BOYD CORPORATION

TECHNICAL DATA SHEET

VME64x/VPX Heat Spreaders

Aavid's family of heat spreaders, supports commercial off-the-shelf (COTS) packing formats. Aavid's heat spreader technology, which meets VME64x/VPX standards, offers three product options: solid aluminum, k-Core®, a highly conductive heat transfer system, which, uses Annealed Pyrolytic Graphite (APG) as an insert within solid aluminum, and solid aluminum with embedded heat pipes (passive two-phase heat transfer devices). In a world of compact designs with increasing power densities, these high conductance plates are satisfying demanding cooling requirements in applications like high-power electronics, lasers, medical and test equipment, and military/aerospace applications.

Three Standard Heat Spreader Options

Three individual heat spreaders are available:

- **Basic Solid Aluminum**
- **k-Core® Encapsulated Graphite**
- **Aluminum with Embedded Heat Pipes**

Selecting a heat spreader depends upon the application need for thermal performance, weight and cost.

Basic Solid Aluminum Heat Spreader

Aavid takes the solid aluminum heat spreader and applies its technical expertise to maximize its conductance through detailed design optimizers, using in-house developed software and testing tools. Aavid machines these spreaders from highly conductive aluminum alloys such as 6061 and 6063 with thermal conductivity values of 166 and 201 Watt/m·K, to meet the VME64x/VPX standards

k-Core® Heat Spreader

High performnce k-Core® material, with up to six times the conductance of solid aluminum designs and 20% lower mass, is used to boost the thermal performance of the basic solid aluminum heat spreader to further lower device temperatures. k-Core® is a patented system that encapsulates Annealed Pyrolytic Graphite (APG) within the same aluminum alloys as the basic solid aluminum cold plates.

Aluminum with Embedded Heat Pipes Heat Spreader

The embedded heat pipe heat spreader is constructed from solid aluminum, with integrated heat pipes to remove "hot spots" from the applications where heat loads are concentrated. Aavid's embedded heat pipes offer significant thermal performance improvement when compared with typical solid aluminum or copper based heat spreaders, in electronics or computers, where the heat source is small.

Thermal Analysis Comparison: 6U k-Core® vs. Solid Aluminum Heat Spreader

Figure 1 shows the outcome of comparing a 6U k-Core® cold plate and a solid aluminum cold plate for a specific heating and cooling condition.

- **Conductance**: **5X the Conductance of Solid Aluminum**
- **Lower Mass Than Solid Aluminum Drop-In Replacement**

