HEAT SINKS USED IN POWER TRANSISTORS

Heat sinks are used for power transistors as the power dissipated at their collector junction is large. If heat dissipation is not done, this will cause large increases in junction temperature.

In a transistor, the collector to base junction temperature (temperature of surrounding air) rises or because of self-heating. The self-heating is due to the power dissipated at collector junction

This power dissipation at junction causes the junction temperature to rise, and this in turn increases the collector current which causes further increase in power dissipation. If the phenomenon continues then it may result in permanent damage of the transistor. This is known as thermal runaway.

In power transistor or large signal transistors, the power to be dissipated at the collector causes junction temperature to rise to a high level.

It is possible to increase the power handling capacity of the transistor if a device that can cause rapid conduction of heat away from the junction is used. Such a device is called a heat sink.

A heat sink is a mechanical device. It is connected to the case of the semiconductor device. So it is providing a path for the heat transfer.

The heat flows through the heat sink and is radiated to surrounding air. If a heat sink is not used then all the heat has to he transferred from a transistor case to surrounding air causing case temperature to increase.

If the power handled by the transistor is higher, then the case temperature will he higher. The temperature of the two types of power transistor is

Germanium: 100°C to 110°C

Silicon : 150°C to 200°C

Heat sinks increase the power rating (ie. power handling capacity) of a transistor by getting rid of the heat developed quickly.

It is in the form of a sheet of metal. Since the power dissipation within a transistor is mainly due to power dissipated at collector junction, the collector (connected to the case of the transistor) is bolted on to metal sheet for faster radiation of heat.

In this case, to prevent the collector from shorting to metal sheet, a thin mica washer is used between the two.

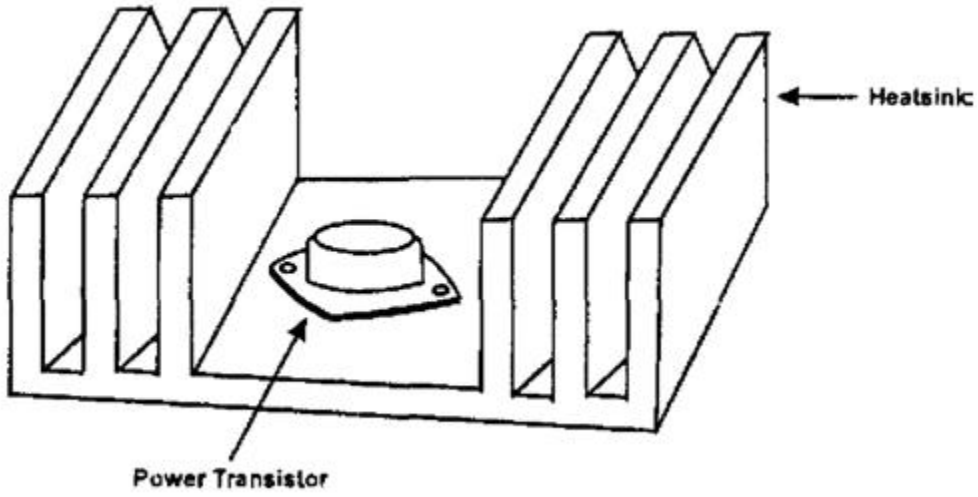

Fig shows a heat sink. The heat now radiate more quickly because of in creased surface area.

Sometimes the transistor is connected to a large heat sink with fins causing more efficient removal of heat from the transistor.

When heat flows out of a transistor, it passes through the case transistor and into the heat sink, which then radiates the heat into the surrounding air.

The temperature of the transistor case T will be slightly higher than the temperature of the heat sink which in turn is slightly higher than the ambient temperature TA.

Ambient Temperature: The heat produced at the junction passed through the transistor case (metal or plastic housing) are radiates to the surrounding air. The temperature of this air is known as the ambient temperature.

Source : http://mediatoget.blogspot.in/2011/09/heat-sinks-used-in-power-transistors.html