

Adjustable Voltage regulator using LM317

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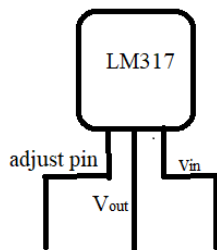
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Abstract: This paper explains about the importance of LM317 adjustable voltage Regulator. Now a day's all the electronic devices are very sensitive. So, for proper operation of these equipments it is necessary to supply constant voltage to them. For maintain voltage as constant voltage regulator is required. We have mainly two types of voltage regulators. Those are fixed voltage regulators and variable voltage regulators. Variable voltage regulators are better than fixed voltage regulators. We have different types of variable voltage regulators among those LM317 is one of the best regulator it is very easy to carry and low cost. This article shows that the importance and variable applications of LM317 voltage regulator.

Keywords: LM317, step-down transformer, preset

1. Introduction

LM317 is a power electronic device. It is an adjustable 3-terminal device. Those 3-pins are input pins, adjustable pins and output pins.



It is invented by Robert.c.Dobkin and Robert J.Wildar in the year1970.it is a positive voltage regulator capable of supplying in excess of 1.5A over an output voltage range of 1.2V to 37V.

2. Description of LM317 pins:-[2]

(a) Input pin[Vin]:-

This receives the input voltage. It is unregulated. Next it can be regulated suppose our input voltage as unregulated 24Volts .It can be adjusted 12V.Now, 12V voltage as regulated.

(b) Output pin[Vin]:-

Vout is the output pin. It gives desired regulated voltage as output. For example, our input voltage is 24V.we get 12V output at output pin.

3. Adjustable pin

As the name indicates adjustable. It is the main important pin. By connecting different values of resistors across the Adjustable pin, We can easily regulate the output Voltage.

4. Schematic Diagram

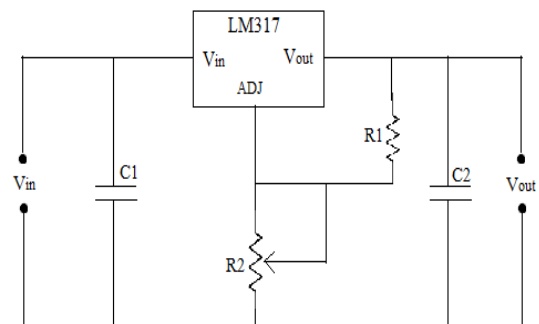


Figure 1: Schematic diagram of LM317[1]

The schematic diagram of LM317 is shown in the above figure. In the above figure we observed that here we are using capacitors. This capacitors are used for input Noise and output harmonics the device produces stable reference voltage of $V_{ref} = 1.25V$. V_{ref} is the difference in voltage between the output pin and the adjustable pin the equation of output voltage

$$V_{out} = V_{ref} \cdot (1 + R1/R2)$$

The maximum current flows across the adjustable pin of the device. so the equation can be modified as,

$$V_{out} = V_{ref} (1 + R1/R2) + I_{qR1}$$

So, for reducing the error in output voltage, the device is designed to keep the current at permissible value. Because of current flow to the device, it releases high temperature .So it is better to use heat sink across the device. We can get the desired output voltage, by substituting the different values of R1 and R2 in the above formula.

5. Experimental Circuit

In our research we prepared a 12V adjustable voltage regulator circuit using LM317.It can adjust voltage in between 0V to 12V.the experimental circuit is shown in below figure.

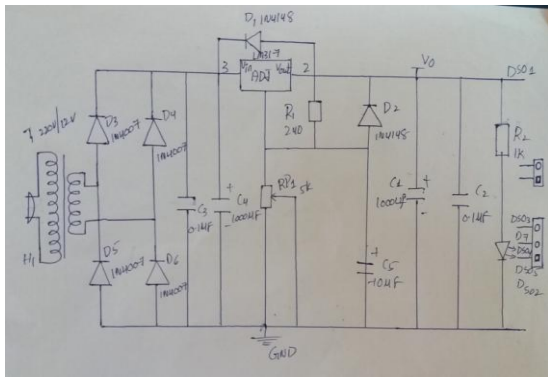


Figure 2: Adjustable voltage regulator circuit using LM317

The main components used for preparing the circuit as follows:

Sno	Name of the components	quantity	Range
1	Diode	4	IN4007
2	Zener diodes	2	4148
3	Resistors	1	240 ohms
4	Resistors	2	10 ohms
5	Resistors	3	100 ohms
6	Resistors	4	1 ohms
7	Capacitors	2	0.1uF
8	Capacitors	2	1000uF
9	Capacitors	2	10uF
10	potentiometer	1	
11	Transformer	1	(0-240v) TO
12	IC 4069BE	1	(0-12v)
13	Alligator clips	2	
14	LM317	1	
15	Preset	1	
16	Heat Sink	1	
17			

6. Process of preparing circuit

In the process of preparing the circuit,

First install the short component and then install the taller size component. Pay attention to the positive and negative electrode of electrolytic capacitor. In this process first install the LM317 carefully with the heat sink.

Instalment of voltmeter: Take out 3-wires;weld three pieces of component pins; install the voltmeter (potentiometer) M3 screws and transparent spacers.

Next connect the Ac 12V line of the transformer on the circuit board(there is no positive or negative electrodes);After that fix the transformer with the circuit board with M3 screws well.

The red line of the transformer shall connect the power source of 200V.protect the welded power line with Heatsink tubing.

Next install the Alligator clips

After installing all these equipments on the board,we get the total circuit.

7. Working

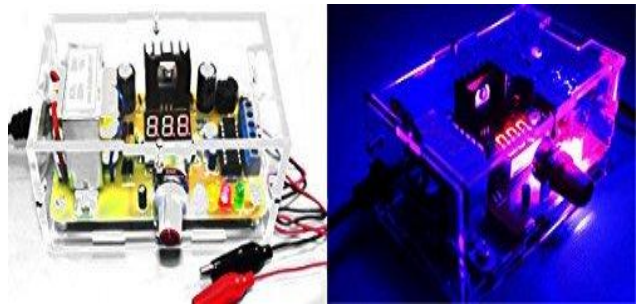


Figure 3: adjustable voltage regulator complete setup

When we are giving the 220V supply to the circuit, the transformer steps-Down into 12V.Actually we are getting AC output from the transformer. Here Diode Bridge used to convert it into 12V DC. Finally by varying the potentiometer we get the desired output voltage. Here we also placed a Four Led's. those are RED, GREEN ,YELLOW & BLUE. Here, the RED LED shines with high level input; the GREEN LED shines with the low level inputs.

This is about the working of the Experimental voltage regulator using LM317.

8. Applications:[3]

- The LM317 serves a wide variety of applications. Such as,
- 1) Local, ON card regulation
 - 2) Use full for making a programmable OUTPUT regulator
 - 3) Applicable for providing constant current circuit

9. Conclusion

This article gives the importance of LM317 voltage regulator and also it gives the process of preparing the practical circuit. Finally, LM317 voltage regulator is best among all the variable voltage Regulators.

References

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