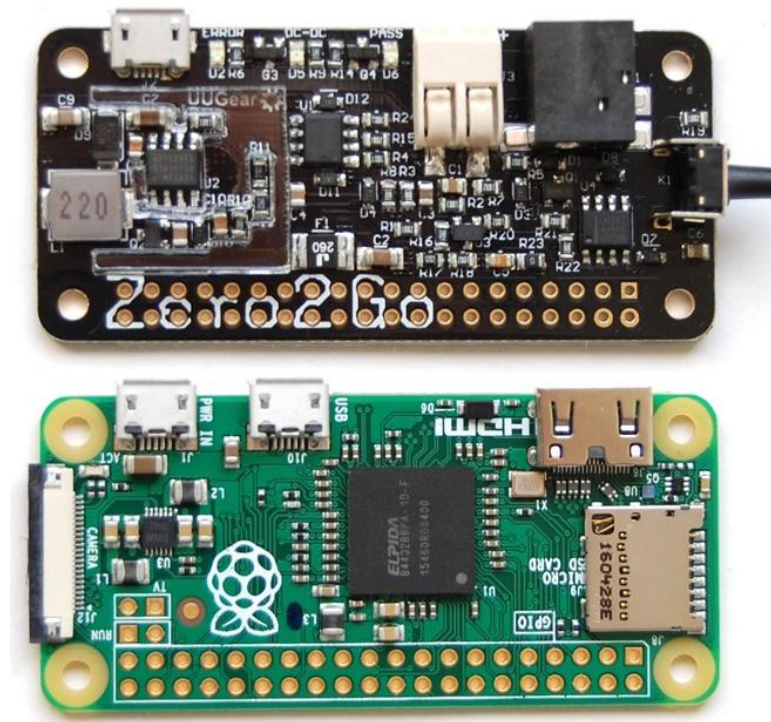


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## Product Overview

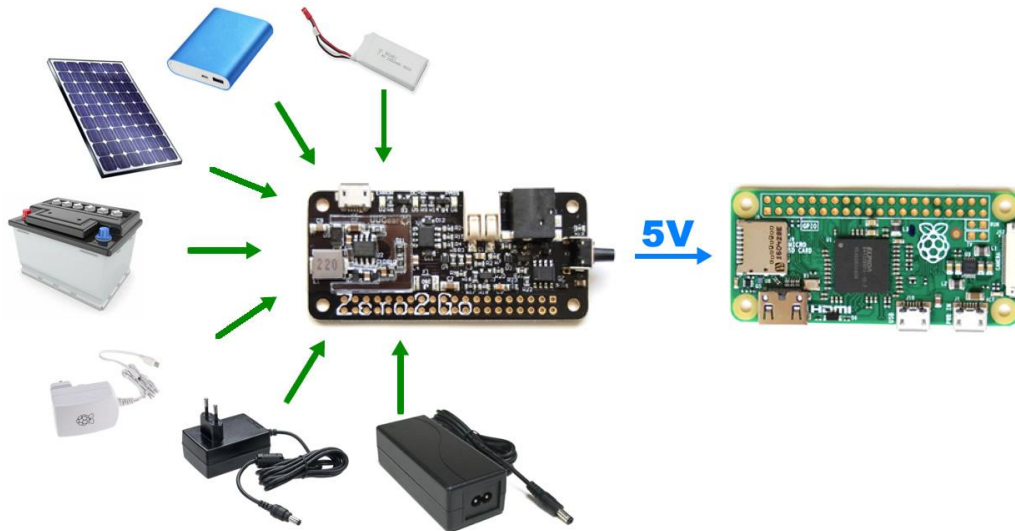
Zero2Go is a small and smart power supply add-on for Raspberry Pi. When using the pogo pin connector (included in package), it can connect to Raspberry Pi Zero without soldering. It also supports other Raspberry Pi models who have 40-pin header.



Main features include:

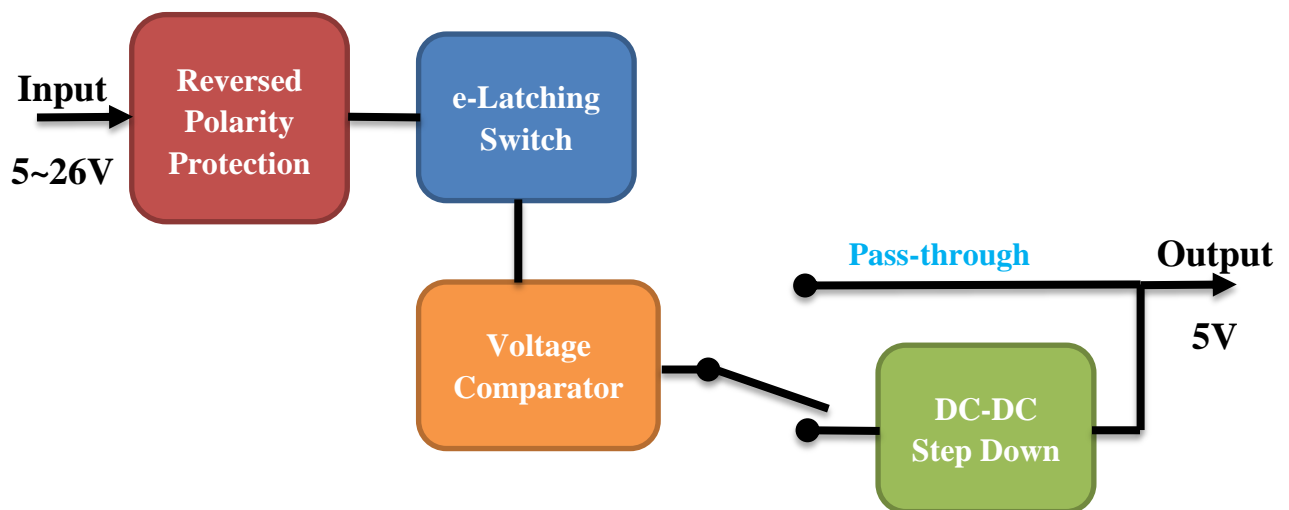
- Same board size with Raspberry Pi Zero
- No soldering required when mounting on Raspberry Pi Zero
- Wide range input voltage (5~26V)
- Reversed polarity protection
- Connect power source via micro-USB, DC power plug or electric wires
- Support “pass-through” and “step-down” modes (auto switching)
- Single tap to startup/shutdown Raspberry Pi
- When the OS loses response, you can long hold the switch to force power cut.

