AC TO DC REGULATED VARIABLE POWER SUPPLY

A Project submitted to the Delhi Technological University, Delhi in Partial fulfilment of the requirements for the award of the degree of

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In

Electronics and Communications Engineering

by

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(23/EC/026, 23/EC/027,23/EC/028, 23/EC/30)

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November, 2023

DECLARATION

We hereby declare that the project titled "**AC to DC Regulated Variable Power Supply"** is an original work carried out by me under the supervision of Mr. Sachin Dhariwal Professor, Department of Electronics and Communications Engineering, Delhi Technological University, Delhi. This thesis has been prepared in conformity with the rules and regulations of Delhi Technological University, Delhi. The research work reported and results presented in the thesis have not been submitted either in part or full to any other University or institute for the award of any other diploma or degree.

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CERTIFICATE

This is to certify that the work embodied in the thesis titled **“AC to DC Regulated Variable Power Supply ”** by Ankur Kumar Singh, Ankur Singh Patel, Antara Mahanty, Anurag tiwari **(**Roll No.: **23/EC/026, 23/EC/027,23/EC/028, 23/EC/30**) in partial fulfillment of requirements for the award of Degree of **Bachelor of Technology in Electronics and Communications Engineering**, is an authentic record of student’s own work carried by him under my supervision.

This is also certified that this work has not been submitted to any other University or institute for the award of any other diploma or degree.

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ABSTRACT

The 9V DC power supply is an essential part in present day electronic frameworks. This complete task report gives an indepth examination of the plan and implementation of a 5V DC power supply, underscoring the

meaning of rectificatjon, sifting, voltage regulation, and yield protection. The report covers different parts of the venture, including plan considerations, part selection, testing, and future upgrades.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

A regulated DC power supply serves several important needs in various fields, particularly in electronics, research, and testing. Its precision, versatility, and protection features are crucial for various applications, from electronics testing to industrial processes, contributing to safety and the consistent performance of electrical systems. This project aims to understand the working of a regulated DC supply and impart practical knowledge on the electronic components, circuits and electronic instruments.

1.2 OBJECTIVES

1. Understanding Electronics Basics: Building a DC power supply helps in grasping fundamental electronic components and principles, such as voltage regulation, current limiting, and circuit design.

2. Practical Skills: It enables us to gain hands-on experience in assembling electronic circuits, soldering, and troubleshooting, which are valuable skills for electronics enthusiasts and professionals.

3. Cost-Efficiency: Homemade power supplies can be more cost-effective than purchasing commercial units, especially when working on DIY projects or prototypes.

4. Educational Purposes: Understanding DC power supply construction is essential for students and hobbyists interested in electronics and electrical engineering.

5. Project Development: A DC power supply is a foundational element in various projects, such as robotics, home automation, and electronics prototyping.

6. Problem Solving: Learning to make a DC supply involves troubleshooting and problem-solving skills, which are essential in the field of electronics.

7. Safety Awareness: Developing a power supply reinforces safety practices, like handling high voltage components, using proper insulation, and implementing safeguards.

8. Skill Development: Building a DC power supply is a practical way to enhance your skills in electronics and DIY electronics projects.

CHAPTER 2

POWER SUPPLY

2.1 POWER

In the field of electrical engineering, power refers to the rate at which energy is transferred or converted. It is a crucial aspect of any electrical system, representing the ability to perform work or generate heat. Power is typically measured in watts (W) and plays a fundamental role in various applications, including powering electronic devices, operating machinery, and lighting up our homes and cities. Power produces electric current and depending upon the type of current generated it is divided into two supplies, DC supply and AC supply.

2.1.1 DC Supply

DC supply stands for Direct Current supply. It flows in one direction, providing a constant voltage and steady current. DC power is essential for electronic devices and circuits, as they require a stable and continuous flow of electricity to operate effectively. Batteries and power supplies are typical sources of DC power, ensuring a consistent electrical flow for various applications.

2.1.2 AC Supply

AC supply stands for Alternating Current supply. In AC circuits, the electric current periodically reverses direction, flowing first in one direction and then in the opposite direction. This cyclical variation of current and voltage is the characteristic feature of AC supply.

AC power is the most common form of electrical power used in homes and businesses worldwide due to its ease of generation, transmission, and distribution over long distances.

2.1.1.2 AC Waveforms

A waveform describes the magnitude and direction of the current. AC waveforms are obtained by plotting the instantaneous ordinate values of the current or voltage against time. The most common is the sinusoidal waveform, typically known as the sine wave, though other AC waveforms such as triangular, square, and sawtooth.

