## Abstract

Enhancing the thermal design of plate-fin heat sink (PFHS) leads to minimize their size and weight, and then improve the heat removal in consequently increase the speed of electronic devices. In this numerical study, an innovative thermal design of PFHS is suggested by inserting ribs in between channels in different sizes, positions, numbers and orientations in order to get an optimal thermal design of this kind of heat sinks. The two main objectives of this study are; investigating the effect of ribs on PFHS while the number of fins is kept constant, second is inserting ribs with reducing the number of fins simultaneously. Two types of reductions are investigated here, first is substrate material reduction by reducing the number of fins and adding ribs simultaneously, second is pumping power reduction by keeping the number of fins and inserting ribs with reducing the pumping of air flow to get the same thermal performance of the original heat sink (without ribs). The concrete findings show that ribbed plate-fin heat sink (RPFHS) provides thermal performance of 1.55 times greater than PFHS under corresponding conditions. But this enhancement reduces when the number of ribs increases. For the same thermal performance, the pumping power of RPFHS is reduced to 69.65% compared to PFHS case. In addition, RPFHS having five channels with 15 ribs shows hydrothermal performance of 1.37 times better than PFHS having nine channels, with reduction in the substrate material of 27.24%.