

- **Advantages of linear power supply :**

Low Noise: Linear power supplies provide a very clean and noise-free output, making them ideal for audio equipment, medical devices, and other sensitive applications where electrical noise can be a problem.

Simplicity: Their design is straightforward, making them easy to understand, build, and troubleshoot. This simplicity also contributes to their reliability.

Stability: Linear power supplies deliver stable voltage and current, which is crucial for the proper functioning of precision electronics.

Fast Transient Response: They respond quickly to changes in load conditions, maintaining stable output without significant delay.

Minimal Electromagnetic Interference (EMF): Linear power supplies generate very little EMF, which is beneficial for applications where electromagnetic compatibility is critical.

Heat Dissipation: While this can be a drawback, the ability to dissipate heat efficiently with proper heat sinks ensures that components stay within safe operating temperatures.

- **Comparison with switching power supply:**

While linear power supplies have many advantages, it's important to understand how they compare with switching power supplies, which are also widely used today.

Efficiency: Switching power supplies are generally more efficient than linear power supplies, as they use high-frequency switching to regulate voltage, resulting in less energy loss as heat.

Size and Weight: Due to their efficiency, switching power supplies can be more compact and lighter than linear power supplies, making them suitable for portable and space-constrained applications.

Complexity: Switching power supplies are more complex in design, involving high-frequency circuits and more components, which can make them harder to design and troubleshoot.

Noise and EMI: Linear power supplies excel in providing low-noise output, while switching power supplies tend to generate more noise and electromagnetic interference, which can affect sensitive equipment.

Cost: The complexity of switching power supplies can make them more expensive to produce and repair compared to the simpler linear power supplies.

### **1.2.2 Switch mode power supply**

A Switch mode power supply is a power converter that utilizes switching devices such as MOSFETs that continuously turn on and off at high frequency, and energy storage devices such as the capacitors and inductors to supply power during the non-conduction state of the switching device.

The supplies have higher efficiencies of up to 90% are small in size and widely used in computers and other sensitive electronic equipment. The basic switch mode power supplies (SMPS) are categorized based on supply input and output voltage. The main four groups are:

1. AC to DC – Off-line DC power supply
2. DC to DC– Converter
3. DC to AC- Inverter
4. AC to AC – Cycloconverter or frequency changer

- **Switch mode power supply topologies:**

The circuit configuration, referred to as topology determines how the power is transferred from the input to the output. Most topologies consist of a power transformer to provide voltage scaling based