

A Note of Caution

In the September 2018 [Micscape](#) I wrote a short piece in which I described some experiments I had undertaken with LED arrays with a view to using them as light sources for microscopy.

During initial testing and before I fitted it to the microscope I tried using a 12V 'wall wart' which had originally powered a wireless router. This worked but I was troubled by a faint glow when only one lead was connected and I was holding the other lead. Clearly the supply was not completely isolated from the mains and there was a small leakage current.

Although it takes up much more bench room I have been using the nominally 12V power supply I use for my amateur radio equipment as I know that this is completely isolated from the mains by a transformer and even has an earthed metal case. These are sometimes called 'linear' power supplies.

Older, heavy 'wall warts' from the 1980s were of the transformer type, but the more recent ones used as mobile phone chargers, set top boxes or to power wireless routers use switch mode power supplies (SMPS), not bulky transformers. The ones I have all carry a square within a square symbol indicating that they are of a type known as Class II. (see the wiki link at the end) The the live and neutral pins of the plug are metal and are sometimes shrouded in plastic for part of their length. The third pin is hard plastic and hence is none functional as an 'earth'. Its sole purpose is to open the shutter in the mains socket to allow the plug to be inserted. Some Class II power supplies have a metal third pin so check for the square within a square symbol.

What is not clear on the wiki page is how one should interpret the term 'double insulated'. I am inclined to take the cautious view that one layer of insulation is in the power supply and the plastic case of the phone, set top box or other device forms the second layer of insulation. If insulation in the 'wall wart' fails I am still protected by the plastic case of the device I am using.

Not all 'wall warts' are (in my opinion) unsafe. The linear type are much safer because the primary windings of the transformer which carry the mains supply of 220V are physically separated from the low voltage secondary winding. The third pin on this type is metal and so can function as an earth. They are commonly supplied to power strings of 'Christmas' lights and similar devices. A good place to find them is in charity shops or on market stalls.

Anyone thinking of using a Class II power supply in conjunction with a heating plate similar to the one described by David Stephens in the August 2019 [Micscape](#) may like to give some consideration to this.

https://en.wikipedia.org/wiki/Appliance_classes

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