Zero2Go has quite wide input range (5V~26V), so it is will be convenient to power your Raspberry Pi with power bank, Li-Po battery pack, solar panel, car battery or different kinds of power adapters etc.



The board size of Zero2Go is exactly the same with Raspberry Pi Zero, and can be mounted on Raspberry Pi Zero without soldering (thanks to the pogo pin connector). You can also mount Zero2Go on other Raspberry Pi models that have 40-pin header, if you solder a female header on Zero2Go as well (not included in the package).

How Zero2Go works? The diagram below gives you the main idea.

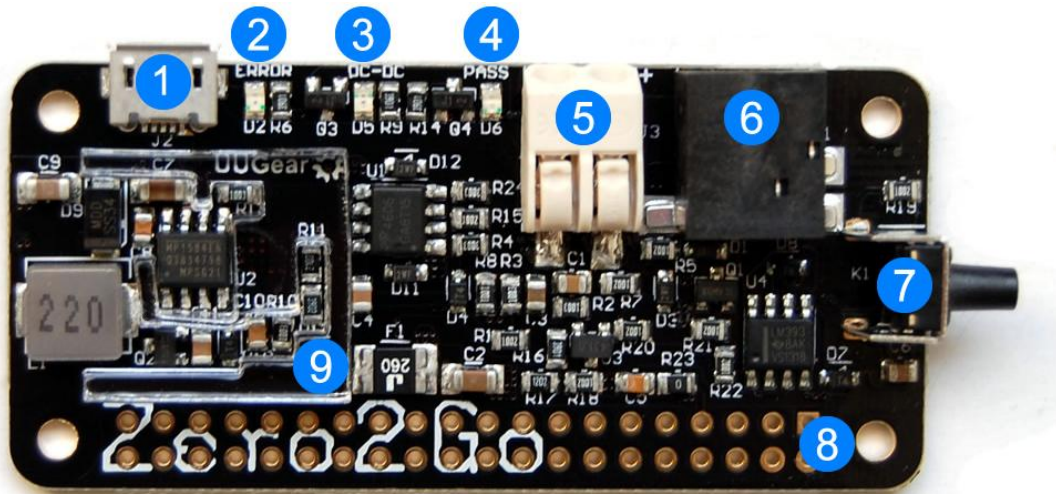


If the input voltage is higher than 5.5V, then the DC-DC converter will be used, otherwise the input voltage will pass through to output. The e-Latching Switch will maintain the power if system is up and the button on Zero2Go is not tapped or hold.

Since DC-DC converter needs more dropout to work well, inputting 5.5~7.0V should be avoided when possible.

## Product Details

The figure below shows how Zero2Go looks like:

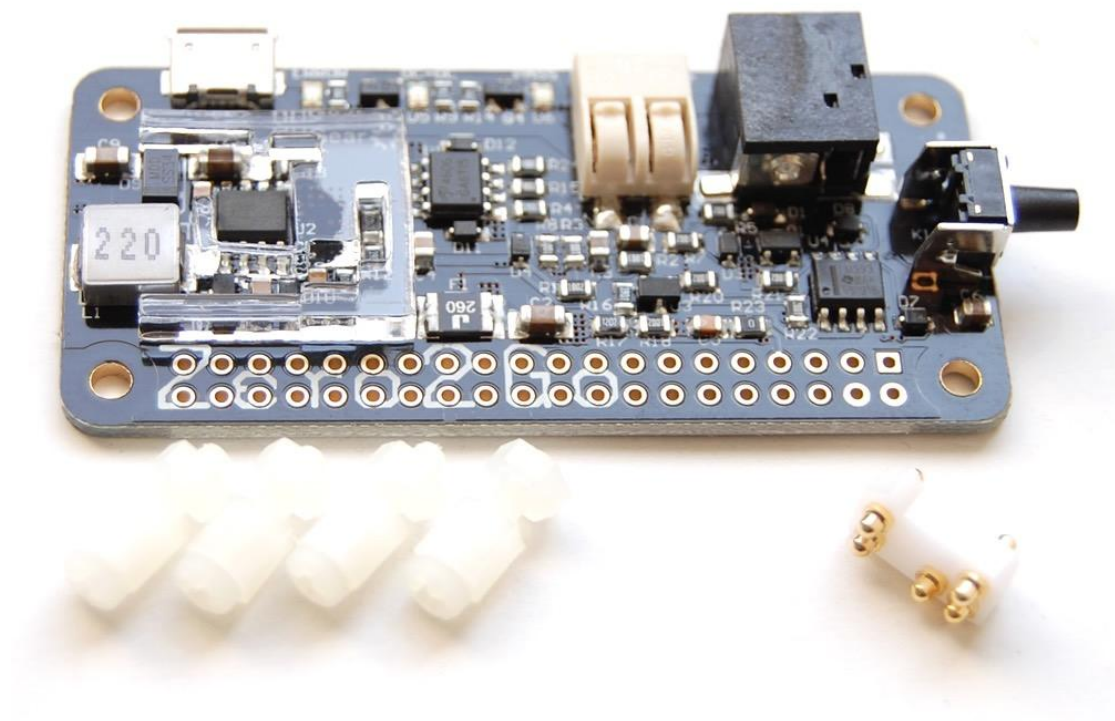


- 1) Micro-USB port for power source connection.
- 2) Red LED as error indicator.
- 3) Green LED as DC-DC step down indicator.
- 4) Blue LED as 5V pass through indicator.
- 5) Terminal block for power source connection.
- 6) DC power jack for power source connection.
- 7) Tact switch for power on/off.
- 8) 40-pin header footprint.
- 9) Acrylic protective frame.

