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ARTICLE

Sensitivity of pin-fin configuration to pin diameter: heat transfer enhancement

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Abstract

The operation of heat sinks is completely dependent on temperature, and if the temperature rises above the allowable range, the efficiency drops sharply. In this study, the main purpose is to keep an electronic component cool by installing cylindrical pin-fins with a diameter of *D*. By changing the diameter of the pin-fins, the variations in pressure drop (PD) along with heat transfer are examined. As the diameter rises, the lateral area of the pin-fin boosts (positive effect) and at the same time the contact surface resistance of the pin-fins with the electronic base increases (negative effect). Three layouts were used to enhance the effectiveness of the pin-fins. The results showed that with increasing the diameter, the heat transfer improves while PD boosts more sharply. Layout A imposes an extra PD on the system, so that by installing a 2.5 mm diameter pin-fin, PD intensifies by 393%. Layout B has the highest heat transfer intensification among the others. Installing a 2.5 mm diameter pin-fin improves heat transfer by 15% and boosts PD by 365%.

Keywords: Cooling | electronic device | heat sink | nanofluid | pin-fin | sensitivity