



IMPLEMENTATION OF A 5V DC SUPPLY

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INTRODUCTION TO 5V DC SUPPLY

In the realm of electronics, the 5V DC power supply stands as a cornerstone, providing a ubiquitous and essential energy source for a myriad of devices. This standardised voltage has become a linchpin in the world of technology, powering everything from mobile devices and microcontrollers to a vast array of consumer electronics.

Significance of 5V:

The 5V DC supply holds its significance in the realm of electronics due to its compatibility with a broad spectrum of devices. This voltage level aligns seamlessly with the operating requirements of numerous integrated circuits, microcontrollers, and digital components. Its prevalence is notably observed in USB (Universal Serial Bus) applications, where it has become the de facto standard for charging and powering a diverse range of gadgets.

Applications and Versatility:

The versatility of 5V DC power supplies is evident in their application across various domains. From charging smartphones and tablets to energising microcontroller-based projects like Arduino, the 5V supply serves as a reliable and universal source of power. Its adaptability to diverse electronic ecosystems has made it an indispensable component in the design and functionality of modern electronic devices.

COMPONENTS USED FOR THE 5V DC SUPPLY EXPERIMENT

- Rectifier
- Transformer
- Network Wires
- 1k ohm resistor
- 3300 microfarad capacitor
- Light Emitting Diode
- LM7805 Voltage Regulator

- Rectifier:
 - **Function:** Converts alternating current (AC) to direct current (DC).
 - **Brief Explanation:** Rectifiers allow the flow of current in one direction, converting the alternating voltage from a power source, such as a wall outlet, into a unidirectional current suitable for electronic devices.
- Transformer:
 - **Function:** Changes the voltage level in an AC circuit.
 - **Brief Explanation:** Transformers consist of coils of wire and are used to step up or step down voltage in electrical circuits. They are crucial in power supplies for adjusting voltage to the desired level.
- Network Wires:
 - **Function:** Transmit electrical signals between components.

- **Brief Explanation:** Network wires, or simply wires, facilitate the flow of electric current between different parts of a circuit. They form the essential conductive paths in electronic systems.
- 1k Ohm Resistor:
 - **Function:** Limits current and voltage in a circuit.
 - **Brief Explanation:** Resistors impede the flow of current and help control voltage levels in a circuit. A 1k ohm resistor has a resistance of 1000 ohms.
- 3300 Microfarad Capacitor:
 - **Function:** Stores and releases electrical energy.
 - **Brief Explanation:** Capacitors store electric charge and release it when needed. A 3300 microfarad capacitor can store a larger amount of charge compared to smaller capacitors.
- Light Emitting Diode (LED):
 - **Function:** Emits light when current passes through.
 - **Brief Explanation:** LEDs are semiconductor devices that emit light when current flows through them. They are commonly used as indicators in electronic circuits.
- LM7805 Voltage Regulator:
 - **Function:** Maintains a stable output voltage.
 - **Brief Explanation:** The LM7805 is a linear voltage regulator that ensures a constant 5V output by adjusting the resistance in the circuit. It's commonly used to provide a stable power source in electronic applications.

WORKING PRINCIPLE OF THE 5V DC SUPPLY

- **Input Stage:**
 - **AC to DC Conversion (if needed):** If the input power source is AC (alternating current), a rectifier is used to convert it to DC (direct current). This is common in situations where the power source provides alternating current, such as from a wall outlet.
- **Regulation Stage:**
 - **Voltage Regulator:** The heart of a 5V DC power supply is a voltage regulator. Voltage regulators maintain a constant output voltage regardless of variations in the input voltage or load conditions. For 5V supplies, commonly used regulators include linear regulators (like LM7805) or switching regulators.
- **Linear Regulator:**
 - In a linear regulator, excess voltage is dissipated as heat. The regulator adjusts the resistance to maintain a constant output voltage. While simple and inexpensive, linear regulators are less efficient, especially when the input voltage is significantly higher than the desired output voltage.
- **Switching Regulator:**
 - Switching regulators are more complex but offer higher efficiency. They work by rapidly switching the input voltage on and off, and then smoothing the output using an inductor and

capacitor. This method reduces heat dissipation, making switching regulators suitable for applications where energy efficiency is crucial.

- **Feedback Loop:**
 - Both types of regulators typically include a feedback loop. This loop continuously monitors the output voltage and adjusts the regulator to maintain the desired 5V output. This ensures stability and accuracy in the power supply.
- **Filtering:**
 - Additional filtering components, such as capacitors, are often included to reduce noise and ripple in the output. These components help smooth the DC output and improve the overall performance of the power supply.
- **Output Stage:**
 - The final stage delivers the regulated 5V DC power to the load or device. The load can be any electronic component or circuit that requires a stable 5V input.

CIRCUIT DIAGRAM

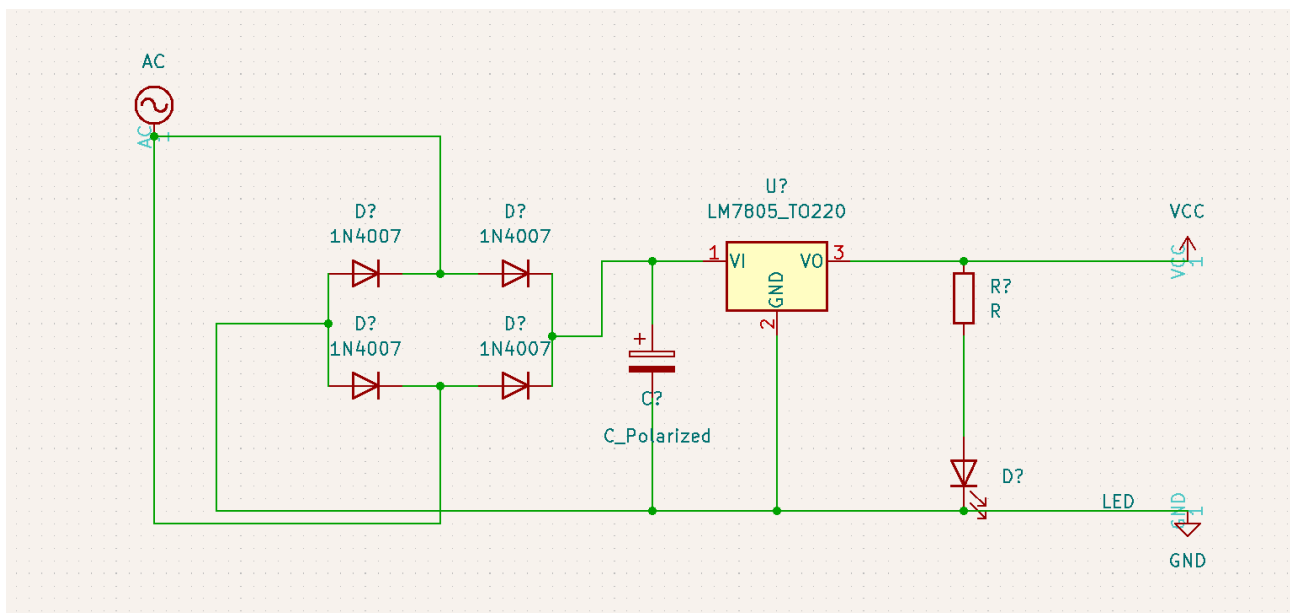


Fig 1: Schematic Circuit diagram for voltage regulator.