## Package Content

Each package of Zero2Go contains:

- Zero2Go board x 1
- Plastic male-female standoff x 4
- M2.5 x 4 mm screws x 4
- M2.5 nuts x 4
- Dual-head Pogo pin connector (5-pin set)





## Specifications

<b>Dimension:</b>	65mm x 30mm x 9mm
<b>Weight</b>	10g (net weight without any accessory)
<b>Input Voltage (<math>V_{in}</math>)</b>	5~26V <sup>1</sup>
<b>Output Voltage (<math>V_{out}</math>)</b>	5V ( $\pm 5\%$ tolerance)
<b>Max Output Current</b>	2.6A <sup>2</sup>
<b>DC-DC Efficiency</b>	88% max
<b>LED Indicators</b>	Red: lights up when input polarity is reversed Green: lights up when DC-DC converter is working Blue: lights up when input pass through to output
<b>Static Current</b>	~0.5mA when $V_{in}=5V$ ~4mA when $V_{in}=26V$ <sup>3</sup>

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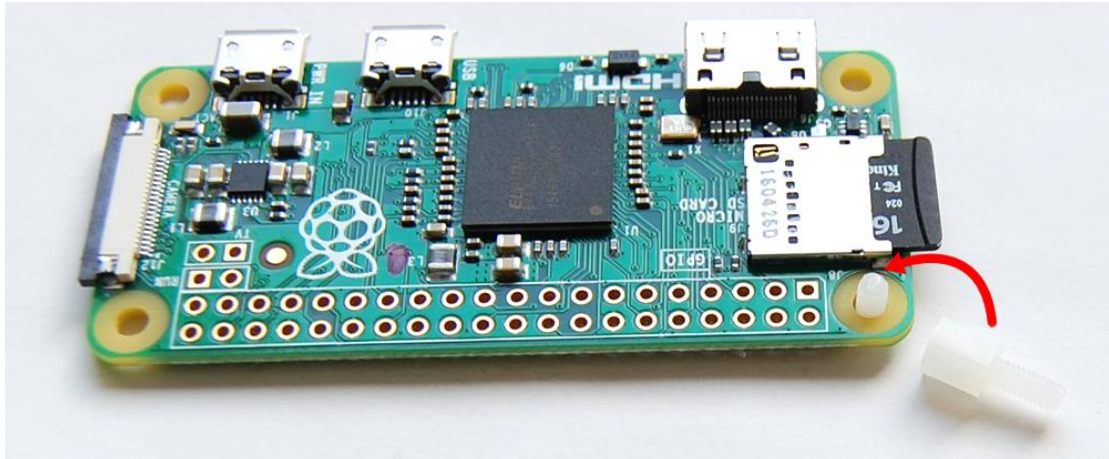
<sup>1</sup> Input 5.5~7.0V is not recommended as the DC-DC converter needs more dropout to work well.

<sup>2</sup> Without adding heat sink to DC-DC chip and the inductor (U2 and L1), we suggest to keep the current below 1.5A for long term usage. If you are using the Pogo pin connector to output all current to Raspberry Pi Zero and peripherals, the current should be 1A or lower.

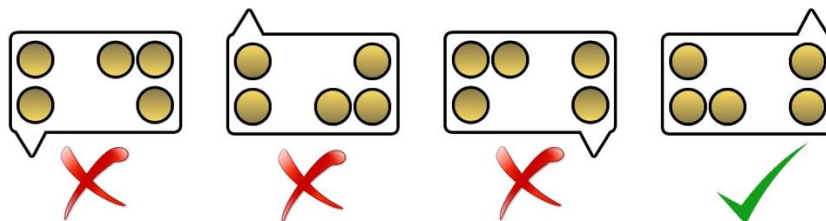
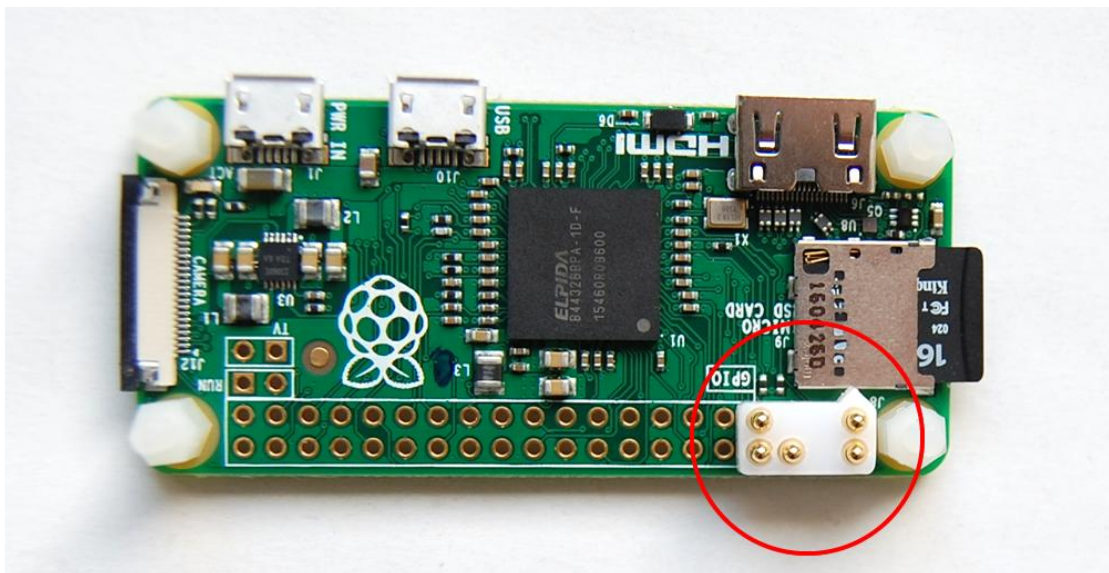
<sup>3</sup> It is the current drawn from the power source, when Raspberry Pi doesn't get powered.

