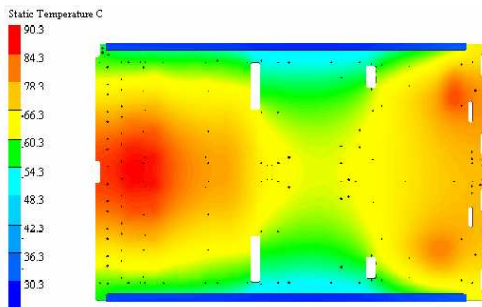
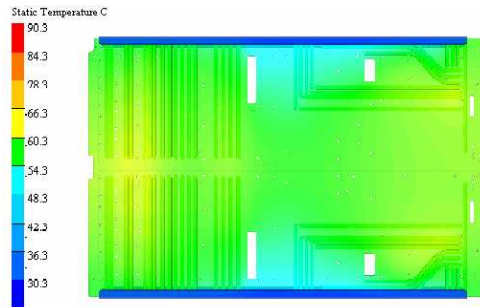


**High Thermal Conductivity (HiK) Aluminum Plates**

High thermal conductivity (HiK) aluminum plates are heat spreaders made by embedding heat pipes into an aluminum plate. Heat pipes, because of their two phase behavior, have effective thermal conductivities between 10,000 and 20,000 W/m-K depending on the heat pipe length. The installation of heat pipes into an aluminum plate increases the effective thermal conductivity range to 500 to 800 W/m-K. In comparison, an equivalent solid aluminum plate has a thermal conductivity of approximately 180 W/m-K. The following two figures compare the performances of a conventional aluminum plate (model on the left) to an equivalently sized HiK aluminum plate (model on the right):



Temperature profile on an aluminum plate

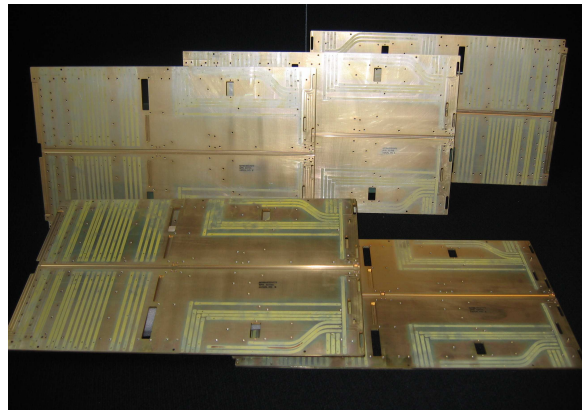


Temperature profile on a HiK aluminum plate

The conventional aluminum plate’s highest temperature was 90.3° C whereas the HiK aluminum plate is 69.1°C. This is a considerable performance improvement.

The layout of the embedded heat pipes is often custom optimized based on the heat source profiles and locations. A higher number of heat pipes may be embedded in areas on the plate where large heat sources are attached. Even with the embedded heat pipes, the HiK aluminum plate is lighter weight than an equivalently sized conventional aluminum plate.

Depending on the application, survivability in cold ambient conditions requires the heat pipes to be tolerant of numerous freeze/thaw cycles. All the embedded heat pipes are tested under these extreme conditions prior to installation. Also surface coatings and finishes may be applied to the HiK aluminum plates to provide weather resistance as required by specific applications.



HiK Aluminum Plates for military RF cooling

ACT’s HiK Aluminum plate specifications

Materials	Copper/Water Heat Pipes
	Aluminum Plate
Dimensions	Max: 60 cm x 60 cm
Thickness	2.5 to 6.0 mm
Heat Flux	Design Dependent
$k_{\text{effective}}$	500 to 800 W/m-K