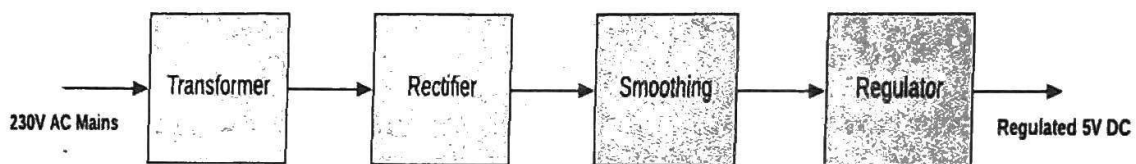


SWITCH MODE POWER SUPPLY (SMPS)

What is a Power Supply?

The power supply can be defined as it is an electrical device used to give electrical supply to electrical loads. The main function of this device is to change the electrical current from a source to the accurate voltage, frequency and current to supply the load. Sometimes, these power supplies can be named to as electric power converters.

Power Supply Block Diagram



Power Supply Block Diagram

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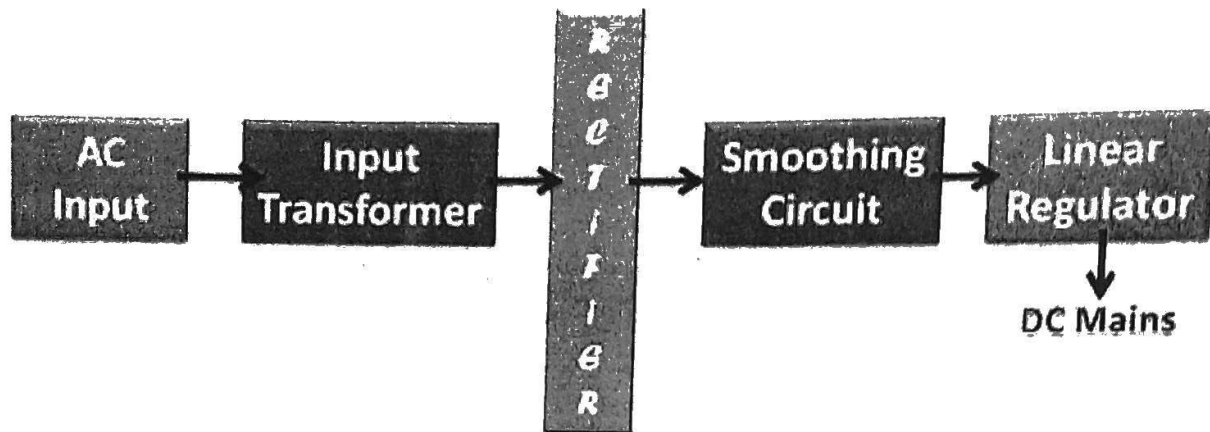
Classification of Power Supply and Its Different Types

| | OUTPUT = DC | OUTPUT = AC |
|------------|--|--|
| INPUT = AC | Wall wart Bench power supplies Battery charger | Isolation transformer Variable AC supply Frequency changer |
| INPUT = DC | DC-DC converter | Inverter Generator UPS |

Linear Power Supply

The **Linear Power Supply** is power supplying circuit which is used in electrical and electronic circuit to supply the DC power to the circuit. It consists of a step-

down transformer, rectifier, a filter circuit and voltage regulator. It completes the stepping down of AC voltage first then it converts it into DC.

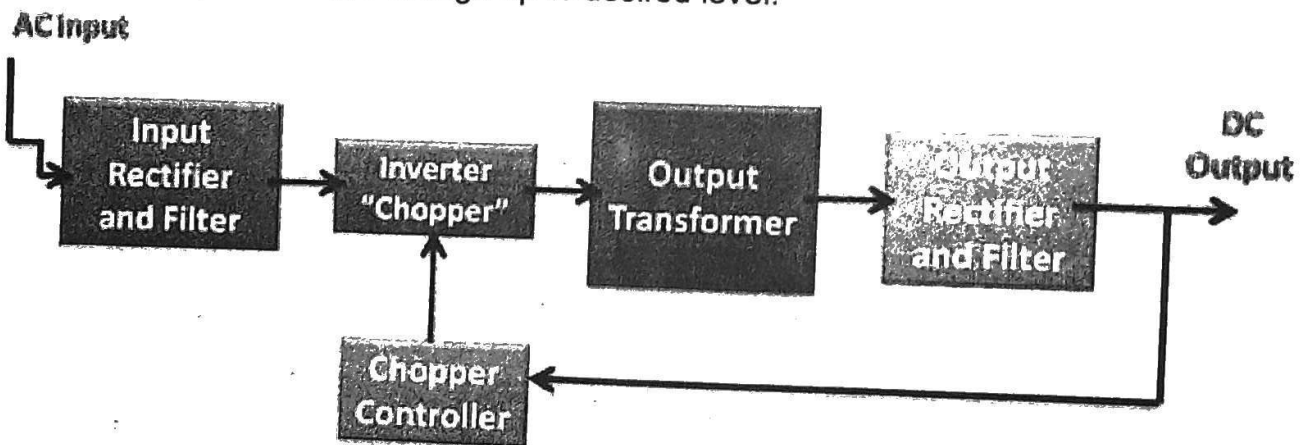


Linear Power Supply

Electronics Coach

Switched Mode Power Supply

The **Switched Mode Power Supply** operated on the principle of switching using a **MOSFET transistor**. It consists rectifier circuit, a filter circuit, chopper, chopper controller, output transformer and a filter circuit. It converts the input signal into DC first then it steps down the voltage up to desired level.