## Mounting on Raspberry Pi Zero

To mount Zero2Go on Raspberry Pi Zero (without 40-pin header soldered), the first step is to fix the 4 male-female standoffs on four corners with screws.

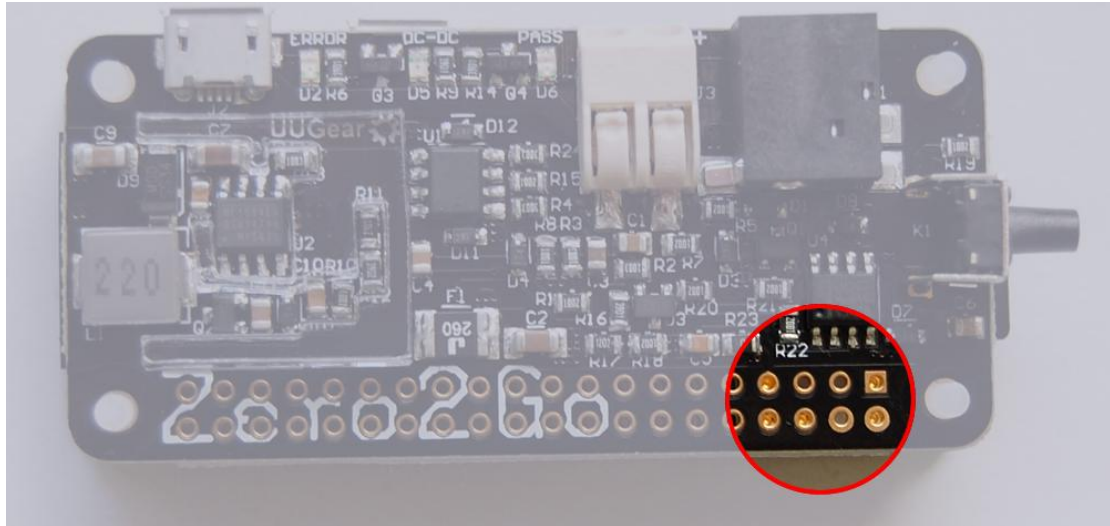


Then you place the pogo pin connector on the correct position. Please make sure the small tip on the plastic frame is on the right and it points to the SD card, as shown below:

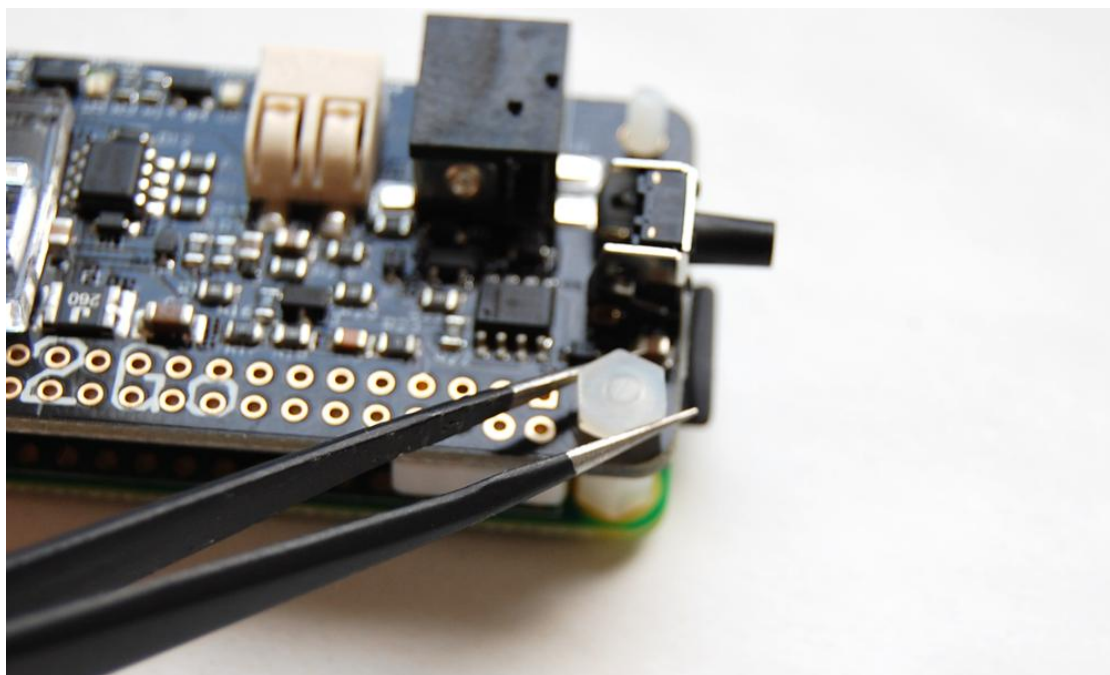




Now you can mount Zero2Go above your Raspberry Pi Zero, please make sure the pogo pin connector contacts the correct pads:



Use the 4 nuts to fix your Zero2Go at its place. You may find tweezers are quite helpful in this case:

