



Application Note

HAND SOLDERING LARGE SMPS CERAMIC CAPACITORS

OVERVIEW

Switch Mode Power Supply (SMPS) Capacitors are complex composite mechanical structures composed of alternate layers of dense ceramic and metal electrodes. Alternate electrodes are connected on opposite ends with termination metals, which typically contain glass fits. As such, the SMPS is inherently sensitive to thermal and mechanical shock. The larger size of SMPS Capacitor increases this sensitivity, in turn requiring greater care with conventional soldering techniques.

Thermal shock encountered with any soldering method can stress the device and lead to fractures ranging from invisible micro-cracks to visible cracks. Accordingly, electrical failures can range from decreased insulation resistance to catastrophic failure [shorts], as well as poor partial discharge performance for SMPS Capacitors.

In general, with SMPS Capacitors, care must be taken, with preheat and controlled cooling, to prevent thermal shocking of the part. Large parts should not see more than 50°C difference between preheat and solder temperature.

SMPS CERAMIC CAPACITORS

It is recommended that capacitors be preheated and maintained to within 50°C of the solder reflow temperature during hand soldering. This high preheat temperature, ranging from 125 to 180°C depending upon the solder used, will shorten the time required to reflow each solder joint. It should be noted that care must be taken to control the rate of temperature change during preheat and cooling of the capacitor.

- Avoid hand soldering operations in drafty, open areas such as near open doors or air conditioning vents.
- Natural cool down of the assembly should be used, avoiding forced cooling, to minimize thermal stress.
- Heating and cooling of the capacitors in an air convection oven is preferred

Again, transfer time between the oven and soldering must be minimized because of rapid cooling of the assembly, and it may be necessary to return the assembly to the oven periodically to maintain adequate temperature until all parts are soldered,

Tip temperature controlled soldering irons are essential to protect the capacitor from thermal damage. For example, when using an Sn60 or Sn53 solder, the tip temperature should be limited to 240°C maximum with contact time limited to 5 to 10 seconds. The soldering tip should contact the pad on the bottom side of the PWB to minimize heating of the capacitor. It is also recommended that a heat sink be used to protect the ceramic body of the capacitor. An aluminum plate or heat sink which contacts the leads just below the capacitor body is recommended for this purpose, and should be used during the hand soldering step. Figure 2 shows the heat sink and soldering iron tip placement for hand soldering lead frame SMPS capacitors.

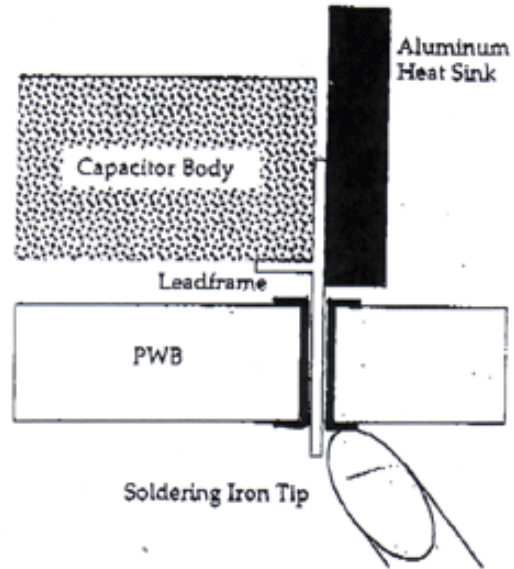


Figure 2. Heat Sink Placement for Lead Frame SMPS Capacitors