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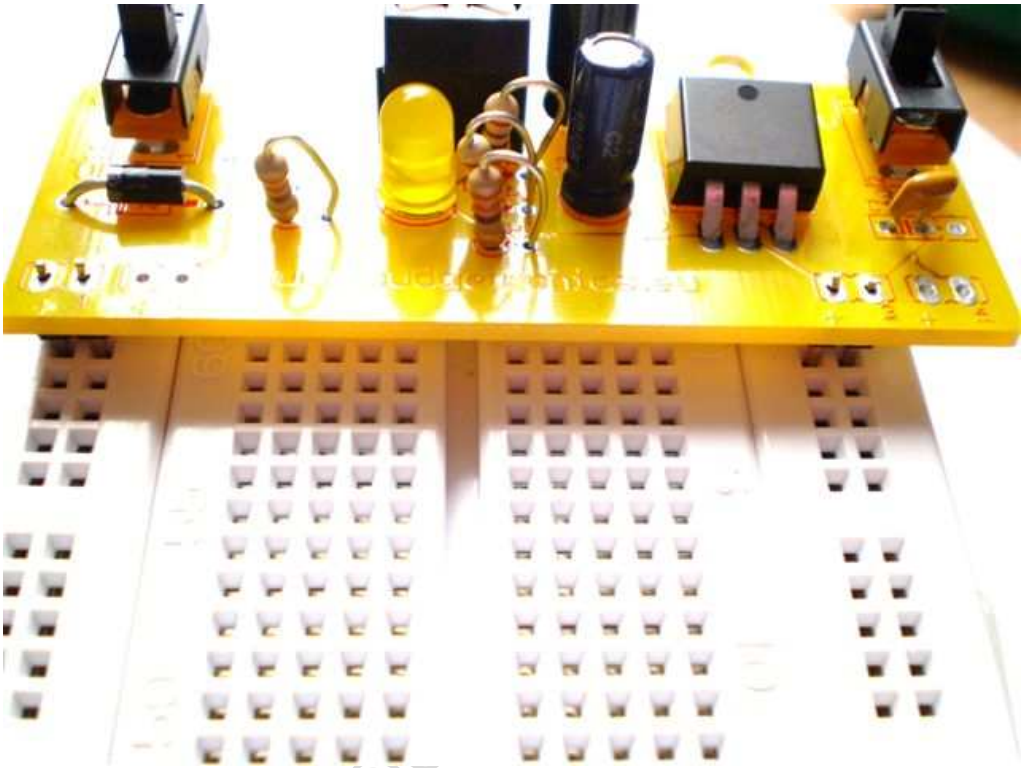
**Breadboard power supply 5V / 3,3V**



A handy breadboard power supply to provide your projects with the right voltage. You can set the voltage between 3.3 volts and 5 volts with the flick of a switch. You can feed the breadboard power supply with voltages between 7 volts and 12 volts. The LM 317 will transform this to a usable voltage for your circuit. You also can connect a 9 volts battery to transform this to a lower voltage.
The breadboard power supply is secured from switching the + and – power lead by a diode. So there is never any danger of blowing your breadboard power supply.

You can stick your breadboard power supply easily in your breadboard and it can be used in almost all types of breadboards.

This electronic kit comes as a bag of parts and is easily assembled with the use of a soldering iron.

If you want you can change the output voltage of the power supply to your own needs by changing some resistor values. This is explained in the downloadable construction manual.