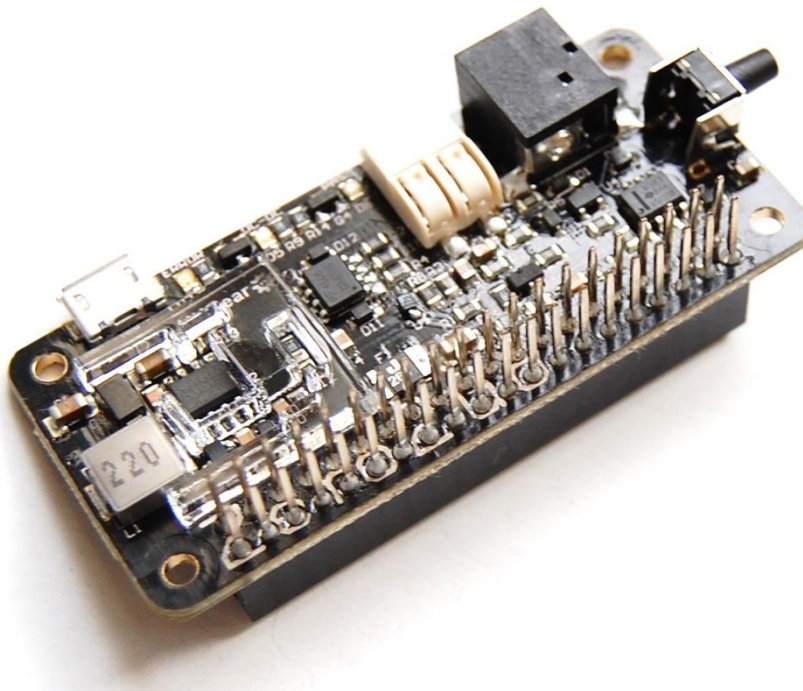


After tightening the 4 nuts, Zero2Go is now firmly mounted on your Raspberry Pi Zero. Please notice **the pogo pin connector is designed to work with 1A current**, if you are expecting a much higher current output, please consider soldering a 40-pin header for the connection.

## Mounting on Other Raspberry Pi Models

If you want to mount Zero2Go on other Raspberry Pi models, you will need to solder a 40-pin header (not included in package) on your Zero2Go.

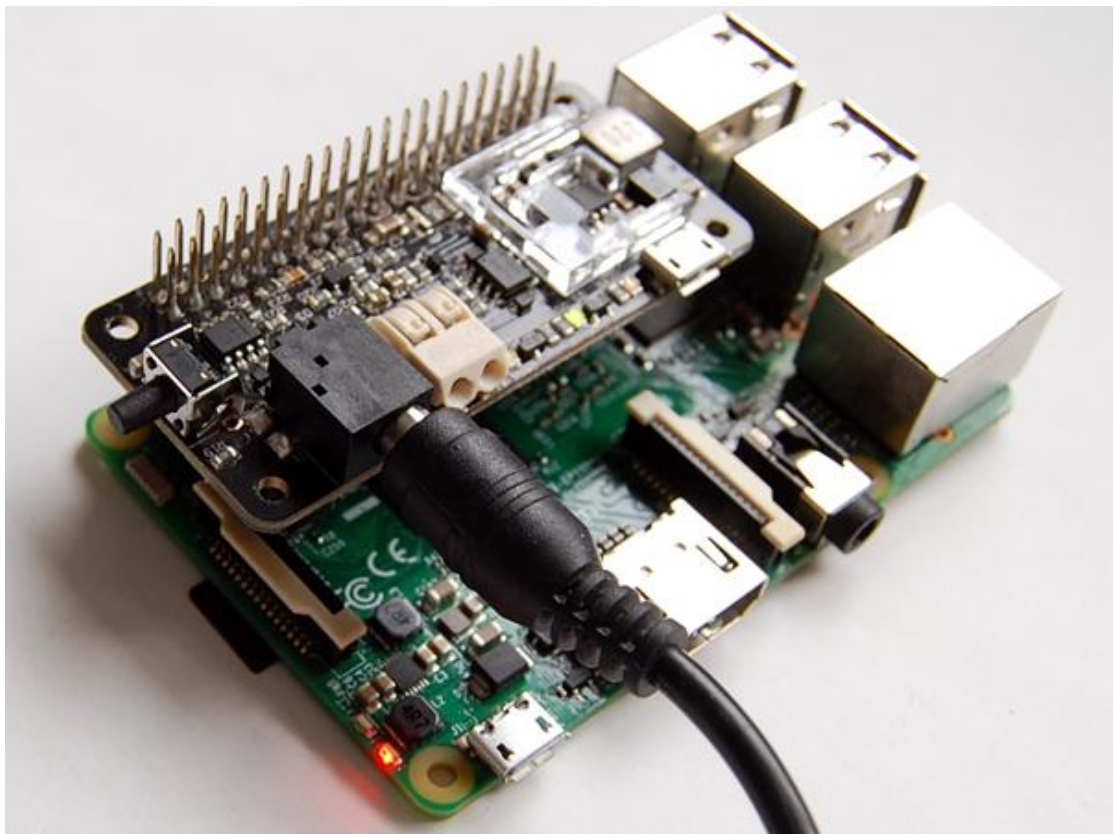
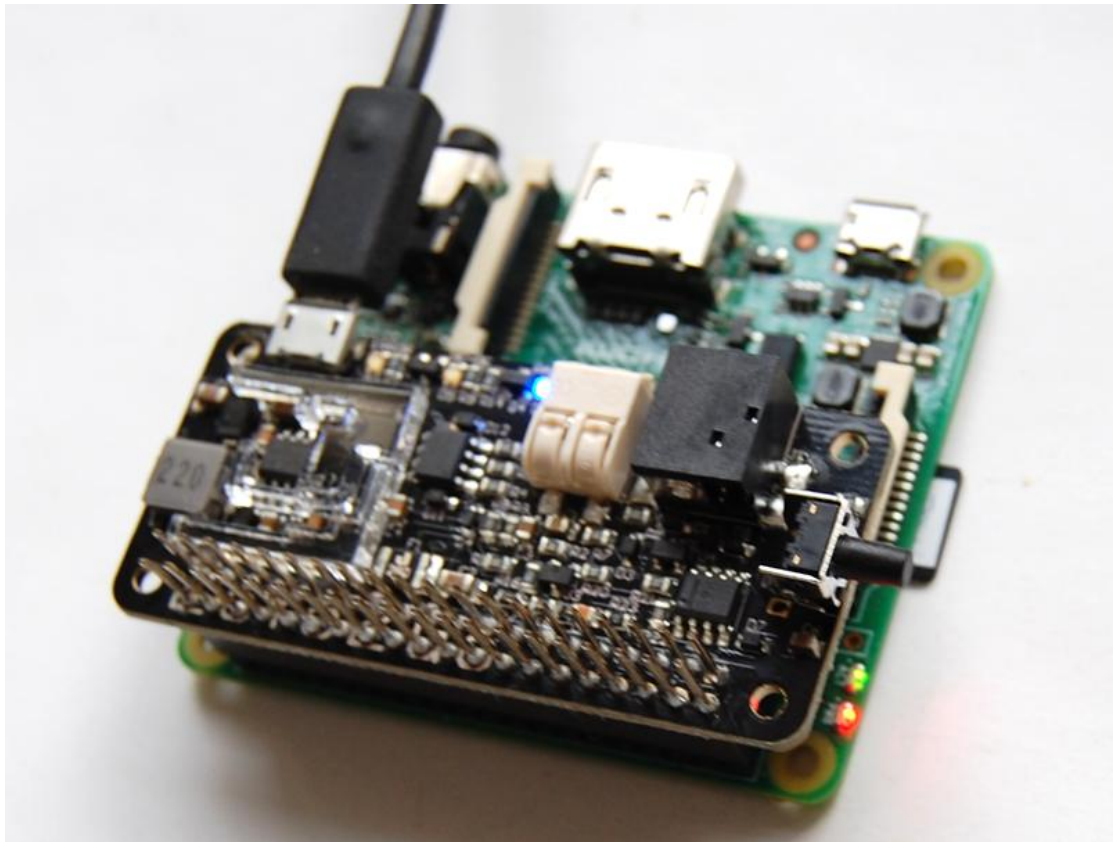
Which type of header should you solder? It depends. If you intend to mount Zero2Go on Raspberry Pi A+, B+, 2B or 3B, which has male 40-pin header onboard, you should solder a female 40-pin header on Zero2Go. Optionally it could be a stacking header which has extra long pins. Below is such an example:



