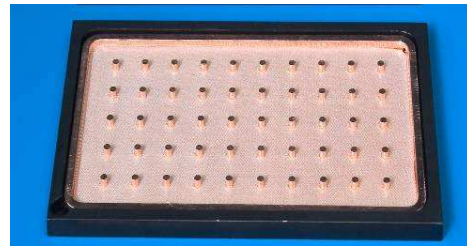


**VAPOR CHAMBER HEAT PIPES**

Vapor chambers are planar heat pipes used for cooling high heat flux electronics. Like conventional cylindrical heat pipes, vapor chambers transport heat from a heat source to a heat sink with a very small temperature gradient. Vapor chamber heat pipes are sometimes referred to as thermal transformers, because they are often used to accept heat from small, high heat flux sources and transfer that heat to a much larger, low heat flux sink, where the heat can be efficiently dissipated. Effective thermal conductivities of vapor chambers can be orders of magnitude greater than that of copper. The heat spreading is direction independent, i.e., isotropic.



**Vapor Chamber with Structural Frame**



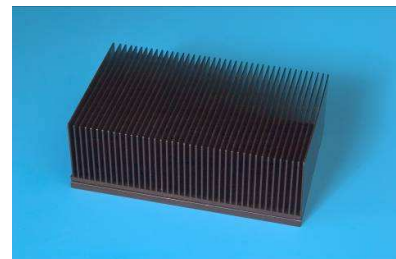
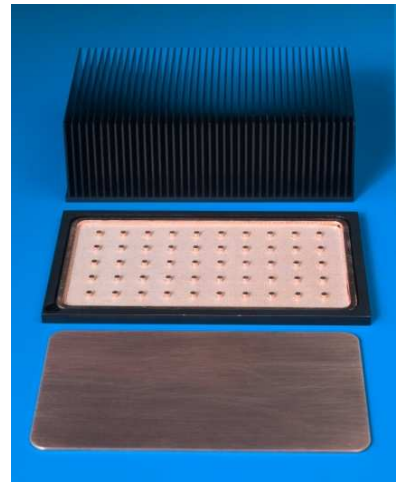
**Vapor Chamber Internal View Showing Structural Posts and Wick**

A common application of vapor chambers in electronics cooling is to place the vapor chamber heat pipe between a small, high heat flux device and a conventional air-cooled heat sink. Without the vapor chamber, only the heat sink area local to the heat source is efficiently utilized because the conduction gradient through the base of the heat sink is large. With a vapor chamber, the heat from the small heat source is delivered to the entire base of the heat sink with minimal temperature gradients. The isothermal base raises the fin efficiency of the entire heat sink.

Another application for electronics cooling is when the heat sources are multiple and discrete on a single plane. The vapor chamber can effectively accept the heat from these sources and transfer it to an integral heat sink or water cooled edge rails.

ACT's vapor chamber product specifications

Materials	Copper/Water
Dimensions	Scalable to 10" x 20"
Thickness	0.125 to 0.200"
Heat Flux	> 25 W/cm <sup>2</sup>
Thermal Resistance	< 0.15 °C/W



**Vapor Chamber Heat Sink Assembly**