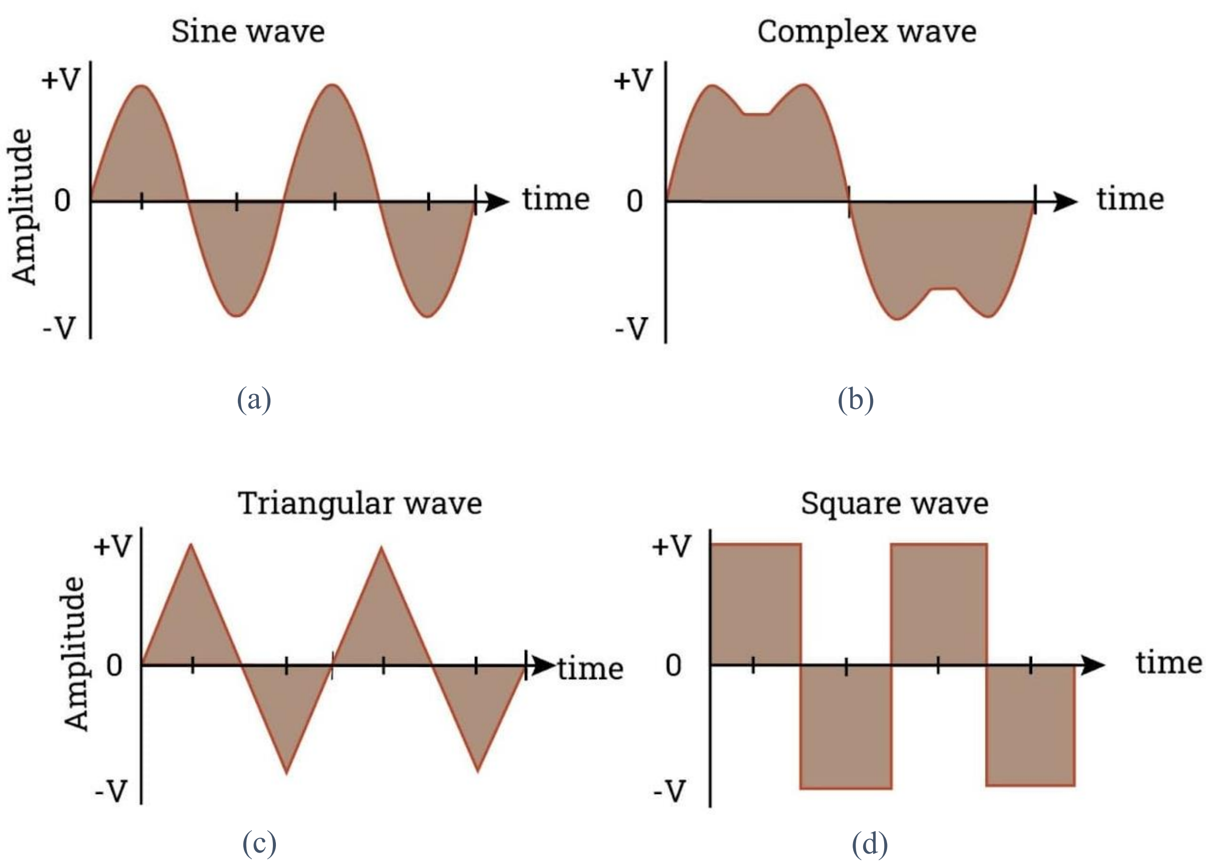


Fig 2.1 Types of AC Waveforms

2.1.2.2 AC Sine Wave and Its Parameters

AC sine waves are represented by the mathematical equation

$A(t) = A_{max} \sin(\omega t)$ (2.1)

Where $\omega = 2\pi f$ (2.2)

Based on the sinusoidal waveform of AC, the following AC parameters had been derived:

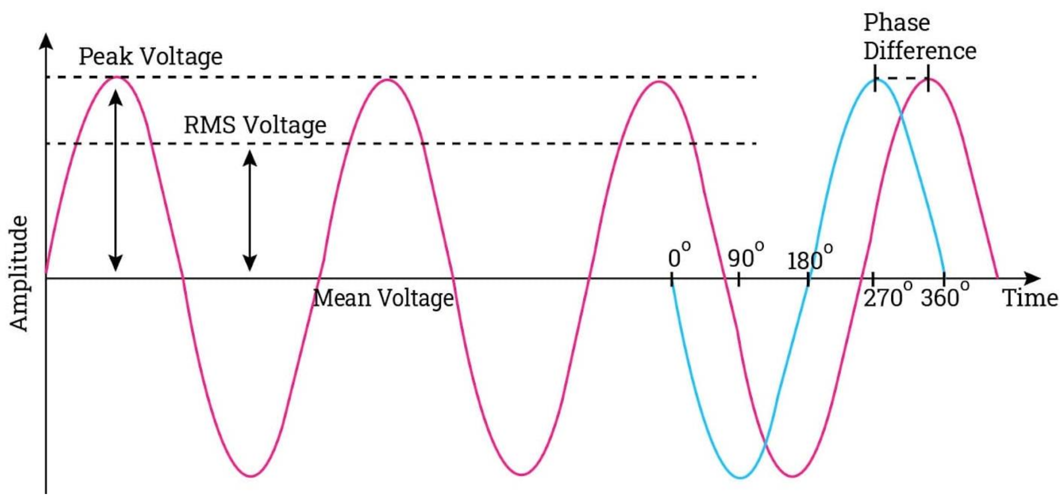


Fig 2.2 parameters of sinusoidal AC waveform

Amplitude (A_{max})

It refers to the maximum voltage or current that the AC waveforms reach. It also refers to the intensity of the voltage or current. It is visualized on the sine wave graph as the highest and lowest peaks. A negative sign signifies that the direction of the wave is in reverse. The value for voltage and current is not less than zero. The maximum value for the voltage in an AC waveform is called "peak voltage".

Frequency (f)

It is the number of times that a wave cycle repeats itself in one second. Hertz (Hz, cycles per second) is the unit of measurement of frequency. This is one of the critical parameters which is frequently specified in AC electrical systems.

Period (T)

It is the duration of the time it takes to complete one cycle. It is equal to 1/f. High-frequency waves have shorter periods.

Mean Voltage and Mean Current

These are the average of all instantaneous voltages and current, respectively, during one wave cycle. For AC sine waves, they are equal to zero since the wave is oscillating above and below symmetrically.

Root-mean-square (RMS) voltage and current

It is the theoretical equivalent DC voltage or current that would dissipate the same power or heat as the same AC voltage or current being measured. RMS is a statistical measure of the magnitude of varying quantities.

In AC sine waveforms, the RMS voltage is equivalent to

$$V_{rms} = \frac{V_{max}}{\sqrt{2}}$$

Phase difference (φ)

It refers to the angular difference between two waveforms. It measures how much time the leading wave is ahead of the lagging wave. It can also be determined by subtracting the corresponding angles by which the waves reach their highest or lowest peaks.