If you are mounting Zero2Go on a Pi Zero with a female 40-pin header soldered, you should solder a male 40-pin header on your Zero2Go. This is also **the suggested way for driving high current devices** from Pi Zero.

After soldering the pin-header, mounting Zero2Go to your Raspberry Pi is the same with mounting other HATs. Just connect the 40-pin headers together and it is done.

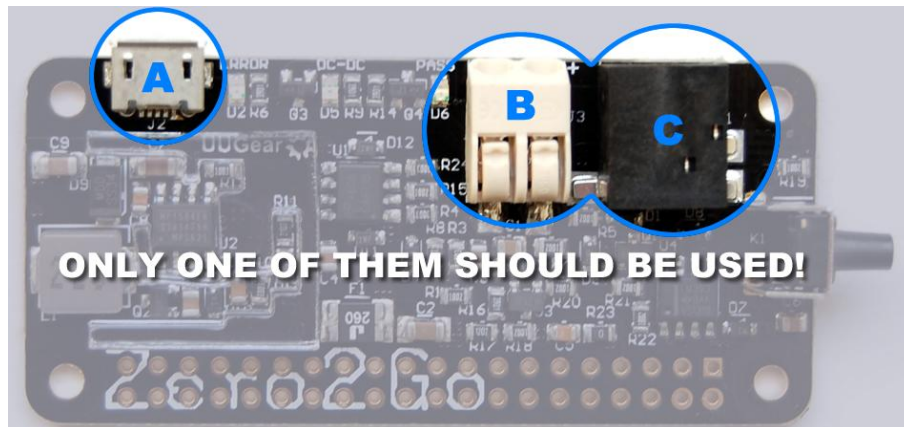
The pictures below shows how Zero2Go looks like when being mounted on Raspberry Pi A+ and Raspberry Pi 3.





## Connect Power Source

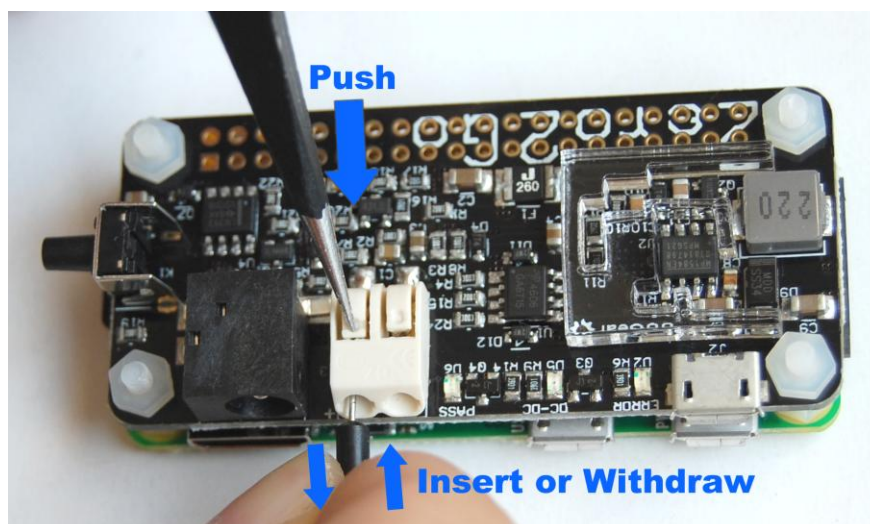
Zero2Go has three input power port on board, the micro-USB port (A), the terminal block (B) and DC power jack (C). You can use one of them to connect the power source for your Raspberry Pi.



