

Worldwide sales of electronic equipment have exploded in recent years, giving rise to increased demand for efficient, low-cost heat-dissipating devices. More often, designers are turning to zinc die castings to produce "heat sinks" for this purpose.

Zinc die casting offers numerous advantages over aluminum extrusion—the most common heat sink manufacturing process—in a number of applications. Die-cast zinc heat sinks

Design flexibility

Extruded fins must run parallel and be continuous unless machined afterwards. Die-cast fins can be placed at any angle and be any shape. This includes porcupine quills and airfoil sections, which maximize design efficiency.

flat surfaces and excellent contact between a heat source and heat sink. Zinc castings can be produced with fine surface finishes and a number of finish coatings, including a chromate finish which greatly enhances its corrosion resistance.

Cost advantages

Zinc die-cast heat sinks—particularly those with a complex design—can often be produced at a lower cost than aluminum extrusions. Tool life often exceeds one million shots, and the ability to cast nearly any shape or

Zinc Die Castings vs. Aluminum Extrusions in Heat Sink Applications

offer one-piece construction, increased design flexibility, lower cost and material properties that make it an excellent option for many uses.

One-piece construction

One of the biggest advantages of a zinc die-cast heat sink is that heat-dissipating fins can be incorporated into a frame, housing or enclosure. Extruded heat sinks must be fastened to an existing frame or housing if the heat source is enclosed. Casting the fins as part of the housing can greatly lower costs by reducing the number of components and eliminating assembly expenses.

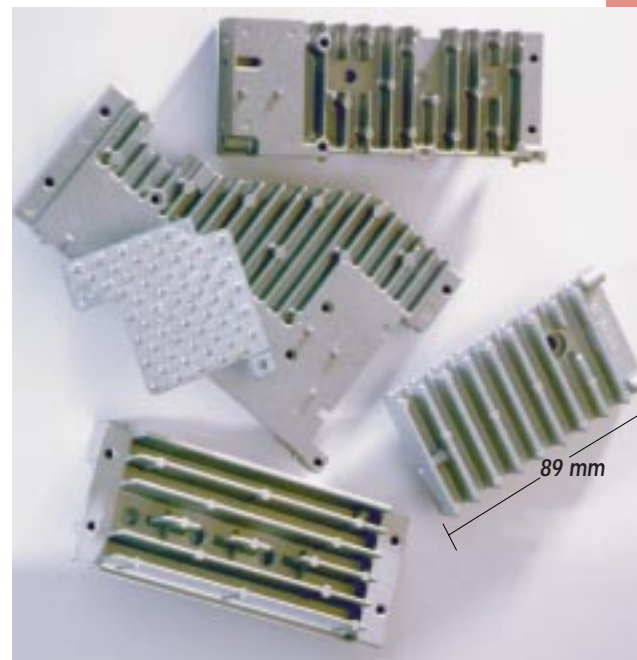
In addition, a single component that combines both housing and heat sink eliminates an interface in the heat flow path, thereby reducing the thermal resistance between the electronics and the fins, thus providing a more efficient means of heat transfer. While zinc's thermal conductivity is not as good as extruded (pure) aluminum, the final thermal conductivity of a monolithic part is superior to an assembly as well as offering greater cost efficiency.

Key properties

While zinc has a higher density than aluminum, zinc die-cast heat sinks don't necessarily weigh more than aluminum extrusions. This is because zinc's excellent fluidity allows for the production of thinner, closely-spaced fins which provide a larger surface area, but less volume.

Zinc is also stronger, stiffer and tougher than extruded aluminum, or even die-cast aluminum and magnesium. This provides high impact strengths along with excellent ductility, enabling an enclosure or frame to stay in one piece providing additional protection for fragile heat sources such as circuit boards.

A zinc die casting also offers excellent EMI and RFI shielding, which is extremely important in many electronic applications such as radios, radar detectors, or computer components. Die casting is capable of holding very tight tolerances, providing exceptionally



Zinc die casting can produce an array of shapes and sizes for heat sink applications.

configuration at tight tolerances can eliminate the need for secondary machining or forming and the resulting expenses. Finally, because a zinc die casting can often combine a frame, housing or enclosure and a heat sink into one piece, the cost of assembling multiple components can frequently be reduced or eliminated.

The heat sinks used in this application were produced by Diemakers, Inc., Monroe City, Missouri.