2.1.3 AC-DC Conversion Basis

AC-DC conversion is the process of converting alternating current (AC) into direct current (DC) which is also known as Rectification. This conversion is achieved using diodes, which act as one-way valves, allowing current to flow in only one direction. The rectification process involves converting the AC waveform into a pulsating DC waveform. Additionally, a transformer is often used to step down the voltage to a suitable level for the rectification process, ensuring the safety and efficiency of the conversion.

2.2 REGULATED POWER SUPPLY

A regulated power supply is an electrical circuit designed to provide a stable and consistent output voltage, regardless of variations in the input voltage or load conditions. It is crucial in electronic devices where fluctuations in power supply can lead to malfunction or damage. Regulated power supplies use voltage regulation components such as voltage regulators to maintain a constant output voltage, ensuring reliable and safe operation of connected devices. Parts of a regulated DC supply are as given below.

2.2.1 Step Down Transformer

A step-down transformer is an electrical device that reduces the voltage of an alternating current (AC) power supply. It consists of a primary winding, a secondary winding, and an iron core. When an AC voltage is applied to the primary winding, it creates a fluctuating magnetic field in the iron core. This magnetic field then induces a voltage in the secondary winding but at a lower voltage level than the primary winding.

2.2.2 Rectifier Circuit

A Rectifier is an electronic circuit that converts an input AC voltage into a DC voltage at the output terminal. This output is known as Rectified output voltage. Bridge Rectifier is a type of Full Wave Rectifier that uses four diodes to form a close-loop bridge. The diodes conduct in pairs through each positive and negative half cycle, leading to no wastage of power.

Bridge Rectifier does not require a center tap over the secondary winding of the transformer. The input is fed through a transformer to the diagonal of the diode bridge. The transformer of this circuit is always busy because it supplies power all the time in both cycles of input AC

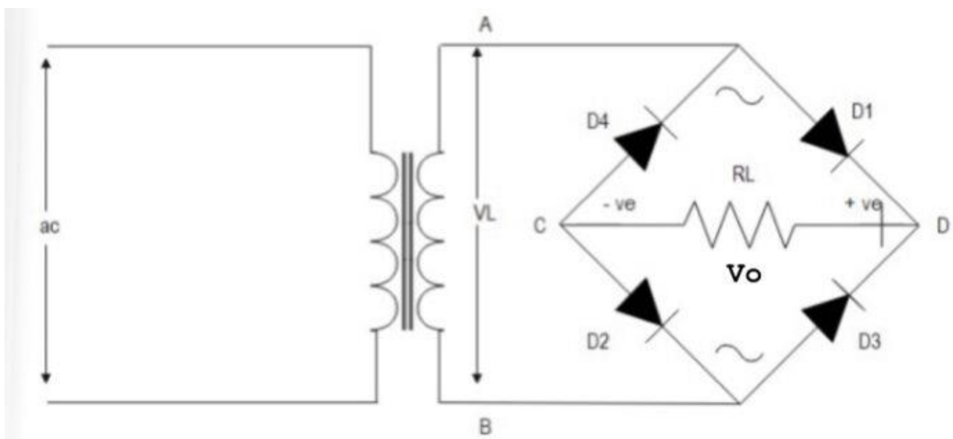


Fig 2.3 bridge rectifier circuit

2.2.2.1 Positive half cycle of bridge rectifier

During the positive half cycle of the input AC supply, the polarity of the secondary voltage across terminal A is positive with respect to terminal B. This causes the Diodes D1 and D2 to be forward-biased and Diodes D3 and D4 to be reversed-biased.

D1 and D2 diodes create a path of short circuits and start conducting while diodes D3 and D4 behave as open circuits. The load current starts to flow through the short circuit path created by both D1, and D2 diodes. The direction of the load current is from D1, RL, to D2. The voltage across load resistor RL is positive at terminal D and negative at terminal C.

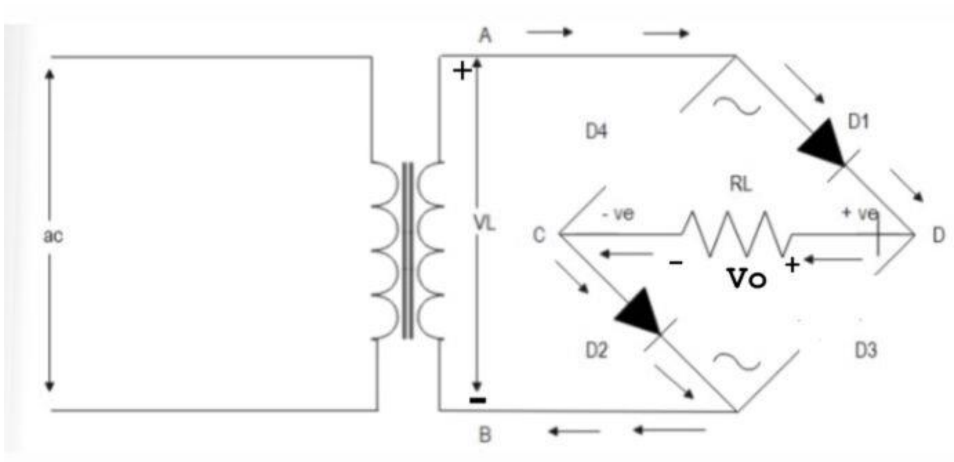


Fig 2.4 bridge rectifier in positive half cycle

2.2.2.2 Negative half cycle of bridge rectifier.

During the negative half cycle of the input AC supply, the polarity of the secondary voltage across terminal B is positive with respect to terminal A.

D3 and D4 diodes create a path of short-circuit and start conducting while diodes D1 and D2 behave as open circuits. The load current starts to flow through the short circuit path created by both D3 and D4 diodes. The direction of the load current is from D3, RL, to D4. The voltage across load resistor RL is positive at terminal D and negative at terminal C.