**An original BudgeTronics building kit.**

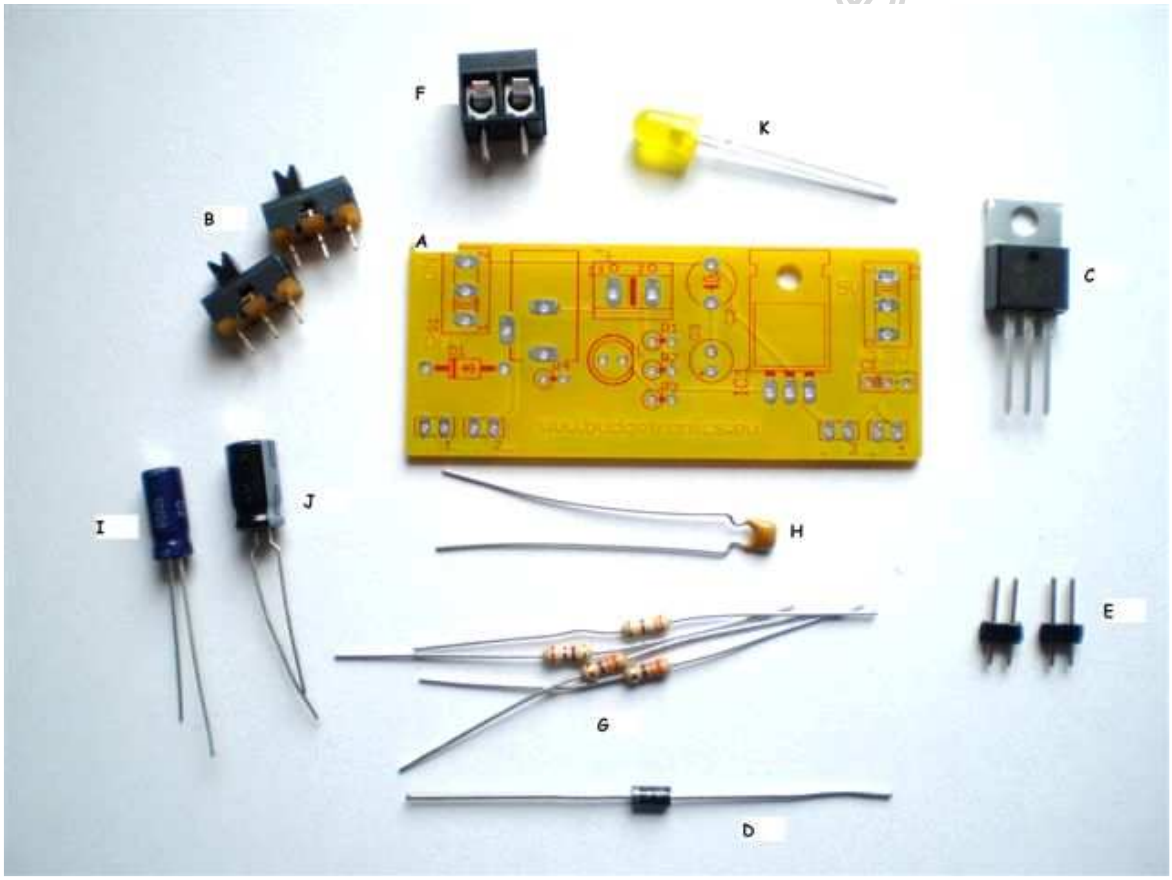
## Introduction

### The LM317

The heart of the power supply is the LM317. The LM317 is a adjustable linear voltage regulator. This regulator can handle voltages between 3 volts and 37 volts at max. 1.5 amps. The output voltage is in theory adjustable between 1.25 volts and 37 volts. You can change this by using different resistor values.
For the breadboard power supply we advice you to use input voltages between 7 and 12 volts. Lower then 7 volts is to low to generate 5 volts and if you input more then 12 volts you will need an extra cooling element for the LM317. The breadboard power supply can easily power circuits with 500ma. This is more then enough for most of your projects

### Partslist Breadboard power supply kit

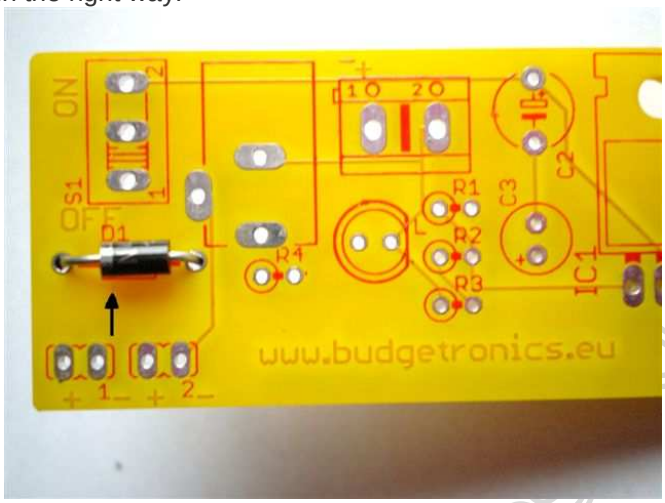
Before you begin building your power supply, first identify and check all the necessary parts:




