Why Are Stabilization Circuits Needed?

The DC from a battery or converted from commercial AC using an adaptor still has unstable variations in voltage. Changes in voltage can cause sensitive electronic devices to malfunction, so stabilization circuits are used to create DC with stable voltage. Two methods of doing this are the linear method (also called the series method and dropper method) and switching method.

Power Supply Devices Play a Variety of Different Roles

Most electronic devices operate on direct current. After commercial AC is rectified (the DC is still unstable), a DC-DC converter is used to change the power (change the voltage or current) and stabilization circuits are used to produce extremely stable DC.

Linear Power Supply (Series Method)

The linear method cuts the unevenness (variation in voltage) to make the voltage smooth.

Input voltage

Output voltage

Stabilized DC

Electric power converted to thermal energy and discarded using semiconductor resistors.

Switching Method

The switching method achieves stable power supply with compact, lightweight, and high efficiency devices.

The current is pulsed at high frequency by switching (ON/OFF) a semiconductor element and is sent to a transformer that changes the voltage.

The switching method uses a cut and paste like method to produce stable current without losses, making it extremely efficient.

AC-DC power supply

DC input/DC output

DC input/AC output

High voltages are required to illuminate the backlights of liquid crystal televisions, so current is converted to alternating current and the voltage is stepped up using a transformer.

The different circuits of electronic equipment use different operating voltages, so they contain multiple DC-DC converters.

Key Points

- Efficiency: Low (30%-60%) Switching Power Supplies: High (70%-90% or higher)
- Radiated heat: High Low
- Size and weight: Large and heavy Compact and lightweight
- Degree of stability: High Ordinary
- Radiated noise: None Noise countermeasures (noise filters) are necessary

The main weakness of switching power supplies is the generation of switching noise in conjunction with the high-speed switching of the semiconductor elements. As a result, EMC countermeasures (noise countermeasures) such as noise filters are essential.