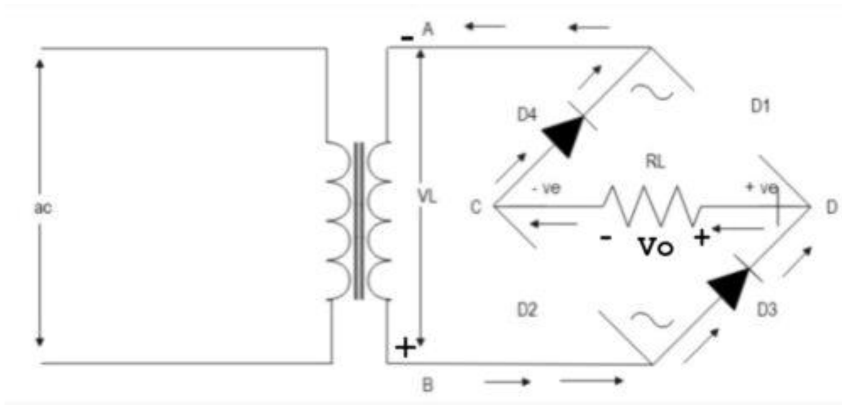


Fig 2.5 bridge rectifier in negative half cycle

2.2.3 DC Filter Circuit

In practice, a rectifier is used to produce pure DC supply in electronic circuits. But the output of a rectifier is not pure DC, it has pulsations, i.e., it contains AC and DC components. The AC component is undesirable and must be removed. For this, a filter circuit is used.

A Filter Circuit is a circuit which removes the ac component from the output of rectifier and produces the pure dc output across the load it should be placed between the rectifier and the load. The capacitor filter circuit consists of a capacitor (C) connected in parallel with the load. The pulsating rectified output is applied across the capacitor. The low reactance of the capacitor bypasses the AC component but prevents the DC component from flowing through the capacitor. Therefore, only the DC component reaches the load.

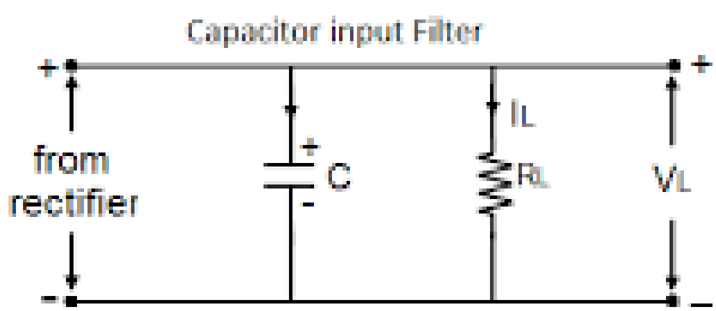


Fig 2.6 Smoothening capacitor connections

2.2.4 Voltage Regulator

A voltage regulator is an integrated circuit (IC) that provides a constant fixed output voltage regardless of a change in the load or input voltage.

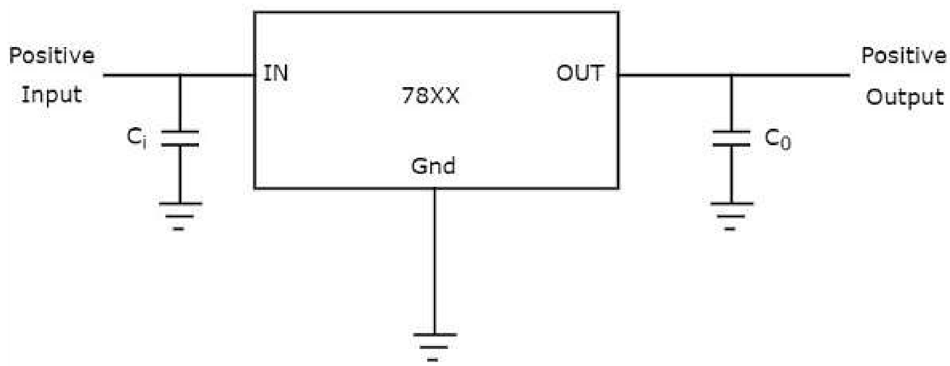


Fig 2.7 Voltage regulator IC connections

In the above figure that shows a fixed positive voltage regulator, the input capacitor C_i is used to prevent unwanted oscillations and the output capacitor, C_0 acts as a line filter to improve transient response.

Values of C_i is 0.33uf, and C_o is 0.1uf in most of the general cases.

2.3 IMPORTANCE OF DC SUPPLY

Direct current (DC) supply is of paramount importance in various aspects of our daily lives and industrial applications. For example,

- Device Compatibility: Many electronic devices, such as smartphones and laptops, operate on DC power.
- Battery-Powered Devices: Portable gadgets, vehicles, and emergency systems rely on DC power stored in batteries.
- Stable Voltage: DC supply provides a stable voltage, preventing damage to sensitive electronic components.
- Efficient Energy Storage: DC power is efficiently stored in batteries, enabling energy backup solutions.
- Electroplating and Electrolysis: DC supply is essential for electroplating and electrolysis processes in industries.
- Electronic Circuits: Transistors, microcontrollers, and integrated circuits require DC power to function.
- Light Emitting Diodes (LEDs): LEDs operate on low-voltage DC power, making them energy-efficient lighting solutions.
- Solar Power Systems: DC power generated by solar panels is stored in batteries for later use.
- Electric Vehicles: EVs use DC power for their electric motors, enabling eco-friendly transportation.

2.4 FEATURES OF REGULATED POWER SUPPLY

Regulated power supplies offer several key features, ensuring reliable and safe power delivery

- Stable Output Voltage: Regulated power supplies maintain a constant output voltage regardless of fluctuations in the input voltage or load changes.
- Low Ripple: They produce a smooth and low-ripple output, reducing electrical noise in connected devices.

- Overload Protection: Regulated power supplies incorporate protection mechanisms to prevent damage due to overloading or short circuits.
- Efficiency: They operate efficiently, minimizing energy wastage and heat generation.
- Voltage and Current Limiting: Some regulated power supplies allow users to set specific voltage and current limits, ensuring optimal performance for diverse applications.