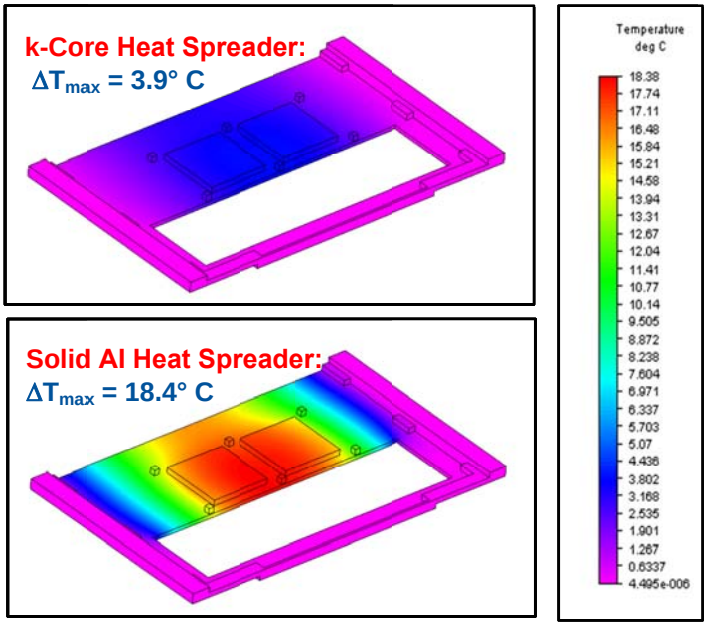

Figure 1 – 6U Temperature Analysis

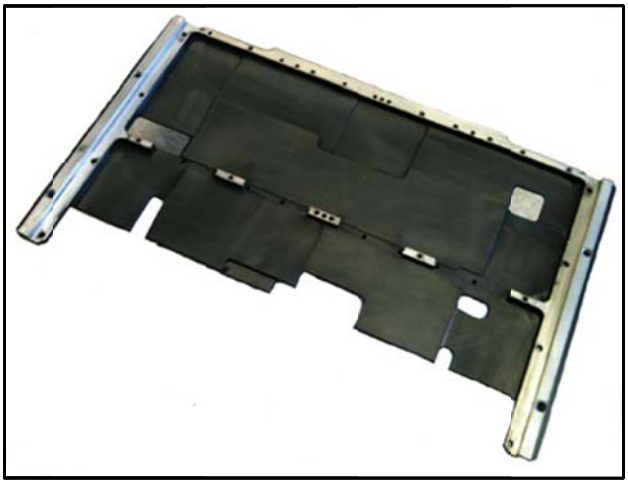

Figure 2 – 6U VME64x/VPX k-Core® Heat Spreader

Thermal Analysis Comparison:
6U Aluminum with Embedded Heat Pipes
Heat Spreader vs. Solid Aluminum Heat Spreader

Figure 3 below shows the outcome of a thermal analysis for a 6U Aluminum cold plate embedded with heat pipes, compared to a 6U solid aluminum cold plate.

- **Conductance**: **26X the Conductance of Solid Aluminum**
- **Long Distance Heat Transport with Minimal ΔT**

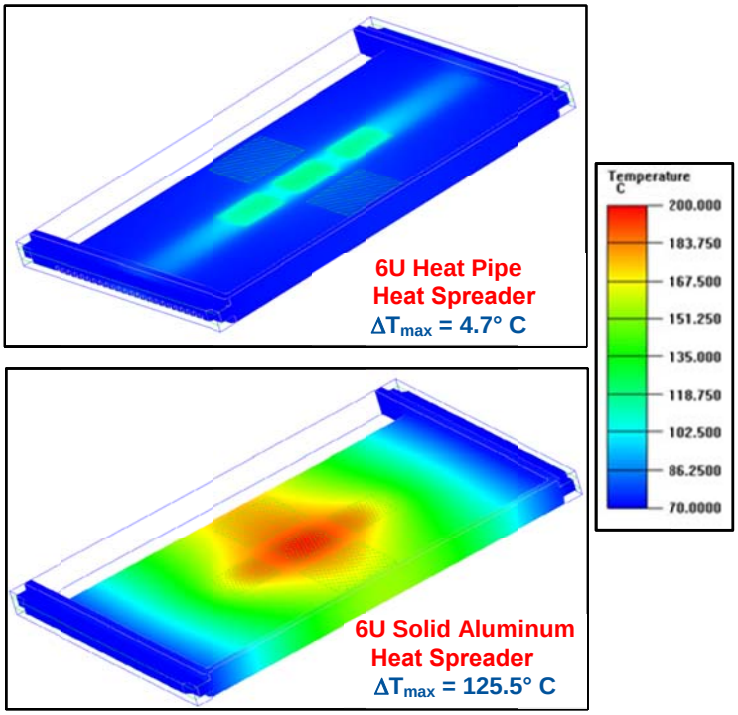

Figure 3 – Thermal Analysis Comparison

Figure 4 – 6U VM64x/VPX Heat Pipe Heat Spreader

Key Features and Benefits

- Superior Thermal Performance
- Lower Electronic Component Temperatures
- Lightweight
- Drop-In Replacement
- Design Flexibility
- Excellent Thermal Uniformity
- Available in 3U, 6U, and 9U Formats

Critical Application Needs

- Computer CPU and GPU Cooling
- Military Radars, Power Converters, Laser Diodes
- Power Electronics Cooling
- Telecom Communications: RF Amplifiers
- Low-Profile Applications: Blade Servers, ruggedized laptops, and hand held devices
- High Temperature Applications (>100° C)
- High Strength and Clamping Force Applications