

## Thermal Performance of Plate-Fin Heat Sink with Lateral Perforation

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**Abstract :** Over the past several decades, the development of electronic devices has led to higher performance. Therefore, an electronic cooling system is important for the electronic device. A heat sink which is a part of the electronic cooling system is continuously studied in the research field to enhance the heat transfer. To author's best knowledge, there have been only a few articles which reported the thermal performance of plate-fin heat sink with perforation. This research aims to study on the flow and heat transfer characteristics of the solid-fin heat sink (SFHS) and laterally perforated plate-fin heat sink (LAP-PFHS). The SFHS and LAP-PFHSs are investigated on the same fin dimensions. The LAP-PFHSs are performed with a 27 perforation number and two different diameters of circular perforation (3 mm and 5 mm). The experimental study is conducted under various Reynolds numbers from 900 to 2,000 and the heat input of 50W. The experimental results show that the LAP-PFHS with perforation diameter of 5 mm gives the minimum thermal resistance about 25% lower than SFHS. The thermal performance factor which takes into account the ratio of the Nusselt number and ratio of friction factor is used to find the suitable design parameters. The experimental results show that the LAP-PFHS with the perforation diameter of 3 mm provides the thermal performance of 15% greater than SFHS. In addition, the simulation study is presented to investigate the effect of the air flow behavior inside the perforation on the thermal performance of LAP-PFHS.

**Keywords :** heat sink, parallel flow, circular perforation, non-bypass flow

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