

Experimental investigation on controlled cooling by coupling of thermoelectric and an air impinging jet for CPU

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ABSTRACT

In this study, experimental tests have been carried out on the coupling thermoelectric cooling module with minichannel heatsink subjected to impinging airflow for cooling desktop central processing unit (CPU). A controlled thermoelectric-forced test system was designed for this purpose. This was designed using electronic Arduino card. The proposed hybrid cooling system was compared with the conventional forced air-cooling technique. Three power of heat source (CPU) were adopted, investigated, and compared, namely 60, 87, and 95 W. Performance of controlled thermoelectric cooling with three preset temperature were experimentally examined. The effects of air velocity and thermoelectric input current on the case temperature (T_{case}), thermal resistance, and heat transfer coefficient were analyzed. Results showed that the T_{case} increases with the increase of its input power. In addition, increasing air jet velocity and thermoelectric input current improve CPU cooling significantly. For a CPU power of 95 W, the recorded T_{case} temperature was 57°C with the conventional system. While it was maintained below 50°C in the hybrid system. The thermoelectric cooler has had a major effect on CPU cooling, having 15% improvement over conventional forced air-cooling. However, this was accompanied by an increase in energy consumption in the range of 45 W.

KEYWORDS

Arduino Uno; CPU; Electronics cooling; Heatsink; Impinging jet; Thermoelectric

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