

# DC Power Supply

## *Solid State Electronic Devices Project Report*

### Team:

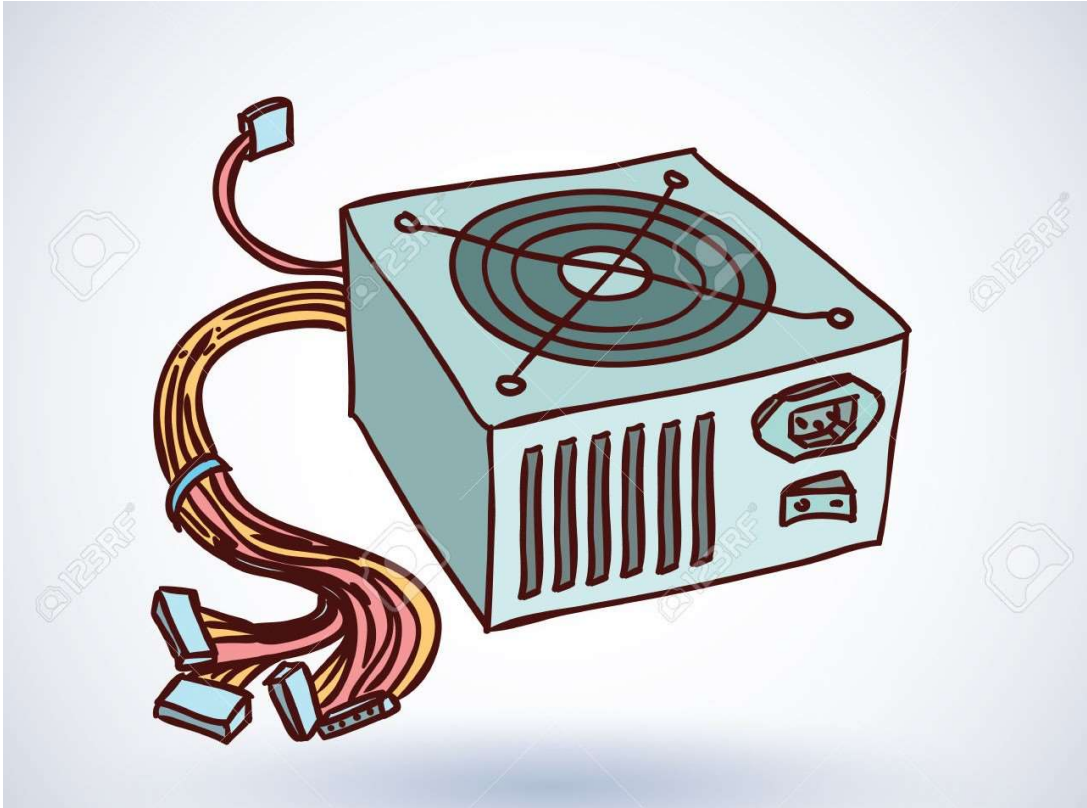
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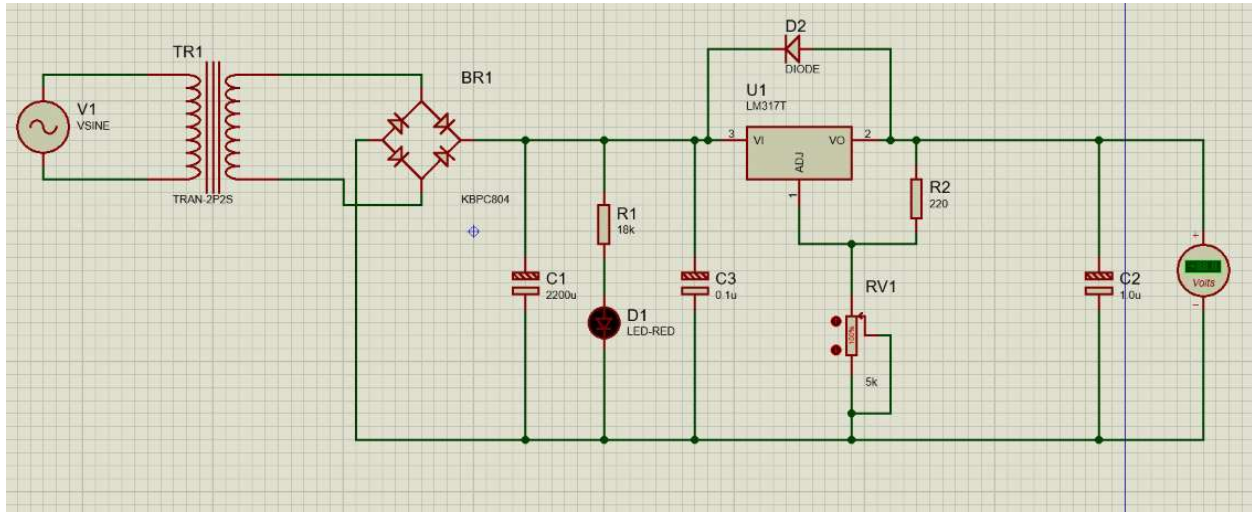
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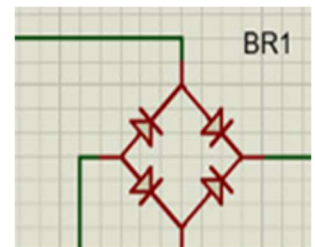
**At the beginning** we designed the project by select the components and choose suitable values for them and types. Before we go and pay the components, we put our circuit on one of the simulator programs to check it. There is different simulation programs, but in this project we will be using proteus (version 8.1) to simulate the circuit as proteus is a more friendly and intuitive tool specially for students of electronics, mechatronics, telecommunications engineering.



