

PT78/79 Series ISR Thermal Considerations

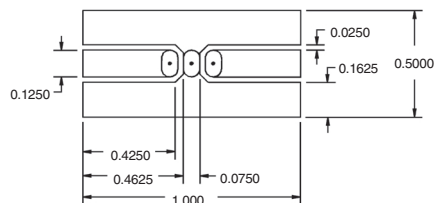
The PT78/79 Series Integrated Switching Regulator (ISR) is protected from thermal overload by an internal over-temperature shutdown circuit. The ISR will operate at ambient temperatures as high as 85°C, but requires derating of either the input voltage and/or output current to do so, as shown in the ISR derating graphs. Additional cooling air or heatsinking, as described below, will significantly decrease the amount of this derating. Power dissipation in the ISR is directly related to the magnitude of the input voltage and/or output current as shown by the efficiency curves on the data sheet.

Thermal Shutdown Sequence When the junction temperature of the custom IC used in the ISR reaches 135°C, the ISR turns itself off. The ISR will automatically restart when the junction temperature cools to 120°C. In an extreme environment, where the ambient temperature is too high for the input voltage/output current operating point, the ISR will cycle on and off continuously.

PC Board Considerations The data used to develop the derating graphs was obtained using a 2oz. single-sided printed circuit board with a foil layout as shown in Figure 14. An internal copper leadframe provides excellent heat transfer to the leads. By simply increasing the copper area of the PC board attached to the leads, such as shown in Figure 14, the ISR will conduct a significant amount of heat out through the leads using the PC board copper as a heatsink.

Figure 14

RECOMMENDED PC BOARD LAYOUT FOR ISR



Airflow Considerations The 40 to 60 LFM noted on the derating graphs is just enough airflow to keep the air surrounding the ISR at a constant temperature, but not enough to cool it. Increasing the airflow will increase the operating range of the ISR. Airflow above 100 LFM across the ISR will dramatically improve the ambient temperature characteristics of the ISR.

Junction Temperature Vs Operating Temperature The internal junction temperature of the components is dependent on the operating environment and condition. The temperature rise between the internal IC and surrounding ambient air, without heatsinking, is 45°C/Watt of internally dissipated power. This number decreases significantly when the ground lead and the optional horizontal mounting tab are soldered to 3 to 5 square inches of copper in the ground plane. This provides an effective heatsink for the ISR and will substantially decrease its junction temperature and thereby increase its reliability.

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