

INVESTIGATION OF FANLESS PCs: DESIGN AND OPTIMIZATION

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ABSTRACT

The purpose of this research is to fundamentally explore the limitations of natural convection as it pertains to the cooling of desktop personal computers (PCs) and, in particular, maximize total thermal loads while minimizing the volume of the complete package. This research is directed towards the ultimate goal of finding the optimum design of a sealed, Fanless personal computer conforming to the Ultra Small Form Factor (USFF). The work presented herein has developed the foundational tools and knowledge base required to accomplish the stated goal from a thermal perspective. This was realized in three unique investigations: heat sink optimization, thermal spreading analysis, and heat pipe implementation study. A program was developed utilizing a cumulative empirical correlation database to output optimized heat sink designs. A look at lumped capacitance, as well as numerical, analytical, and experimental comparisons for spreading resistance revealed good results for simple analytical approximations as a design tool. Finally, heat pipe implementation was looked at from several common design assumption angles allowing for several valuable conclusions to be made on heat pipe placement in any future Fanless PC design.