

Switched Mode Power Supplies

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Compact powered subwoofers require significant electrical boost at low frequencies to overcome the limitation of bass extension that would normally occur when operating a large efficient driver in a small cabinet. Switched Mode Power Supplies (SMPS) offer several practical advantages over conventional designs that become especially desirable when these high power outputs are required. Conventional designs, although relatively economic for low current applications, become heavy and bulky for high powers because of the need for a large transformer and smoothing capacitors. In an SMPS, the



power transistor is switched very rapidly between being fully on and fully off. In both these states, little power is dissipated in the device, leading to less heat generation and a relatively small heatsink. The extremely high switching frequency means that smaller capacitors are used. This and the lack of a transformer gives a consequent reduction in size and weight. Power factor correction ensures lower levels of harmonic distortion are injected back into the mains supply. An added advantage of SMPS is the ability to operate over a wide range of mains voltages without adjustment, other than a simple change of input fuse rating. Looking at the specifications, it might appear at first sight that our Class-D amplifiers with switched mode power supplies are over 600% efficient, because the rated power consumption is much less than the rated power output. This appears to contravene the laws of physics and the answer lies in the nature of the signals that the amplifier processes. Music and movie soundtracks may contain high peak powers, but the power drain is far from constant. If you imagine the amplifier and its power supply as a power reservoir, it is easy to understand how a relatively low level, but constant recharging can support sporadic bursts of high output drain. One must, of course, take care in the design to ensure that the capacity of the power supply is enough to cope with all likely power drain situations and we have built in a particularly generous safety factor in that respect. Part of that safety factor involves good heat sinking and you will notice that our Class-D/SMPS amplifiers still incorporate fins on the heat sink whereas many other similar designs do not. Conventional amplifiers and power supplies continuously waste significant power as heat, irrespective of the signal they are processing and the rated power output is typically only 70% of the rated power consumption.