A: 1 x PCB power supply
B: 2 x sliding switches
C: 1 x voltage regulator LM 317
D: 1 x diode 1N4004 (watch the polarity!)
E: 2 x 2 pin header
F: 1 x blockterminal
G: 1x resistor 240 Ohms (colour code red, yellow, brown)
G: 2 x resistor 330 Ohms (colour code orange, orange, brown)
G: 1 x resistor 390 Ohms (colour code orange, white, brown)
H: 1 x ceramic capacitor 100 nf
I: 1 x electrolytic capacitor 10uf (watch the polarity!)
J: 1 x electrolytic capacitor 100uf (watch the polarity!)
K: 1 x yellow LED (watch the polarity!)

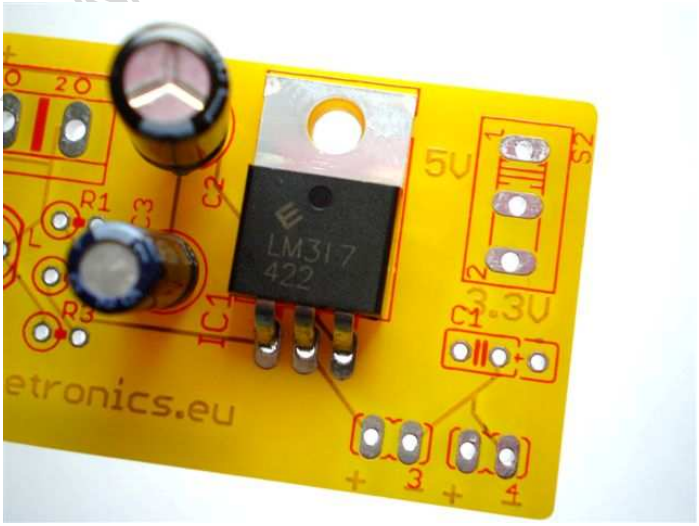
**Construction**

Place the diode on the PCB and solder it. Watch the polarity! On the diode you can see a stripe on one side. Keep this stripe aligned with the indication on the PCB. Look closely at the picture to be sure you connect the diode in the right way.




Now solder the two electrolytic capacitors in their place. Also watch the polarity here. On the side of the capacitors you can see a clear negative (-) indicator. Look closely at the picture.
At C3 you must place the capacitor of 10 uF and at C2 the capacitor of 100uf.


Solder the LM317 in its place after you have bent it in its position as is shown in the pictures. The metal part of the LM 317 is on the down side.

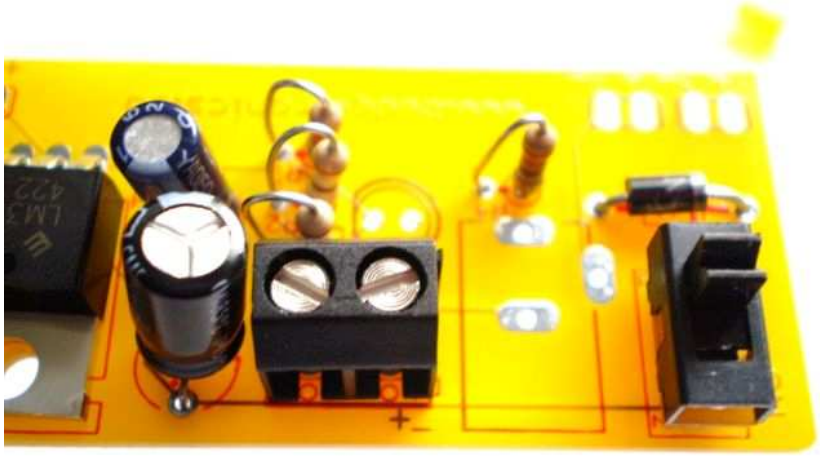


Place de ceramic capacitor in its position. It does not matter how you connect this. You see in the picture that one hole is crossed out. Don't use this hole. Just connect the capacitor exactly as shown in the picture.

