BOYD
TRUSTED INNOVATION

TECHNICAL DATA SHEET

k-Core® Advanced Solid Conduction Material System

Boyd has developed k-Core®, a patented, and high-performance advanced solid conduction material system that can help alleviate heat in high power electronics for aerospace, military and commercial applications. Using solid Annealed Pyrolytic Graphite (APG) material placed within an encapsulate (Figures 1 and 2), k-Core® offers effective thermal conductivity of 1000 W/mK, which is five times greater than that of solid aluminum and three times greater than that of solid copper. k-Core® is also lightweight offering less mass than aluminum.

k-Core® can be fabricated by employing most conventional thermal management metals and materials as the encapsulant, such as aluminum and copper alloys, ceramics, and composites, depending on the user's need and application.

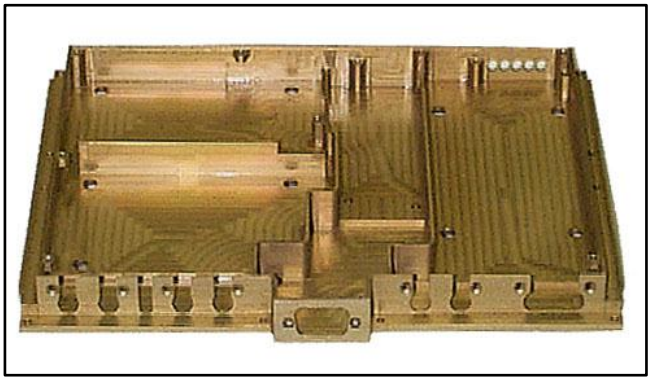


Figure 1. k-Core® Cold Plate

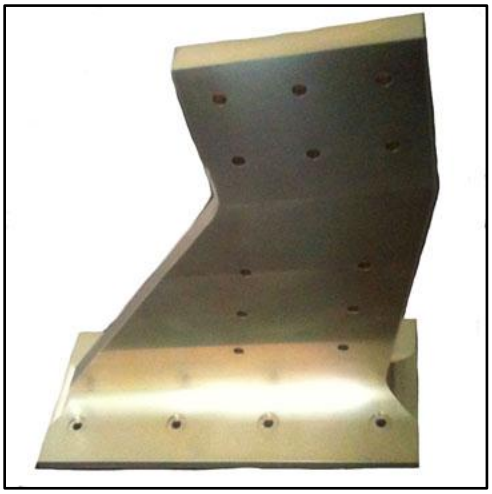


Figure 2. k-Core® NASA Satellite Bracket

Key Features and Benefits

- Significantly Reduced Peak Semi-Conductor Temperatures
- "Drop-In Replacement" for Equivalent Solid Conduction
- Smaller Heat Sink Size
- Lower Mass than Traditional Aluminum or Copper Heat Sinks
- Gravity-Independent (for 0g to >9g environments)
- Fully Hermetic Encapsulation
- Heightened Passive Conductance: In-plane, isotropic room-temperature thermal conductivity up to 1700 W/m·K
- Can be CTE-matched to Semi-Conductor Materials for Direct Attachment
- Rugged, and Resistant to Damage
- Aerospace Qualified

Critical Application Need

- Advanced Aircraft: F-35/JSF, FA-22 /Raptor, and F-18
- Control, Target Acquisition, & Avionics Cooling
- Sensitive Electronic Components and Control Systems for Aerospace and Spacecraft Communications Satellites
- Electronic Chassis
- Thermal Shields, Ground Planes, and Doublers
- Conduction Bars, Battery Brackets, and Constraining Cores
- Radars, Power Converters and Laser Diodes

Typical Thermal Performance

A main component of k-Core® is APG, which has an in-plane, isotropic room-temperature thermal conductivity of 1700 W/m·K. Thermal conductivity is 7-8 times greater than solid aluminum and 4-5 times greater than copper (Figures 3 and 4).

