

THERMAL PERFORMANCE OF PCM-BASED HEAT SINKS

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ABSTRACT

Thermal management of portable electronic devices plays a crucial role with regards to their reliability, increased installed functions, and user comfort. Using Phase Change Material (PCM) based heat sinks can offer a great advantage in such applications. However, poor thermal conductivity of the PCMs urges for a solution to improve their cooling performance. This work presents an experimental investigation into the effects of heat sink configuration on PCM thermal performance for the purpose of cooling of electronic devices. Based on fins arrangement and corresponding number of cavities, six heat sink designs having similar dimensions were tested. Heat sinks were partially filled with paraffin wax type PCM and experimentally investigated for their heating and cooling down performances. Results showed that using PCM reduces heating rates and consequently the peak temperature of heat sinks. In addition, the level of PCM in the heat sink showed a significant effect on the peak temperature. Besides, increasing the number of fins was shown to enhance the heat distribution to PCM and, thus, leads to lower heating rates of heat sinks. The lower heating rates obtained with the use of PCM-based finned heat sinks were shown to be at the expense of cooling down rates.

KEYWORDS: Heat Sinks, Phase Change Material, Cooling of Electronic Devices