Using heatsink mount power resistors

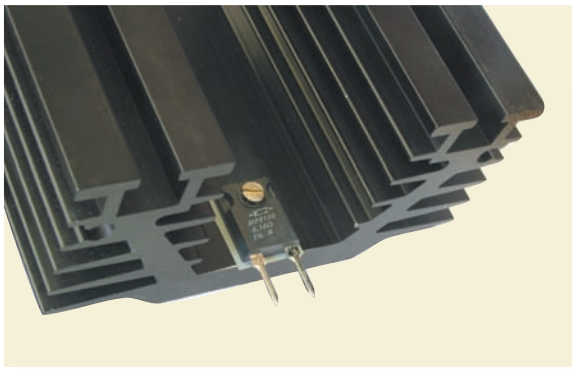
Heatsink mounted power resistors offer the designer several advantages over using conventional (non- heatsink mounted) power resistors.

These are:

- **Low inductance compared to power wirewound resistors.**
- **As the parts are attached to a heatsink there is a reduced susceptibility to vibration.**
- **Good thermal management leading to reduced heating effects on neighbouring components.**
- **Space saving on PCB.**

Working out thermal requirements for MP series power resistors.

The maximum power rating is specified with the ceramic back surface maintained at 25˚C. Careful design and testing is needed to make sure the case temperature does not exceed its rating.



The allowable power rating (Pd, Watts) may be determined as follows:

$$P_d = (T_J - T_A) / (R\theta_{JC} + R\theta_{CS} + R\theta_{SA})$$

Where:

T_J is the maximum temperature for the resistance film. 150˚C for MP930, MP915, MP925 and 175˚C for the MP9100.

T_A is the ambient or temperature reference.

$R\theta_{JC}$ Is the thermal resistance-resistor film to ceramic element

$R\theta_{CS}$ Is the thermal resistance-ceramic element to heatsink surface (pad or thermal grease)*

$R\theta_{SA}$ Is the thermal resistance of heatsink to ambient.

* The use of thermal grease or thermal pads is strongly recommended, typically the thermal resistance can vary between 0.5 to 2˚C /W.

$R\theta_{JC}$ = 8.3˚C/W (MP915), 5˚C/W (MP925), 4.17˚C/W (MP930), 1.5˚C/W (MP9100).

Using heatsink mount power resistors (continued)

Selecting a heat sink for a MP series power resistor

$$R\theta_{CS} + R\theta_{SA} = ((T_J - T_A)/Pd) - R\theta_{JC}$$

Using the MP930 series at an ambient temperature of 25˚C with a power dissipation of 8 Watts, the total allowable thermal resistance for the heat sink and the attachment interface is as follows:

Maximum total Rθ of the heat sink and interface = **((150˚C – 25˚C)/8W) – 4.17˚C/W**

((150˚C – 25˚C)/8W) – 4.17˚C/W = 15.63˚C/W – 4.17˚C/W = 11.46˚C/W

If 1˚C per watt is allowed for the interface, then a heatsink of approximately 10.5˚C/W is required.

Determining the maximum power of a MP series power resistor for a given heatsink

For a MP9100 used on a 40˚C ambient heatsink with a thermal resistance of 5˚C/W, the maximum power dissipation is determined as follows (assuming 1˚C/W for thermal grease):

$$Pd = (T_J - T_A)/(R\theta_{JC} + R\theta_{CS} + R\theta_{SA})$$

Pd = (175˚C – 40˚C)/(1.5 + 1 + 5)

Pd = 135/7.5 = 18W