2.5 APPLICATIONS OF REGULATED POWER SUPPLY

Regulated power supplies find applications across various industries and fields, including:

- Electronic Devices: Powering computers, smartphones, and consumer electronics.
- Telecommunications: Providing stable power to communication equipment and networks.
- Industrial Automation: Powering sensors, actuators, and control systems in manufacturing processes.
- Laboratory Equipment: Powering testing instruments, oscilloscopes, and scientific apparatus.
- LED Lighting: Regulating power for energy-efficient LED lighting systems.
- Educational Institutions: Powering electronics labs and educational kits for students.
- Aerospace and Defense: Powering avionic systems, radar, and communication devices.
- Research and Development: Powering experimental setups and prototypes in research projects.

CHAPTER 3

DESIGN-MATERIALS

3.1 COMPONENTS

The main components of the regulated DC power supply are as follows:

3.1.1 Transformer

A transformer is a magnetic device that takes advantage of the phenomenon of mutual inductance. It is a static electrical machine which is used for either increasing or decreasing the voltage level of the AC supply with a corresponding decrease or increase in the current at constant frequency.

Specifications of 12-0-12 1 Ampere Center Tapped Transformer: -

- Input Voltage: 230V AC
- Output Voltage: 12V, 12V or 0V
- Output Current: 1 Amp
- Mounting: Vertical mount type

Features of 12-0-12 1 Ampere Center Tapped Transformer: -

- Soft Iron Core.
- 1 Amp Current Drain.

3.1.1.1 Working principle

According to the principle of mutual inductance, when an alternating voltage is applied to the primary winding of the transformer, an alternating flux ϕ_m which is called as the mutual flux is produced in the core. This alternating flux links both the windings magnetically and induces EMFs E1 in the primary winding and E2 in the secondary winding of the transformer according to Faraday's law of electromagnetic induction. The EMF (E1) is called as primary EMF and the EMF (E2) is known as secondary EMF and being given as,

$$E_1 = -N_1 \frac{d\varphi_m}{dt} \tag{3.1}$$

And,

$$E_2 = -N_2 \frac{d\varphi_m}{dt} \tag{3.2}$$

Therefore,

$$\frac{E_2}{E_1} = \frac{N_2}{N_1} \tag{3.3}$$

From the above expression it can be seen that the magnitude of EMFs E_1 and E_2 depend upon the number of turns in the primary and secondary windings of the transformer respectively, i.e., if $N_2 > N_1$, then $E_2 > E_1$, thus the transformer will be a step-up transformer and if $N_2 < N_1$, then $E_2 < E_1$, thus the transformer will be a step-down transformer. If a load is now connected across the secondary winding, the EMF E_2 will cause a load current I_2 to flow through the load. Therefore, a transformer enables the transfer of power from one electric circuit to another with a change in voltage level.

3.1.1.2 Centre Tapped Transformer

A Centre Tapped transformer works in the same way as a usual transformer. The difference lies in the fact that its secondary winding is divided into two parts, so two individual voltages can be acquired across the two-line ends. When an additional wire is connected across the exact middle point of the secondary winding of a transformer, it is called a center tapped transformer. The wire is adjusted such that it falls in the exact middle point of the secondary winding and is thus at zero volts, forming the neutral point for the winding. This is called the "center tap" and this thing allows the transformer to provide two separate output voltages which are equal in magnitude, but opposite in polarity to each other.

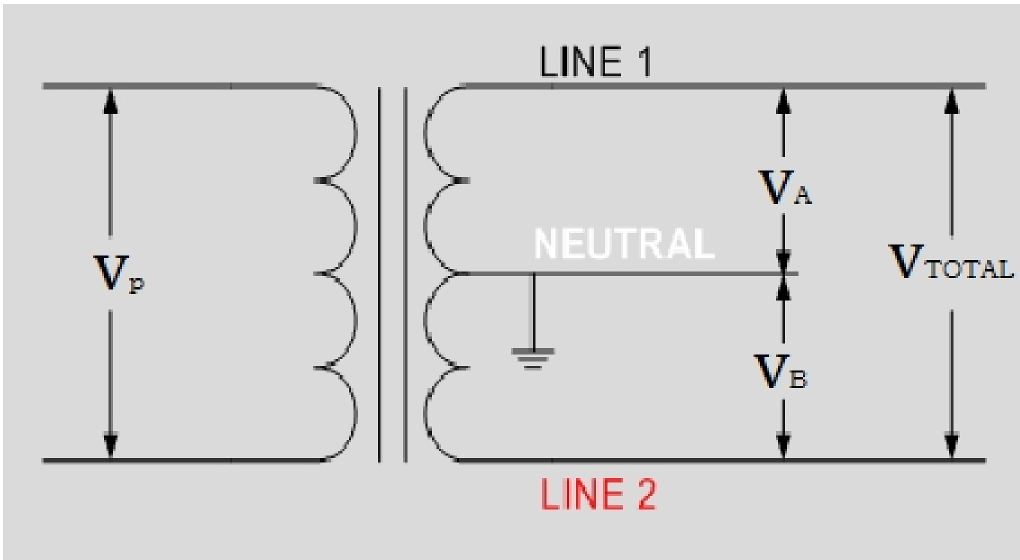


Fig 3.1 Centre tapped transformer circuit

3.1.2 PN junction diodes

A two-terminal or two-electrode semiconductor device, which allows the electric current to flow only in one direction while blocking the electric current in the opposite or reverse direction, is known as PN junction diode. This device is forward biased, allowing the electric current to flow. On the other hand, in reverse bias conditions, it blocks the electric current flow.

