# APPLICATION NOTE

## AE-AN-SK-007 Thermal Testing of Ardent Socket Assembly

**Purpose:**
This application note is to explain how the test determining the thermal resistivity was conducted in reference to Cool Innovation's heat sink, within an assembly provided by Ardent. Thermal resistance is a heat property and a measurement of a temperature difference by which an object or material resists a heat flow.

**Equipment:**

In order to perform this test there were several different devices and pieces of equipment used. Those pieces of equipment are listed below:

- Ardent Assembly
  - Contains: 60x60x38mm Fan (12V), Mechanical Attachment, Cool Innovations Heat Sink (3-252517RSFBLAN)
- Resistor
  - 6X MP9100 Power Film Resistors, 10Ω
  - 6X 4-40 Screw
- Cool Innovations Testing Plate-
  - Machined Aluminum Plate
- Screw and Standoff Kit
  - 4X M2x.40x30mm Screws
  - 4X 22m Standoff
- Thermocouple
  - Omega Thermocouple Wire TT-K-36_SLE
- Loctite Glue
  - Loctite 7378 Activator and Loctite 384 Adhesive
- Thermal Grease
  - Wakefield Thermal Joint Compound Type 120 Silicone

- Resister Power Source
  - HP 6261B DC Power Supply
  - 0-20V, 0-50A

- Fan Power Source
  - Open Solution Components
  - Model #:Z350-08F (350W Peak)
  - DC Output 12V
- Multimeter
  - Ideal 61-312

**Test Setup**:

In order to accomplish the thermal resistivity test, an aluminum plate was machined to support the thermocouple and resistors. This was to prevent permanent alterations to the Ardent Assembly, because any alterations could change the data and make it invalid. To make sure that the thermocouple didn't move it was adhered using Loctite Glue and in an effort to minimize movement in the resistors, they were attached with 4-40 screws and thermal grease was then applied. Once this was done, the installation was then mated with the Ardent Assembly heating surface with thermal grease as a contact interface. The assembly was then held together using a screw and standoff kit to again limit movement and not allow for any outside, unaccounted for, variables.

Following Cool Innovations Standard Testing Procedure, the power value was set to bring the heat sink to 60°C. Once stabilized, the computer program, Wavescan, recorded the ambient and heat sink temperature data, which was then saved and stored for later review.

**Results:**

Shown below are the results found in the test mentioned prior. The voltage, power, ambient temperature and the temperature of the heatsink are used to calculate the thermal resistance with an equation shown after the table.

| Voltage [V] | Power [W] | $T_{Ambient}$[°C] | $T_{Heatsink}$[°C] | Thermal Resistance [°C/W] |
|---|---|---|---|---|
| 16.32 | 160 | 23 | 60 | 0.23 |

As you can see below, the ambient temperature and the temperature of the heatsink have been used with the voltage to calculate the thermal resistance.

$$\frac{Avg(T_{HS}-T_{AMB})}{\frac{V^2}{\frac{10}{6}}} = \frac{23-60}{\frac{16.32^2}{\frac{10}{6}}} = 0.23$$

**Summary:**

The tested thermal resistance of the heatsink, fan, mounting assembly supplied, thermal grease and thermal interface material is 0.23 °C/W.

Assuming linear scaling of thermal performance with device power for the range of 160W to 200W, under similar conditions, the device case temperature rises above ambient air temperature and would be expected to be approximately 46°C.

**Who is Amphenol Ardent Concepts?**

Amphenol Ardent Concepts is a leading designer and manufacturer of high performance multicoax and coaxial assemblies, connectors, and sockets used in the development of next generation semiconductors and electronics systems. Our core technology is the smallest, fastest, most electrically efficient compression mount connector technology worldwide. As data rate requirements increase and devices and systems shrink, Ardent's products deliver superior signal integrity in a dense footprint that can be reusable across programs to maximize cost savings.