

# What is the difference between a switching and linear power supply?

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Linear DC regulated power supplies (“linear supplies”) alter the output voltage to the required value through the power frequency (50/60 Hz alternating current) voltage transformer. After being lowered (or raised) to the appropriate AC voltage value, the waveform is rectified, filtered, and stabilized by a voltage regulation circuit, and is then output as a regulated direct current (DC). These types of power supplies have a common characteristic; the voltage transformer works in the linear range. The noise on the input is not amplified on the output. This makes for a quiet and stable output. But, there are drawbacks. The large static loss of the regulating element requires a large heat sink to cool the device and the physical size of a transformer that works in the power line frequencies (50/60 Hz) is large and heavy.

## Linear power supplies:

- Fast response, small output ripple, low noise
- Relatively large size, heavy, low efficiency and higher heat dissipation.

Switching type DC regulated power supplies (“switching supplies”) typically first rectify the alternating current then filter the AC into DC current by use of a filter capacitor. Next this DC power is switched to a higher frequency through a switching circuit (Switch K). By controlling the switch’s speed between the “open” and “closed” states, we can now create a higher (than 50/60 Hz) frequency current through the switching transformer. Finally, the switching transformer outputs the lower (or higher) desired voltage to another rectifier, filter capacitor, and regulating circuit.

The main difference between the switching power supply and the linear power supply is that the switching supply does not operate at normal power line frequencies (50/60 Hz) but rather at considerably higher frequencies (several KHz to several MHz). In a switching power supply, the regulating device operates in the saturation or cut-off area as opposed to the linear power supply regulator which operates in the less efficient linear range.

## Switching power supply:

- Small size, lighter weight, and higher efficiency (can reach nearly 99%)
- Larger output ripple, RFI/EMI interference from pulsed power, higher output voltage if failure occurs



### **North American Headquarters**

SIGLENT Technologies America, Inc  
6557 Cochran Rd Solon, Ohio 44139  
Tel: 440-398-5800  
Toll Free: 877-515-5551  
Fax: 440-399-1211  
[info@siglent.com](mailto:info@siglent.com)  
[www.siglentamerica.com/](http://www.siglentamerica.com/)

### **European Sales Offices**

SIGLENT TECHNOLOGIES EUROPE GmbH  
Staetzlinger Str. 70  
86165 Augsburg, Germany  
Tel: +49(0)-821-666 0 111 0  
Fax: +49(0)-821-666 0 111 22  
[info-eu@siglent.com](mailto:info-eu@siglent.com)  
[www.siglenteu.com](http://www.siglenteu.com)

### **Asian Headquarters**

SIGLENT TECHNOLOGIES CO., LTD.  
Blog No.4 & No.5, Antongda Industrial Zone,  
3rd Liuxian Road, Bao'an District,  
Shenzhen, 518101, China.  
Tel: + 86 755 3661 5186  
Fax: + 86 755 3359 1582  
[sales@siglent.com](mailto:sales@siglent.com)  
[www.siglent.com/ens](http://www.siglent.com/ens)