Specifications of 1N5399 diode: -

- Standard Silicon Rectifier with Low Leakage Current
- Peak Reverse Voltage (V_{rrm}): 1000V
- Max. RMS Reverse Voltage (V_r): 700V
- Average Rectified Current (I_o): 1.5A
- Max. Reverse Current (I_r): 5µA

- Max. Forward Voltage Drop (V_f): 1.0V

3.1.2.1 Leakage Current

It is seen that in a reverse-biased diode, some current flows through the depletion region. This current is called leakage current. Leakage current is dependent on minority current carriers. The minority carriers are electrons in the P type material and holes in the N type material. In all reverse-biased diodes, occurrence of leakage current is normal to some extent. In Germanium and Silicon diodes, leakage current is only of few $\mu A(10^{-6})$ and $nA(10^{-9})$, respectively. Germanium is much more susceptible to temperature than silicon. For this reason, mostly Silicon is used in modern semiconductor devices.

3.1.2.2 Peak Inverse/Reverse Voltage

PIV is the maximum voltage that should be applied to the diode in reverse bias. The diode is a unidirectional device, hence if a voltage more than PIV is applied across the diode, an avalanche breakdown occurs. When this happens, the potential barrier is broken and a high impulse current flows in the circuit. This can damage the diode and the whole equipment as well. Diodes must have PIV rating that is higher than the maximum supplied voltage. Thus, PIV rating is important to know how much maximum voltage can be applied across the diode safely without damaging the diode.

3.1.2.3 Average Rectified Current

Average rectified current (Io) is the maximum allowable continuous average current in the forward direction under specified conditions.

3.1.3 Capacitor

A capacitor is referred to as a condenser or a device one which stores energy in the form of an electrostatic field which produces a potential across its plates. A capacitor consists of two parallel conductive plates that are not connected but are electrically separated by either air or by an insulating material called dielectric.

Specifications of 2200/25V electrolytic capacitor: -

- Capacitance: 2200µF
- Voltage (DC): 25V
- Capacitance Tolerance: ± 20%
- Ripple Current: 1.5A

3.1.3.1 Electrolytic Capacitors

These are generally used when very large capacitance values are required. Here instead of using a very thin metallic film layer for one of the electrodes, a semi liquid electrolyte solution in the form of a jelly or paste is used which serves as a second electrode.

The majority of electrolytic capacitors are polarized.

The capacitance in these are generally in the order of "µF".

3.1.3.2 Ceramic Capacitors

These are made by coating two sides by a small porcelain or ceramic disc with silver and then are stacked together to make a capacitor.

They are unpolarized and are of the order "pf".

3.1.4 Voltage Regulator IC

A voltage regulator is an integrated circuit (IC) that provides a constant fixed output voltage regardless of a change in the load or input voltage.

It produces a fixed DC output voltage, which is either positive or negative.

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

IC used: 7809

3.1.4.1 characteristics of 78xx and 79xx 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.

Table 3.1 Specifications of various voltage regulator ICs

IC regulator	Input voltage	Output voltage	Current
7824	33-40 V	24V	1.5 A
7812	14-35 V	12V	1 A

7809	11-35 V	9V	1.5 A
7806	8-25 V	6V	1 A
7805	7-25 V	5V	1.5 A

3.1.5 Resistor

A resistor is an electrical component that limits or regulates the flow of electrical current in an electronic circuit.

All other factors being equal, in a direct-current (DC) circuit, the current through a resistor is inversely proportional to its resistance, and directly proportional to the voltage across it. This is the well-known Ohm's Law.

$$V=IR \tag{3.4}$$

In alternating-current (AC) circuits, this rule also applies as long as the resistor does not contain inductance or capacitance.

Specifications of resistor: -

- Resistance: 82Ω
- Tolerance: 5%
- Resistor type: carbon film
- Power rating: 1W
- Max. operating voltage: 180V to 240V

3.1.6 LED

A Light Emitting Diode (LED) is a semiconductor device, which can emit light when an electric current passes through it. To do this, holes from p-type semiconductors recombine with electrons from n-type semiconductors to produce light. The wavelength of the light emitted depends on the bandgap of the semiconductor material.

Specifications of LED: -

- Wavelength: 470nm
- Forward Voltage: 2.48 ~ 3.7V
- Viewing Angle: 20º
- LED Brightness (MCD): 200
- Color: Blue

3.1.7 Trimpot

Potentionmeters are manually adjustable variable resistors with three terminals. Two

terminals are connected to the ends of the resistive element, while the third terminal is connected to a sliding contact called Wiper. So, by rotating the wiper, the resistance of the Potentiometer can be adjusted to its maximum value. The position of the wiper determines the output voltage of the Potentiometer. They are commonly called as "Pot meter" or simply "Pot". They may be Carbon, Cermet, Wire wound, Conductive plastic or metal film. Usually, the value of the Pot is printed on its body. But the miniature "Trimpots" have codes to represent its value. For example, 102 (1K), 103 (10K), 104 (100K), 105 (1M) etc.

Specifications of 103/10K electrolytic capacitor: -

- Resistance: 10k
- Resistance Tolerance: ±20%
- Effective travel: 25 turns
- Operating Temperature Range: -10°C to 70°C
- Mounting Type: Through Hole
- Maximum operating Voltage: 50V DC

3.1.7.1 As a Voltage Divider

Potentiometers are variable voltage dividers with a shaft or slide control for setting the division ratio.

