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# Experimental and numerical studies of finned L-shape heat pipe for notebook-PC cooling

## Abstract

This paper presents the experimental, numerical, and analytical investigations on the horizontal L-shape heat pipe for the notebook-CPU cooling. Simulations are carried out for both the 2-D and 3-D cases. In a 3-D model, the heat pipe as a whole is modeled based on the heat transfer by conduction. The heat pipe is assumed to be a conducting medium without taking into account the events occurring inside the heat pipe. A 2-D model based on the characterization of the working fluid inside the heat pipe is the other developed model. The 2-D finite element simulation is performed under natural and forced convection modes, by using ANSYS-FLOTRAN. Moreover, the design of experiment software is employed to optimize the coolant airflow rate and the heat input to get the best performance of heat pipe. The wall temperatures, velocity, and pressure distributions of the vapor and the liquid are analyzed. The heat inputs of the minimum thermal resistance in both natural and forced convection are found to be 20 and 35 W, respectively. The simulation and experimental wall temperatures are found to be a good match. Accordingly, the numerical solution is in agreement with the analytical solution in terms of vapor and liquid pressure drops.

### Keywords

Coolant airflow rate; Heat input; L-shape heat pipe; Liquid pressure drop; Thermal resistance; Wall temperature