**Power supply 5v, 9v, 12, 12V AC**

Material required

* 1n4007 diode
* 12V transformer
* 1000Uf-50v capacitor
* Female pin
* PCB
* Voltage regulator IC
* LM7805
* L7809
* L7812

How the system works:-

The 12V transformer converts the 220v alternating current into 12V direct current. The bridge type arrangement of diode acts as rectifier which helps to rectify alternating current to direct current. Capacitor will act as filter for the AC part of the output.

What is Rectifier?

A rectifier is an electronic device that converts an alternating current into a direct current by using one or more P-N junction diodes. A diode behaves as a one-way valve that allows current to flow in a single direction. This process is known as rectification.

A rectifier can take the shape of several physical forms such as solid-state diodes, vacuum tube diodes, mercury-arc valves, silicon-controlled rectifiers, and various other silicon-based semiconductors switches.

Different Types of Rectifier

Rectifiers are mainly classified into two types as:

1. Uncontrolled Rectifier
2. Controlled Rectifier

Uncontrolled Rectifiers

The type of rectifier whose voltage cannot be controlled is known as an uncontrolled rectifier. Uncontrolled rectifiers are further divided as follows:

* Half Wave Rectifier
* Full Wave Rectifier
* Controlled Rectifiers
* A type of rectifier whose voltage can be varied is known as the controlled rectifier. We use SCRs, MOSFETs and IGBTs to make an uncontrolled rectifier a controlled one
* Half Wave Rectifier
* Full Wave Rectifier

Why to use 1n4007 diode for rectifier purpose?

1n4007 diode is used because its Peak inverse voltage is much higher then the other diodes i,e; 1000v.

Datasheet [1N4001/1N4007 Datasheet - Vishay Semi Diodes | DigiKey](https://www.digikey.in/en/datasheets/vishay-semiconductor-diodes-division/vishay-semiconductor-diodes-division-1n4001?utm_adgroup=Vishay&utm_source=bing&utm_medium=cpc&utm_campaign=Dynamic%20Search_EN_Suppliers&utm_term=vishay&productid=&utm_content=Vishay&utm_id=bi_cmp-420496587_adg-1296324573502689_ad-81020360791949_dat-2332820076894209:loc-90_dev-c_ext-_prd-&msclkid=7d35173dae6c1037cee8748e47d1f7ad)

What is Peak inverse voltage of a diode?

Ans: The maximum reverse voltage that appears across the diodes during the reverse bias condition is called PIV.

**Formula** = Vrms = v’ /root 2

V’=Vrms\* root 2

Where V’ = PIV

PIV for Half wave rectifier =Vm

PIV for full wave rectifier =2Vm

PIV for Bridge rectifier is = Vm

Where Vm is the voltage in secondary coil of the transformer.

**Calculation** = Vm = 12V

V’=12\*1.414

V’=16.968V

How to choose the value of capacitor for the rectifier?

Ans = 1. Find the total voltage drop across the point where capacitor needs to be used.

**Formula:-**

V = V’- Vd

Vd = voltage across the no of diode active towards the each cycle of alternating current

1. We always increase the Voltage across the capacitor by 30-40%

V\*30% (**This will be the voltage of the capacitor)**

1. To calculate capacitance

C = I\*t/V

Where I = current in secondary coil of the transformer

T = Time taken in half cycle **(During the negative half cycle the diode in forward bias)**

V = Difference between the maximum and minimum voltage across voltage regulator

1. Increase the Capacitance value by 50%

**Calculation:-**

V’ = 16.968V

Vd = 2\*0.7 **(Because in bridge configuration two diode we active at once)**

Vd = 1.4V

V = 16.968 - 1.4

V= 15.568V

V = 15.568\*30%

V= 4.6704V

V = 15.568+4.6704 **(30% added)**

V = 20.2384V **(so we take 25 volt)**

C = 1\* 10 ms/ V

V = 27-14.5

12.5V

C = 1\*1000/12.5V

C = 800 **(so we take 1000 uf)**

What is voltage regulator?

The function of a **voltage regulator** is to maintain a constant DC voltage at the output irrespective of voltage fluctuations at the input and (or) variations in the load current. In other words, voltage regulator produces a regulated DC output voltage.

Voltage regulators are also available in Integrated Circuits (IC) forms. These are called as **voltage regulator ICs**.

Types of Voltage Regulators

There are **two types** of voltage regulators −

* Fixed voltage regulator
* Adjustable voltage regulator

This chapter discusses about these two types of voltage regulators one by one.

Fixed voltage regulator

A **fixed voltage regulator** produces a fixed DC output voltage, which is either positive or negative. In other words, some fixed voltage regulators produce positive fixed DC voltage values, while others produce negative fixed DC voltage values.

**78xx** voltage regulator ICs produce positive fixed DC voltage values, whereas, 79xx voltage regulator ICs produce negative fixed DC voltage values.

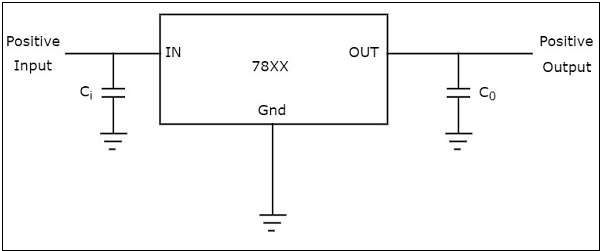
The following points are to be noted while working with **78xx** and **79xx** voltage regulator ICs −

* “xx” corresponds to a two-digit number and represents the amount (magnitude) of voltage that voltage regulator IC produces.
* Both 78xx and 79xx voltage regulator ICs have **3 pins** each and the third pin is used for collecting the output from them.
* The purpose of the first and second pins of these two types of ICs is different −
  + The first and second pins of **78xx** voltage regulator ICs are used for connecting the input and ground respectively.
  + The first and second pins of **79xx** voltage regulator ICs are used for connecting the ground and input respectively.

Examples

* 7805 voltage regulator IC produces a DC voltage of +5 volts.
* 7905 voltage regulator IC produces a DC voltage of -5 volts.

The following figure shows how to produce a **fixed positive voltage** at the output by using a fixed positive voltage regulator with necessary connections.



**In the above figure that shows a fixed positive voltage regulator, the input capacitor Ci is used to prevent unwanted oscillations and the output capacitor, C0 acts as a line filter to improve transient response.**

**Note** − an get a **fixed negative voltage** at the output by using a fixed negative voltage regulator with suitable connections.

Adjustable voltage regulator

An adjustable voltage regulator produces a DC output voltage, which can be adjusted to any other value of certain voltage range. Hence, adjustable voltage regulator is also called as a **variable voltage regulator**.

The DC output voltage value of an adjustable voltage regulator can be either positive or negative.

**Circuit diagram:-**