So, let's talk about our components, what are they and their uses:

### 1-Bridge Rectifier:

It is a convertor that convert the Alternating Current (AC) to Direct Current (DC), it rectifies mains AC input to DC output and is widely used in power supplies.



They can be built with four or more diodes or any other controlled solid-state switches.

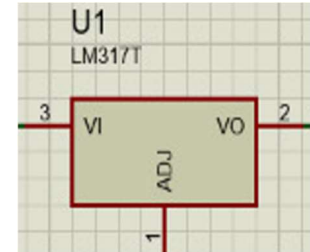
And its main advantage is that it produces almost double the output voltage as with the case of a full-wave rectifier using a center-tapped transformer.

*Number and value used in this project:* one bridge, BR1 100V-3A

## 2-Adjustable Voltage regulator:

It is a regulator that can output adjustable voltages from anywhere in the range that the voltage regulator is designed to output.

In our case we'll be using LM317 voltage regulator, it can be made to output any voltages from +1.2V-37V.

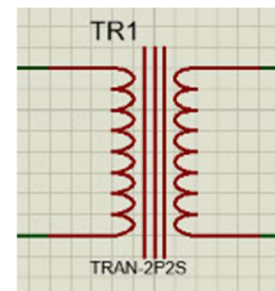


- It protects loads from over and under voltages.
- Need to provide a constant voltage to the loads.
- To maintain stability in system voltage using the regulation technique occasionally.

*Number and value used in this project:* one U1 LM317

## 3-Transformer:

It is basically a voltage control device that's used widely in the distribution and transmission of alternating current power and can be described as a thing that steps up or steps down voltage.



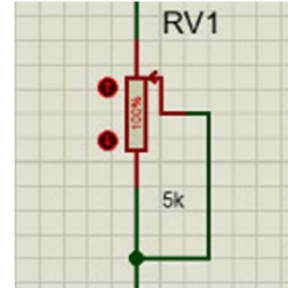
In our case we will be using a step-down transformer. In a step-down transformer, the output voltage will be decreased, while the output current will be increased to keep the input and the output current of the system equal.

*Number and value used in this project:* one Transformer, TR1 24V-3A.

#### 4-Potentiometer:

They are passive devices which means they do not need power supply or additional circuits to function.

It is a three-terminal resistor with a rotating contact that forms an adjustable voltage divider.



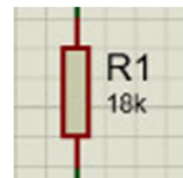
- used to accurately measure voltage.
- help achieve a variable voltage from a fixed-voltage source.

*Number and value used in this project:* one potentiometer, RV1 5k.

#### 5-Resistor:

A passive electrical component with two-terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

It is made of copper wires which are coiled around a ceramic rod and the outer part of the resistor is coated with an insulating paint.



*Number and value used in this project:* two resistors, R1 18k-5%, R2 220 5%.

## 6-Capacitors:

They are passive electronic components consisting of two or more pieces of conducting material separated by an insulating material.

It has the capacity to store energy in the form of an electrical charge producing a potential difference across its plates.

its job in the output is to maintain a constant DC value by removing as much power ripple as possible.



*Number and value used in this project:* three Capacitors C1 2200  $\mu\text{f}$ , C2 1.0  $\mu\text{f}$ , C3 0.1  $\mu\text{f}$ , 40V.

## 7-Diode:

It is a semiconductor device that allows current to flow easily in one direction, and is called forward-biased. It restricts current from flowing in the opposite direction and is called reverse-biased, and acts as an insulator and does not permit current to flow.



Diodes are known as rectifiers because they change Alternating Current (AC) into Direct Current (DC).

They are rated according to their type, voltage, and current capacity and have polarity, determined by an anode and cathode.

*Number and value used in this project:* one diode D2 400 V,1A.

## 8-Light-emitting diode (LED):

It is a semiconductor device that emits light when current flows through it. The color of the light is determined by the energy required for electrons to cross the band gap of the semiconductor.