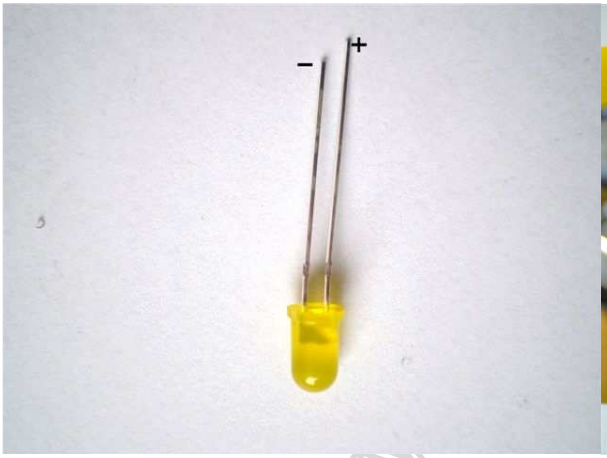
Bend the 4 resistors as shown and place the different values in their right place.
R1=240 Ohms, R2 = 390 Ohms and R3 + R4 are both 330 Ohms. Look at the colour codes and at the picture to see how they must be connected.

Solder the two slide switches in place.

Put the block terminal in place with like shown in the picture.



Solder the LED on its spot and watch the polarity! The short pin is the negative and the long pin the positive. At the negative side you can see the led has a flat side. On the PCB this flat side is also indicated.



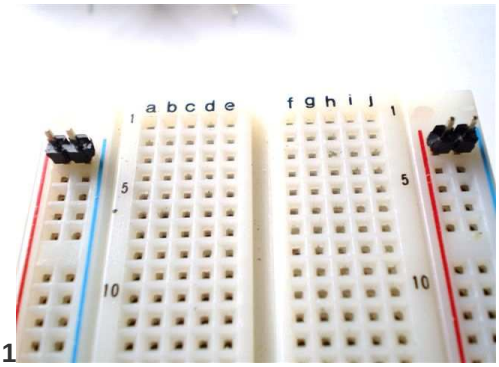


Look closely at the picture how to connect the LED. The LED shows you when the power supply is switched on.

If you did everything in the right order you now have only two pin headers left. Through these pin headers the voltage will be transferred to your breadboard. There are a lot of different breadboards with different measurements. On the PCB you can see there are 4 positions to solder the pin headers in place. This is done to position the pin headers in a way that is suited for your breadboard.

**Don’t solder the pin headers just like that! First place the pin headers in their position on the breadboard. Long pins in the breadboard!**

Put the holes of the PCB on the pin headers and if they fit, solder them while they are still positioned in the breadboard.

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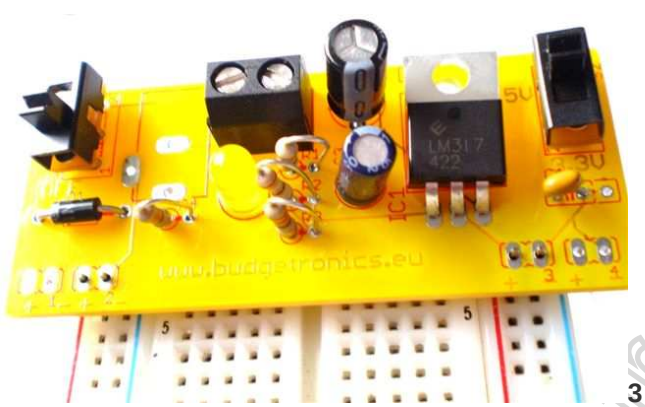


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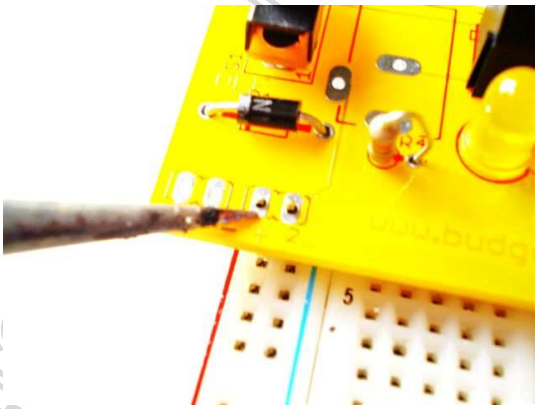