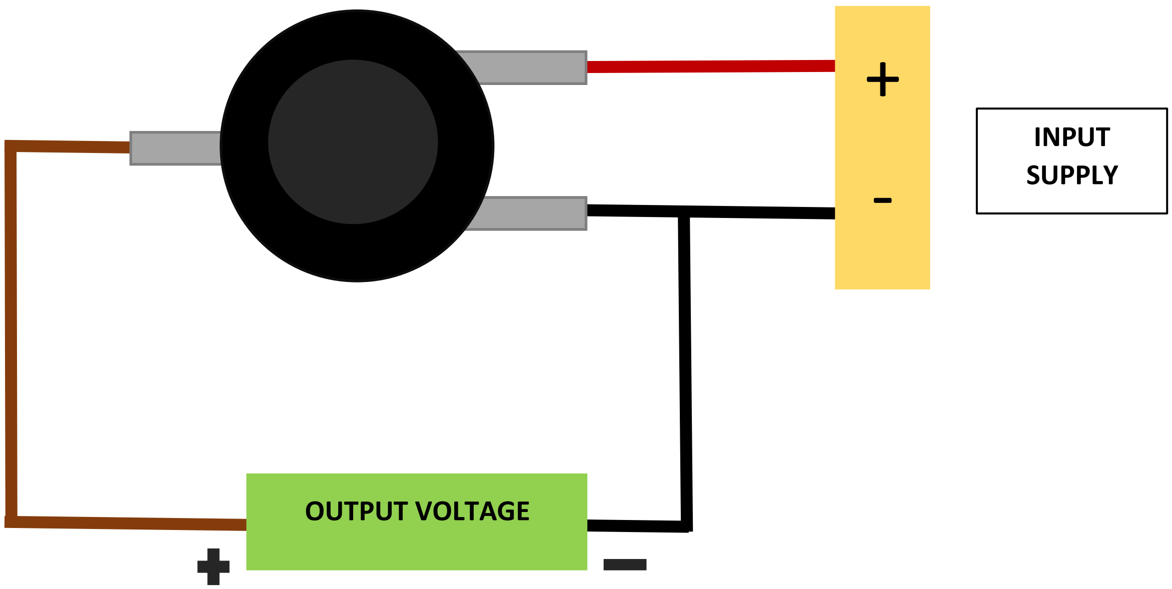


Fig 3.2 Trimpot connections for a voltage divider

3.2 CALCULATIONS FOR FILTERING CAPACITOR

$$C = I\frac{dt}{dv} \tag{3.5}$$

The 12-0-12 v transformer can give 12 v rms value.

$$V = Vrms\ \sqrt{2} \tag{3.6}$$

During one half cycle 2 diodes are forward biased, therefore the voltage drop across them would be 1.4V.

The minimum voltage drop across the 7809 IC can be 11V.

Hence,

dv = V_{rms} $\sqrt{2}$ - 1.4 - 11 v (3.7)

3.2.1 Practical Values

I = 1A (output from transformer)

dt = 10ms (half time period cycle)

dv = 4.5706 V

Therefore, inputting the values in the formula

C= 2187.9 μF

We can use a standard capacitance value of 2200μF for this purpose.

3.3 CIRCUIT CONNECTIONS

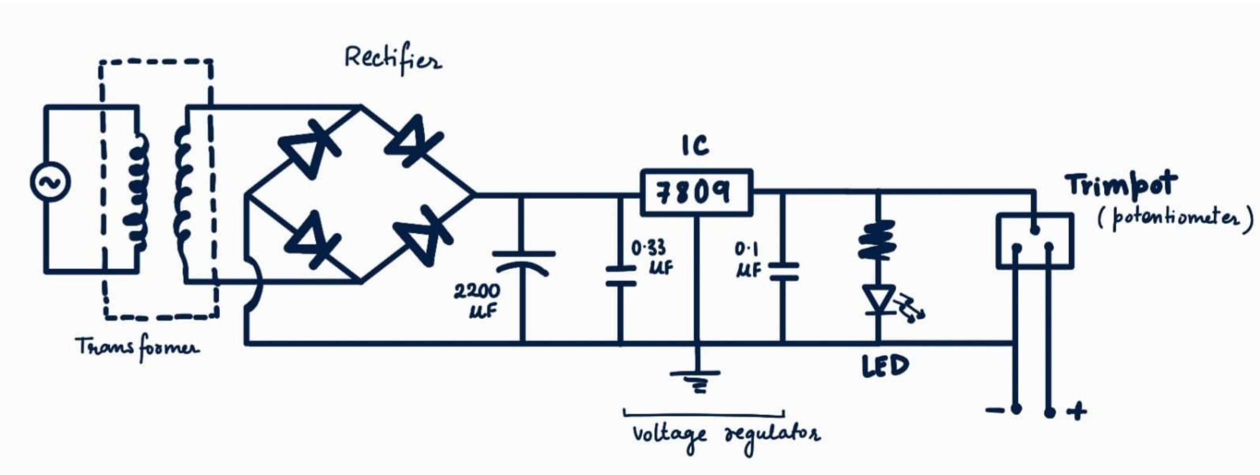


Fig 3.3 Circuit diagram of a DC regulated power supply

3.4 TOOLS

3.4.1 PCB

A printed circuit board (PCB) is an electronic assembly that uses copper conductors to create electrical connections between components. Printed circuit boards provide mechanical support for electronic components so that a device can be mounted in an enclosure.

3.4.2 Connecting Wires

Connecting wires allows an electrical current to travel from one point on a circuit to another because electricity needs a medium through which it can move. Most of the connecting wires are made up of copper or aluminum.

3.4.3 Soldering Iron

Solder is melted by using heat from an iron connected to a temperature controller. It is heated up to temperatures beyond its melting point at around 600 degrees Fahrenheit which then causes it to melt, which then cools creating the soldered joint.

As well as creating strong electrical joints solder can also be removed using a desoldering tool.

A soldering iron is a hand tool used to heat solder, usually from an electrical supply at high temperatures above the melting point of the metal alloy. This allows for the solder to flow between the workpieces needing to be joined.

3.4.4 Soldering Wire

Filler metals used in soldering were once lead based (lead solder), however, owing to regulations, lead-based solders are increasingly replaced with lead free solders, which may consist of antimony, bismuth, brass, copper, indium, tin or silver.