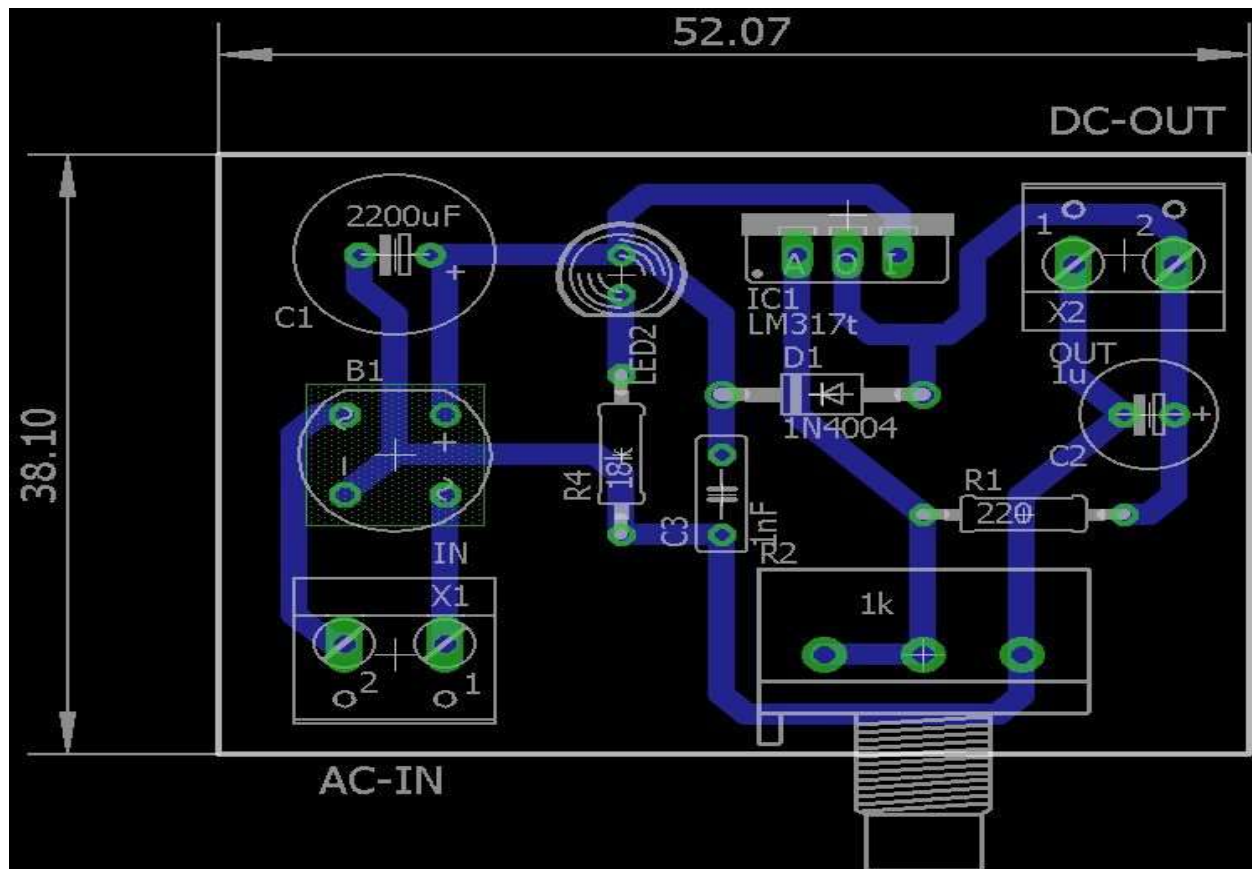


*Number and value used in this project:* one diode D1 Red.



After we designed the circuit, and put it on the simulator application (Proteus) it gave us voltage ranging from **1.26V-29.9V**.

So, we went on and printed our design on the PCB



About the **Printed circuit board (PCB):**

PCBs is a medium used to connect electronic components to one another, allows for communication between them, and help protects these components from damage and interference.



We then went on and bought the components mentioned in details above plus the following components

- **Plugs:**

AC power plugs and sockets connect electric equipment to the alternating current (AC) power supply in buildings and on other sites.

*For our project we got a 2-wire plug.*

- **Cord:**

A power cord is an electrical component used for connecting appliances to a power supply. It is made from an insulated electrical cable with one or both ends molded with connectors.

- **Switch:**

A device that opens and closes an electric circuit. It uses a lever that is moved up and down.

- **Banana Connectors:**

They are electrical connectors that are used to join single-conductor wires to each other or to pieces of equipment.

*For our project we got the red and black banana jacks.*

- **Connectors:**

It joins two pieces of equipment, wire or piping together.

*For our project we got the 3-pin terminal block connector*

- **Soldering Iron:**

A soldering iron is composed of a heated metal tip and an insulated handle. It supplies heat to melt solder so that it can flow into the joint between two workpieces.

Using the soldering iron we joint the components together to the PCB, then plugged in the plug to a power source, opened the switch then we checked the voltage using digital multimeter (AVO) it gave us a voltage ranging from **1.2V to 31.5 V**.