**Caution:** do not connect multiple power sources at the same time!

The micro-USB port is for connecting those power adapters with matching plug. The official Raspberry Pi power adapter, many mobile phone chargers and all power banks belongs to this category. Although most devices that output 5V to micro-USB, this micro-USB port can accept 5~26V.

The terminal block in white can connect metal wires with diameter 0.5~1mm. When connecting or disconnecting a wire, you need to push the small button on top, and then insert or withdraw the wire.



The DC power jack in black is for connecting those power adapters with 5.5mm/2.1mm plug. Many power adapters for notebook belongs to this category.



Different than the micro-USB and then terminal block, the connection between barrel shaped plug and DC power jack is not that tight, as it could still be rotated after the connection. This might lead to unstable input voltage, which should be avoided.

**Caution:** please avoid poor contact between power source and Zero2Go.

If Zero2Go is used on a portable project, it is recommended to use the micro-USB or terminal block for power source connection. If the DC power jack is used, it is recommended to take additional efforts to fix the barrel shaped plug on its place.

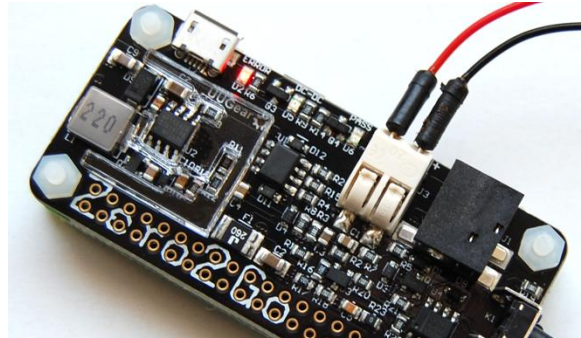
Please keep in mind that, the power source should have very solid connection to Zero2Go. If you are using the terminal block, please make sure the wires are tightly fixed, and they should not be disconnected during the usage. If the connection is not reliable, it could lead to very bad consequence, especially when input voltage is higher than 20V. In worse case it could burn out the MOSFET on Zero2Go and then kill your Raspberry Pi!

**Caution:** quickly connect and disconnect power source is a big NO NO!!!



## Working Modes

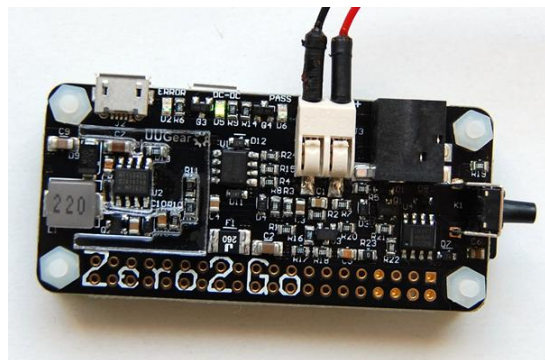
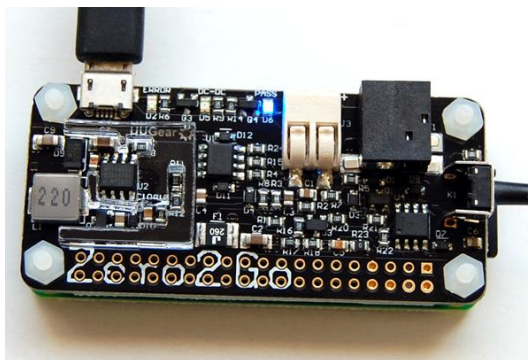
If the input polarity is reversed, the red LED will light up and Zero2Go does not work. This will not harm any device as the power switch is disabled in this case.



After correctly connection with the power source, a single tap on the button (K1) will turn on your Raspberry Pi.

If the input voltage is less than 5.5V, Zero2Go works in “**pass-through**” mode, and the input voltage will be directly output (with very low voltage drop). In this case the blue LED will light up.

If the input voltage is higher than 5.5V, Zero2Go works in “**step-down**” mode, and the DC-DC converter will convert input voltage to 5V output. In this case the green LED will light up.



## Before Installing Software

You will need to installed the OS on the SD card first. **We recommend NOT to use NOOBS**, instead download the Raspbian image and directly flash it into your SD card (tutorial is [here](#)). The process could be faster and you will not have the problem caused by the NOOBS boot menu (read on for details).

The software of Zero2Go has been tested under **Raspbian Jessie**. Raspbian Wheezy should also work, but it is better to use Jessie as it will be much easier to install Qt 5, which is required by the (optional) GUI of the software.

The software of Zero2Go might also work on other operating systems with or without modification. The software is written in BASH, so it could be easily modified by the customers to support other OS. However, at lest for now, only Raspbian Jessie and Wheezy are officially tested. You should have mind preparation that tweaking might be needed when using Zero2Go on other operating systems.

**If you have installed the OS with NOOBS, please make sure to skip the boot menu.** Otherwise the boot menu will postpone the booting long enough to make Zero2Go think the system is down and then cut the power (so your Raspberry Pi will not boot).

Here is how to skip the NOOBS boot menu: you insert your SD card to your PC (use a SD card reader if your PC doesn't have SD card slot), open the RECOVERY partition and create a text file named "autoboot.txt" there. Edit it and put this into the file:

**boot\_partition=6**

It tells NOOBS to boot from the partition who is numbered 6. It is usually the case when you installed only one OS on the SD card (more details could be found [here](#)). If you have multiple OS installed, you can run "sudo fdisk -l" command to find the partition to boot with.

**Remarks:** there is a regression on NOOBS V2.2 and V2.3, so the trick above will not work on (at least) these two versions (details [here](#)). We hope it could be fixed soon, meanwhile you can use NOOBS V2.1 to avoid this problem (download from [here](#)), or even better, do not use NOOBS and directly flash the OS into the SD card.

## Software Installation

After mounting Zero2Go on your Raspberry Pi, you can tap on the button to turn your Raspberry Pi on. However, without installing the software, you can only hold the button for several seconds to force the power cut, which is not recommended.