CHAPTER 4

RESULTS AND CONCLUSION

4.1 RESULTS

4.1.1 Load Testing

The power supply underwent rigorous load testing to assess its ability to deliver a stable 9V output under varying load conditions. Both light and heavy load scenarios were tested to evaluate its performance.

4.1.2 Ripple Voltage Analysis

Ripple voltage, the AC component superimposed on the DC output, was carefully analyzed. A digital oscilloscope was used to measure and analyze the ripple voltage, ensuring that it remained within acceptable limits.

4.1.3 Voltage Stability under Varying Load Conditions

The power supply was tested to ensure its capacity to maintain a consistent 9V output voltage, even as the load conditions fluctuated. The voltage regulator's performance in sustaining a constant output voltage was evaluated.

4.2 CONCLUSION

4.2.1 Summary of Achievements

The project report summarizes the key achievements of the project, highlighting the successful design and implementation of a stable 9V DC power supply. It underscores the importance of various components and design principles that contributed to the project's success.

4.2.2 Key Takeaways

The conclusion section offers valuable insights and lessons learned during the project, providing guidance to future power supply designers. It serves as a source of knowledge and experience gained throughout the project.

4.2.3 Significance of the Project

The report emphasizes the significance of the 9V DC power supply in a wide range Of electronic applications. It underscores the power supply's crucial role in ensuring a dependable and stable power source for electronic circuits, making it an indispensable component in modern electronics.

4.3 SAFETY CONSIDERATIONS

4.3.1 Overcurrent Protection

The power supply incorporated overcurrent protection mechanisms to prevent damage in the event of a short circuit or excessive current draw. These safety features ensured the longevity of the power supply and protected connected devices.

4.3.2 Overvoltage Protection

Measures were implemented to safeguard the power supply from voltage spikes or surges in the input voltage. Protection against overvoltage events was critical to prevent damage to the components.

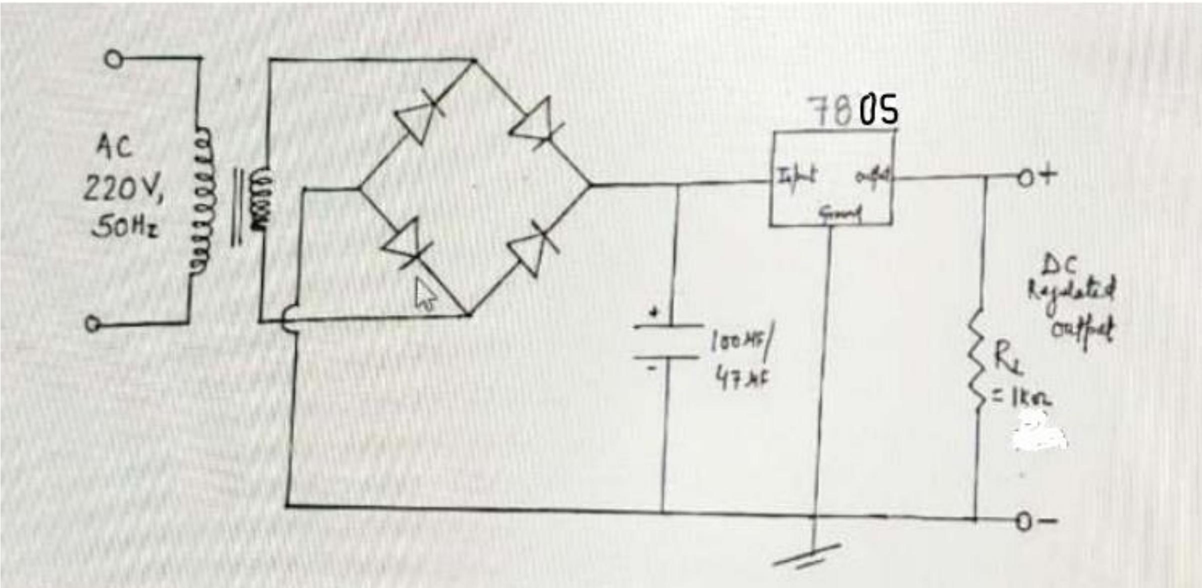
4.3.3 Short Circuit Protection

The power supply featured short circuit protection to handle short circuit conditions without incurring damage. This protective mechanism contributed to the overall reliability and safety of the system.

APPENDIX

11.1. SCHEMATIC ILLUSTRATION

This section encompasses thorough schematic illustrations and circuit diagrams, offering in-depth visual depictions of the power supply's electrical connections and precise component arrangements.



11.2. INVENTORY OF COMPONENTS:

This section comprises an extensive catalog detailing the materials, components, along with their respective specifications employed in the project. The inventory facilitates comprehension of component costs and accessibility.

#	Item Description	HSN/SAC	Qty	Rate	SGST	CGST	Cess	Amount
1	Capacitor (50)		4	30	7.20 6	7.20 6	0.00 0	120.00
2	IC (7805)		2	40	4.80 6	4.80 6	0.00 0	80.00
3	Breadboard		2	70	8.40 6	8.40 6	0.00 0	140.00
4	Jumper Wires		3	30	5.40 6	5.40 6	0.00 0	90.00
5	Resistor (1K)		1	35	2.10 6	2.10 6	0.00 0	35.00
6	Diode (p-n)		4	30	7.20 6	7.20 6	0.00 0	120.00
7	Transformer(0-9V)		1	150	9.00 6	9.00 6	0.00 0	150.00
8	PCB Board		1	85	5.10 6	5.10 6	0.00 0	85.00
						Sub Total		820.00
						SGST (6%)		49.20
						CGST (6%)		49.20
						TOTAL		**Rs.918.40**

This project report stands as a testament to the effective creation and realization of a dependable 5V DC power supply. It highlights the project's importance, meticulous attention to design and safety elements, and prospects for future improvements. The power supply holds a pivotal role in contemporary electronics, guaranteeing consistent and reliable power distribution to electronic circuits.

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[End of Report]