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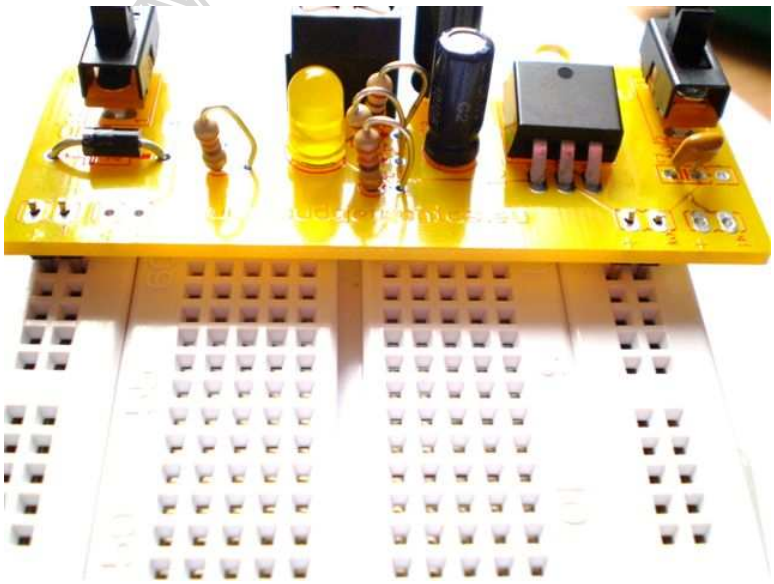
In this way your power supply will fit your breadboard.

***On the breadboard power supply you can see which pin is + and which is -. On some breadboards are colour band indications like a blue and red line to indicate polarity. WATCH OUT! This can be different from your power supply. Always look at the indication on the power supply to be sure what is positive and negative.***

Below you see an example of a breadboard. Notice that the pin headers are positioned differently. The pin headers give + and – power to the breadboard at both sides.



**Checking and powering up**

Check if you have constructed everything as is shown in the picture. Look at the solder side if there are no loose contacts or wires that make a short.
If you checked everything carefully you can connect power to the PCB. You do this by securing the power leads in the screw connections. Watch the polarity! If you do this the wrong way nothing will happen and the LED will stay out. Just disconnect and connect it in the right way.
If the yellow LED lights up your power supply is working. If you cannot get the yellow LED to light up you have probably connected it the wrong way around.

Before you use it measure the output of your power supply. Most of the times this will be not exactly be 5 or 3.3 volts but it will be very close to this.
You will see three empty holes on the PCB. If you want you can connect a power supply input there. This is not provided in the kit because there are many different kind of power inputs and the need will be different for everyone.
If you want to change the power supply to your specific needs read on. If not you can stop reading and start experimenting with your projects.

**Changing the output voltage**

The building kit has all the parts to generate 5 volts en 3.3 volts. If you want to change this you will have to use different values for resistors R2 and R3.

With the following formula you can calculate the resistor values to adjust the output of the LM317 to your desired voltage.

**R2=R1((V/1.25)-1)**

The standard R1 value is 240 Ohms, so the formula reads:
R2 + R3=240((V/1.25)-1)

R2 is standard 330 Ohms and R3 is standard 390 Ohms. If the switch is put on the 5 volts position R2 and R3 in series will have together a value of 330+390 =720 Ohms.

Check it:
720 Ohms = 240 (R1 resistor)((5 /1,25)-1)= 720 Ohms

If the switch is put on the 3.3 volts position only resistor R2 is used with 390 Ohm.

Check it:
240(3,3/1,25)-1= 393,6 Ohms = (rounded) 390 Ohms.

By changing the values of R2 andR3 you can change the output voltage.

Some examples:
R2 = 47 Ohms > 1.5 volts
R2 = 330 Ohms > 3 volts
R2 = 390 Ohms > 3.3 volts
R2 = 680 Ohms > 4.8 volts
R2 + R3 = 330 + 390 Ohms > 5 volts
R2 + R3 = 820 + 100 Ohms > 6 volts
R2 = 1500 Ohms > 9 volts
R2 + R3 = 1800 Ohms + 270 Ohms > 12 volts

If only R2 is mentioned you will get the voltage if the switch is positioned on 3.3 volts. Resistor R3 is activated if the switch is put in the 5 volts position.
With the formula you can calculate whatever other voltage you will need. Remember always check the output with a multimeter if you changed something before using the power supply on your projects.