How the Zero2Go software works? The software will run in the background after boot, and listen to your button input (via GPIO-4). It will initiate a shutdown command once you tap on the button. After the system gets shutdown, the TXD pin will go LOW permanently, and Zero2Go will then fully cut the power.

Zero2Go's software is a subset of the software for [Witty Pi](#). So if you have installed Witty Pi's software on your Raspberry Pi, you don't need to install Zero2Go's software and it will work just out of the box.

To install Zero2Go's software, please run this command in your home directory:

```
pi@raspberrypi ~ $ wget http://www.uugear.com/repo/Zero2Go/installZero2Go.sh
```

If your Raspberry Pi has internet connection, it will immediately download the script from our website, and you will then see the "installZero2Go.sh" script in your home directory. Then you just need to this script with with sudo:

```
pi@raspberrypi ~ $ sudo sh installZero2Go.sh
```

Please notice that **sudo** is necessary to run this script. This script will copy a file to "/etc/init.d/zero2go", and register it to run after boot.

## GPIO Pins Used by Zero2Go

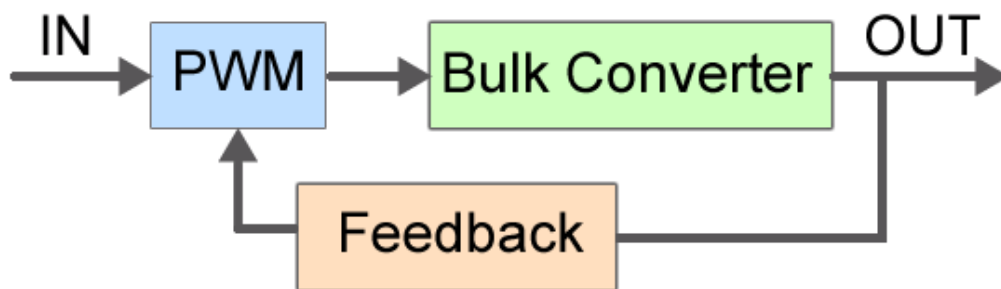
Besides the +5V and GND pins, Zero2Go uses GPIO-4 (BCM naming) to monitor the button tapping. The TXD pin is also monitored but it will not affect the data transferring via serial port. Zero2Go will cut power when TXD pin gets pulled down for long enough (> 3 seconds).

GPIO (BCM)	Name	Physical		Name	GPIO (BCM)
	3.3V	1	2	5V	
2	SDA 1	3	4	5V	
3	SCL 1	5	6	GND	
4	GPIO 7	7	8	TXD	14
	GND	9	10	RXD	15
17	GPIO 0	11	12	GPIO 1	18
27	GPIO 2	13	14	GND	
22	GPIO 3	15	16	GPIO 4	23
	3.3V	17	18	GPIO 5	24
10	MOSI	19	20	GND	
9	MISO	21	22	GPIO 6	25
11	SCLK	23	24	CE0	8
	GND	25	26	CE1	7
0	SDA 0	27	28	SCL 0	1
5	GPIO 21	29	30	GND	
6	GPIO 22	31	32	GPIO 26	12
13	GPIO 23	33	34	GND	
19	GPIO 24	35	36	GPIO 27	16
26	GPIO 25	37	38	GPIO 28	20
	GND	39	40	GPIO 29	21

## About the Protective Frame

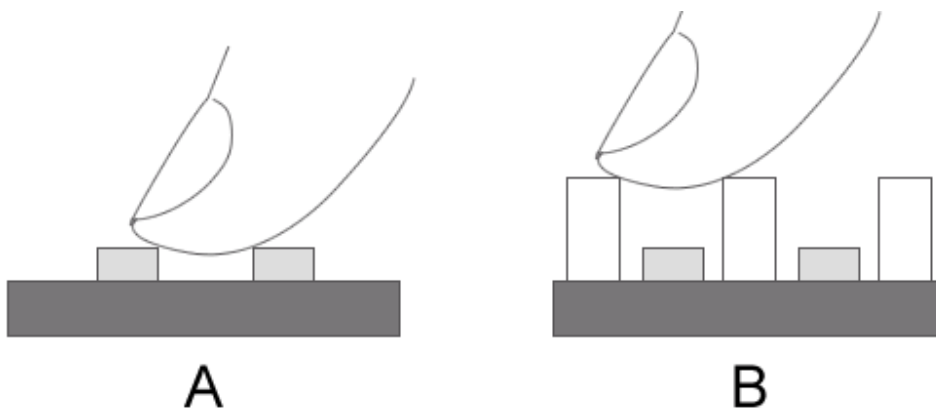
Around the DC-DC chip (U2), there is an Acrylic protective frame, which sticks on the top surface of the PCB with adhesive gel.

What is this frame for? It is there to protect the DC-DC circuit, from your finger. Below is a (very simplified) chart to show how the DC-DC converter works.



The feedback channel is there to make sure the output voltage is at the expected level. If for any reason, the feedback channel is interfered, the PWM module will collect wrong sample and the output voltage will be wrong.

In Zero2Go we use a SO-8 IC (U2) to build the DC-DC converter, some resistors and capacitors around setup the feedback channel for it. If you use a finger to touch some of them at the same time, you may interfere the feedback channel and the result could be disaster (scenario A in figure below). With the Acrylic protective frame mounted, your finger will not be able to touch those components (scenario B in figure below).



**Caution:** please try not to remove the Acrylic protective frame, if you are using Zero2Go without a case.



## Revision History

Revision	Date	Description
1.00	2016.11.22	Initial revision
1.01	2017.03.03	Add caution about unreliable power source connection.
1.02	2017.04.03	Add “Before Installing Software” section.
1.03	2017.12.18	Add description of “long hold to force power cut” behaviour. Fix typo.