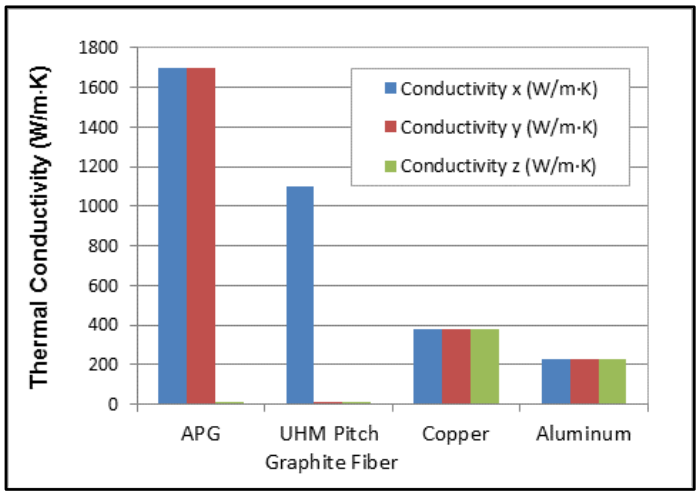


Figure 3. Thermal Conductivity Comparison

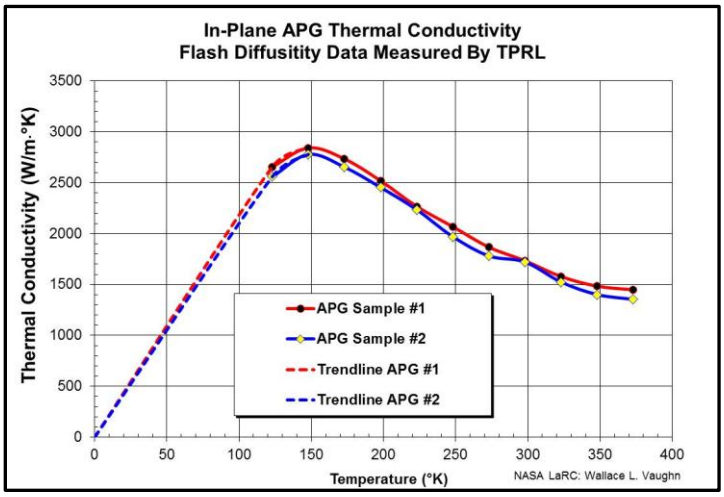
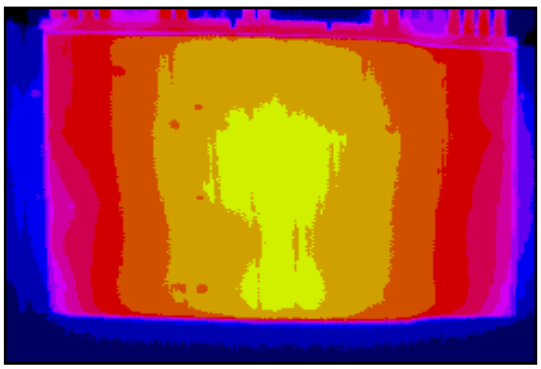
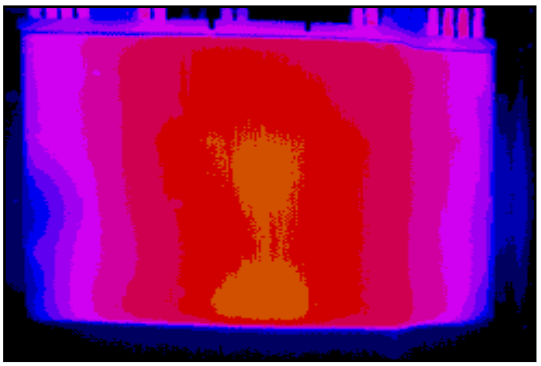


Figure 4. k-Core® APG Thermal Conductivity as a Function of Temperature

Thermal Images



Aluminum: Maximum Center Source Temp. – 61.3° C



APG: Maximum Center Source Temp. – 22.8° C