

Copper Forged Heat Sinks

Introduction

Design engineers occasionally face thermal problems that require a lower thermal resistance than what traditional extruded aluminum heat sinks can provide. One solution is to combine copper with precision forged technology.

Improving Thermal Resistance by Design & Material Choices

Forged technology allows a higher fin/aspect ratio than extruded heat sinks. This simply means that the fins on forged products can be taller than extruded products, therefore creating more surface area and lowering the thermal resistance. This is especially desirable in forced convection environments. Copper is the preferred metal for conducting heat when aluminum is insufficient. The chart below shows how selecting different products and metals will reduce thermal resistance. Please note that all four products have the same 1.50" x 1.50" footprint.

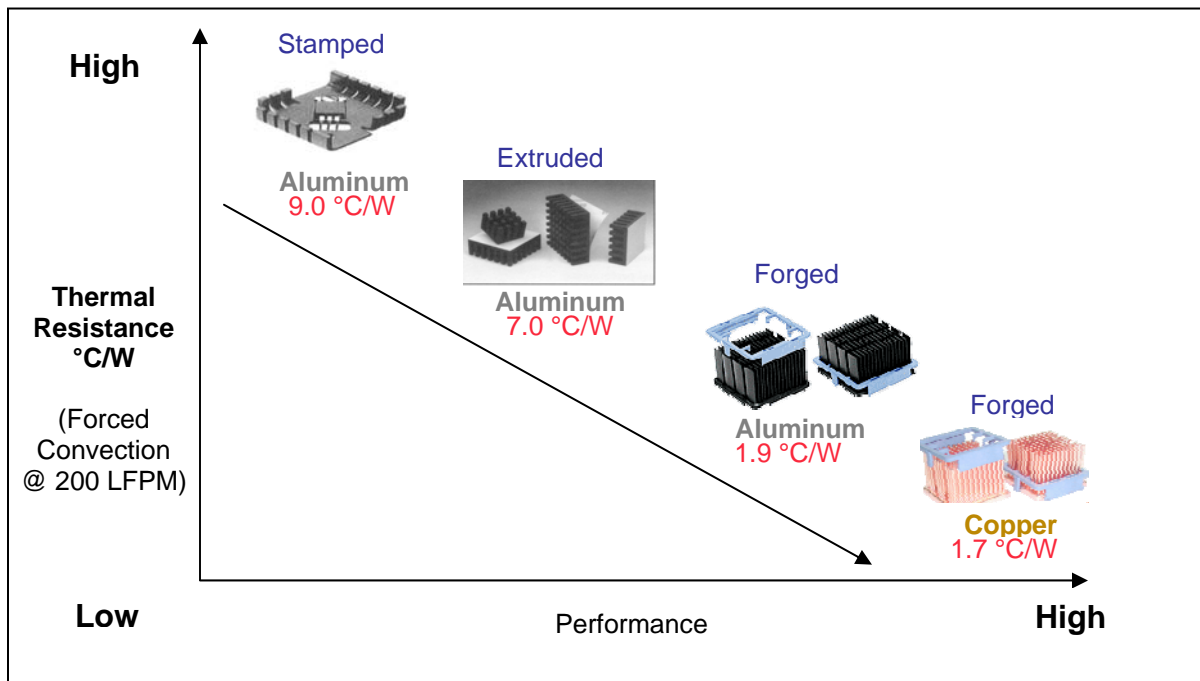


Figure 1. Product and Material Comparison

Select the Size that Meets Your Requirements

Copper forged products come in a variety of footprints and fin heights. Table 1 illustrates the standard footprints, fin heights, and their accompanying thermal resistance. Custom designs are also welcomed.

Fin Matrix (Rows x Columns)	Length x Width x Height (mm)	Thermal Resistance (°C/Watt @ 200 LFPM)
5 x 5	18.6 x 18.6 x 11.6	6.4
5 x 5	18.6 x 18.6 x 14.6	6.0
5 x 5	18.6 x 18.6 x 19.6	4.1
5 x 5	18.6 x 18.6 x 24.6	3.9
8 x 8	26.6 x 26.6 x 11.6	4.6
8 x 8	26.6 x 26.6 x 14.6	4.0
8 x 8	26.6 x 26.6 x 19.6	2.9
8 x 8	26.6 x 26.6 x 24.6	2.5
8 x 8	28.6 x 28.6 x 11.6	4.1
8 x 8	28.6 x 28.6 x 14.6	3.6
8 x 8	28.6 x 28.6 x 19.6	2.5
8 x 8	28.6 x 28.6 x 24.6	2.4
9 x 9	32.6 x 32.6 x 11.6	3.0
9 x 9	32.6 x 32.6 x 14.6	2.5
9 x 9	32.6 x 32.6 x 19.6	1.8
9 x 9	32.6 x 32.6 x 24.6	1.6
10 x 10	34.7 x 34.7 x 11.6	3.0
10 x 10	34.7 x 34.7 x 14.6	2.6
10 x 10	34.7 x 34.7 x 19.6	1.8
10 x 10	34.7 x 34.7 x 24.6	1.7

Table 1. Available Footprint Sizes with Fin Heights

Copper versus Aluminum

There are certain advantages and disadvantages with selecting copper over aluminum. Copper weighs 3x the amount of aluminum and is more expensive. However, copper conducts significantly better than aluminum and is preferred when the thermal interface area is small compared to the heat sink surface area. Copper is to be used in applications with extreme heat such as high-speed networking equipment, routers, telecom equipment, and high-end industrial controls. The low thermal resistance is the most valuable aspect to this product.



Figure 2. Copper Pin Fin with Mounting Clip

Conclusion

Precision forged technology creates the most surface area and copper provides the best heat spreading characteristics. This is the best combination for cooling environments with extreme heat. In addition to copper pin fins, CTS also offers forged aluminum products with both elliptical and pin fins. For more information on CTS' full line of extruded, stamped, and Series AER, APR, and CPR forged products, visit the following site: http://www.ctscorp.com/components/heat_sinks.asp

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