Switched Mode Power Supply

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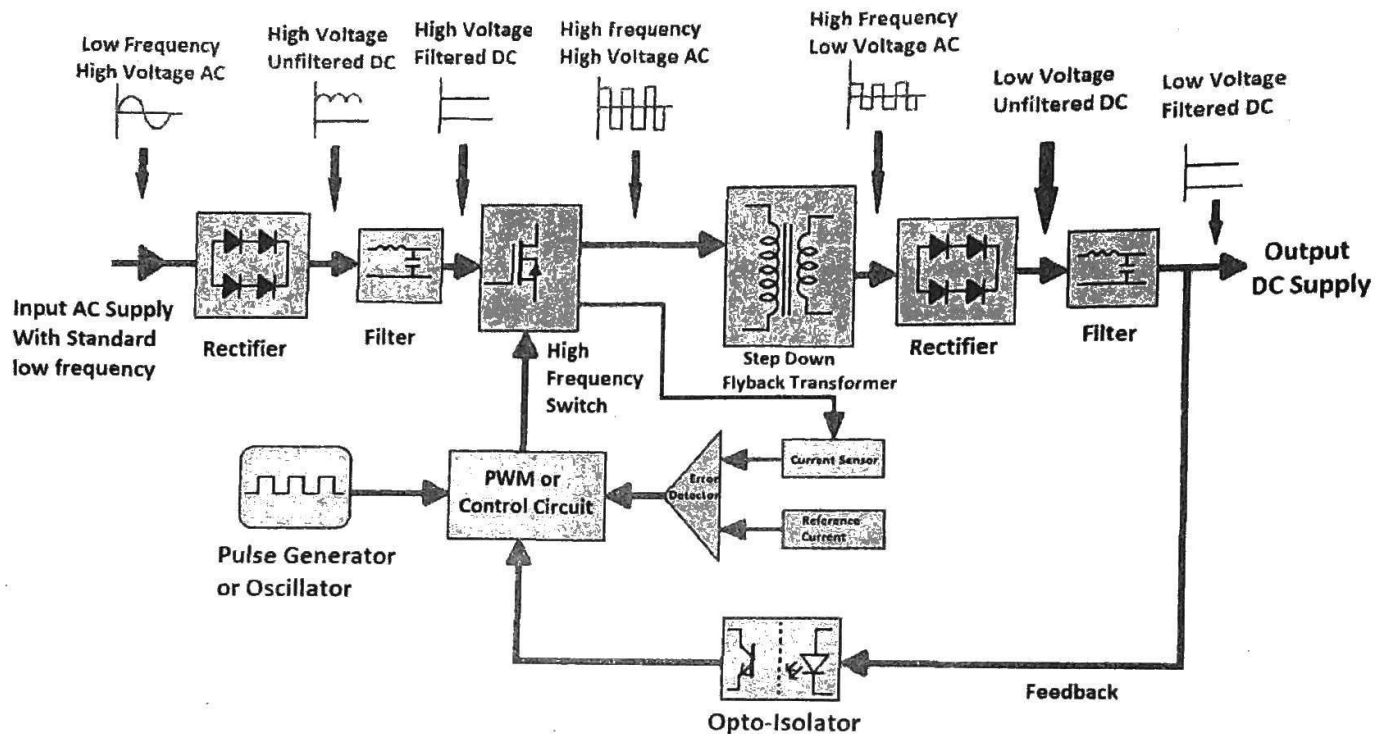
Types of SMPS

1. D.C. to D.C. Converter:
2. Forward Converter:
3. Fly back Converter:
4. Self-Oscillating Fly Back Converter:

Comparison Chart

| PARAMETERS | LINEAR POWER SUPPLY | SWITCH MODE POWER SUPPLY (SMPS) |
|--|---|---|
| Definition | It completes the stepping down of AC voltage first then it converts it into DC. | It converts the input signal into DC first then it steps down the voltage up to desired level. |
| Efficiency | Low efficiency i.e. about 20-25% | High Efficiency i.e. about 60-65% |
| Voltage Regulation | Voltage regulation is done by voltage regulator. | Voltage regulation is done by feedback circuit. |
| Weight | It is bulky. | It is less bulky in comparison to linear power supply. |
| Reliability | More reliable in comparison to SMPS. | its reliability depends on the transistors used for switching |
| Complexity | Less complex than SMPS. | More complex than Linear power supply. |
| Transient response | It possess faster response. | It possess slower response. |
| RF interference | No RF interference | RF shielding is required as switching produces more RF interference. |
| Noise and Electromagnetic interference | It is immune to noise and electromagnetic interference. | Effect of noise and electromagnetic interference is quite significant, thus EMI filters are required. |
| Applications | Used in Audio frequency applications and RF applications. | Used in chargers of mobile phones, DC motors etc. |

Block Diagram of SMPS for AC to DC converter



ETechnoG

SMPS Block Diagram

Switched Mode Power Supply Working Principle for AC to DC converter

According to the above block diagram, the working principle is explained below.

1. The first block is the Bridge rectifier circuit. So the input high voltage AC supply(230V) is given to the rectifier and it converted into high voltage DC(230V).
2. Then the unfiltered DC is filtered by the filter circuit.

3. Then the high voltage DC is converted into very high-frequency square wave AC. Here the high-frequency switch is used to convert DC to AC. The switch is controlled by the feedback and control circuit.

4. The high-frequency AC is step down into low voltage (may be 12V, 6V, etc.) by a fly back high-frequency transformer.

5. Then again a rectifier circuit is used to convert the low voltage AC to DC.

6. A filter circuit is used to filter the DC.

The feedback path and control circuits are used to control the output DC supply. Mainly the Pulse Width Modulation Circuit is used for the control circuit.