

enertron inc.

Enertron's contribution to the evolution of portable electronics cooling

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Since its inception, Enertron has been a pioneer in the development of thermal management solutions for portable computers. Portable computers offer many challenges to thermal engineers. The biggest challenge is the limited space. Components must be reduced to the smallest size allowable. Additionally, access to the heat source is often difficult because the components are tightly packed. The solution must fit around all the obstacles and still function correctly. Furthermore, the weight of the solution must be kept as low as possible.

Portable computers have not always needed thermal management. In the early 1990's, portable computers were powered by 486 processors. These processors released such a small amount of heat, that cooling was not a problem. However, we all knew of Moore's Law, and knew that as the processors improved, their heat would increase as well. Thus, Enertron began to prepare.

In early 1992, Enertron introduced the concept of heat pipe aided thermal solutions to major notebook PC OEMs. Next, Enertron conveyed its vision to several heat pipe manufacturers and suggested that they prepare for mass production of micro heat pipes. Heat pipes were already in wide use in other industries, but had never been mass produced for microelectronics.

When the desktop Pentium processor was introduced in 1993, Enertron engineered the thermal solution for the first Pentium used within a laptop computer. The solution, the Slim Coldplate, was the first to use a heat pipe to cool a microprocessor. It featured a 4mm heat pipe bonded to a thin aluminum sheet. The heat pipe collected the heat from the processor and spread it over the length of the coldplate. The coldplate then used natural convection to dissipate less than 10W of heat. It would still take several years, however, for Intel to release a low power Pentium CPU for the mobile market.

In 1994, Enertron began working on a 486 notebook computer with the OEM laptop supplier for Dell Computers. They were confronted with a dilemma, either design a new platform or re-engineer their current platform with an innovative cooling solution. They chose the latter, and Enertron picked up its first production quantity contract in the portable computer industry. The solution used a heat pipe to spread 5W of heat to an aluminum plate located under the keyboard. Here the heat was spread and dissipated through the keyboard to the ambient.

Enertron continued to use various Slim Coldplates in the notebook computer industry for the next three years. Our customers included IBM, Acer, and Hewlett Packard. During this time, CPUs continually put off more heat. As the heat increased, so did the size of the coldplates.

Then in 1997, the limit with natural convection was reached. The new mobile Pentium CPU for notebook computers was emitting over 10W. To further complicate the matter, the CPU was generally located near the center of the notebook. Placing a conventional fan/heat sink combination on the CPU would not solve the heat problem because the heat could not be rejected to the outside of the machine.

Enertron's engineers responded with an advanced cooling solution, the Mini Modular Fan Cooler (MFC). It featured a small axial fan mounted to a highly efficient heat sink. A micro heat pipe ran from a heat collector which was mounted on the CPU to the center of the heat sink. The fan/heat sink was located next to the enclosure to allow for an effective air inlet and outlet. The CPU could be located away from the fan/heat sink as long as the heat pipe could join the two.

The Mini Modular Fan Cooler entered production in 1998 and is still used in Dell's laptop computers. Further improvements were made on the Mini Modular Fan Cooler. A second generation MFC was designed with two micro heat pipes and corrugated copper fins. This design was capable of removing up to 25W of heat while occupying same volume as the original MFC.

Earlier this year, Enertron was approached by Acer Computer to design a solution capable of dissipating 25W of heat from their next generation laptop computer. A new solution would have to be designed because Acer did not have enough space to allow for a Mini Modular Fan Cooler. Enertron responded with the Slim Modular Fan Cooler. This solution pulls heat from the processor using a heat pipe and dissipates it to the ambient through two sets of stacked fins. An axial blower is used to supply sufficient airflow

while still maintaining a low profile.

As we have done in the past, Enertron continues to prepare for the future. We are continually designing solutions for tomorrow's thermal management problems, insuring that we stay one step ahead of Moore's Law.

