

## Embedded Heat Pipe Heat Sink

Aavid's embedded heat pipe heat sink solutions are two-phase heat transfer devices that allow spreading of heat along the length of a heat pipe embedded within a heat sink (Figure 1). The heat pipes take "hot spots" on the heat sink base, and transport the heat across the base for more efficient cooling, maximizing airside fin efficiency. The heat pipes incorporate sintered powder wick structures that provide high-heat flux heat dissipation capability (>300 Watts/cm<sup>2</sup>), and improves thermal performance of up to 20%, compared to a solid aluminum or copper based heat spreader. Its smaller size improves system packaging, and provides quieter operation through less air flow. Minimal design effort is required because a metallic-based heat spreader can be changed to an embedded heat pipe sink without altering the geometry of the original design.

### Options to Attach the Heat Pipes to the Base

The heat pipes can be mounted to the heat sink base. The first option is to embed the heat pipes into gun-drilled holes, using Aavid's unique expansion process that gives the heat sink a very efficient metal-to-metal thermal interface. The heat pipes can also be directly soldered (lead-free, high and low temperature) into the grooves on the heat sink base surface, which provide an excellent, low thermal resistance interface with the heat sources. In more cost sensitive applications, Aavid uses a thermally conductive adhesive film, which covers the epoxy joint evenly throughout the surface. The heat pipes can also be integrated into the "hot face" of the heat sink for direct contact to the heat wall.

### Key Features and Benefits

- ▶ Industry Leading Thermal Performance
- ▶ Over 40 years of [life and reliability testing](#)
- ▶ Able to withstand increased internal freeze-thaw and thermal shock ranging from -50° to 200°C)

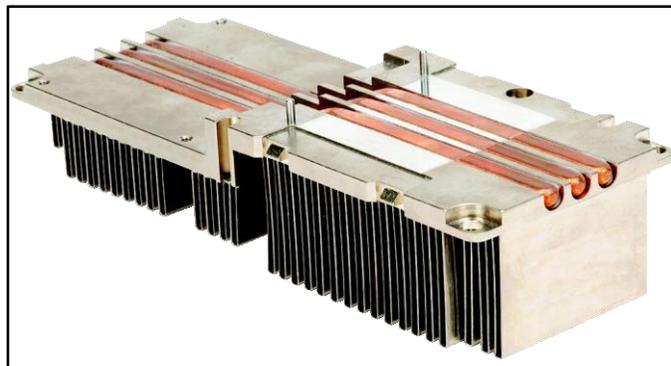


Figure 1 – Embedded Heat Pipe Heat Sink

Specifications – Embedded Heat Pipe Heat Sink	
Sizes	Custom sizes, application specific
Options	Various Shapes (Square, L-shaped, Rectangular)
Heat Pipe Options	Expanded, Soldered or Thermal Epoxy
Wall Material	High Purity Copper
Working Fluid	Water
Wick	Sintered Copper Powder
Maximum Heat Flux	300 Watts/cm <sup>2</sup>

### Critical Application Need

- ▶ Military Power Electronics Cooling:
  - IGBTs, MOSFETs, TWTs, and Thyristers
  - Transmitter/Receiver Modules
  - Transporting Heat to Liquid-Cooled Rails
- ▶ Telecom Communications: RF Amplifiers
- ▶ Low-Profile Applications
- ▶ Computer CPU, and GPU Cooling:
  - Desktop, Laptop, and Servers

**Custom Embedded Heat Pipe Heat Sink Solutions**



**Heat Pipes Embedded into a Cold Plate**



**Heat Pipes Embedded  
onto Cold  
Plate Surface**