Tech Note

ThermaBridge™

A ThermaBridge™ is a specialty thick film component developed and offered by IMS for use in the thermal management of electronic devices and modules. These products operate under the simple principle of conducting as much heat energy as possible, while simultaneously serving as an outstanding insulator of electrical energy and signal. The combination of these characteristics makes the ThermaBridge™ a very useful and flexible component that designers use to move heat either in, out, or to balance the temperature between two locations. ThermaBridges™ accomplish this without any fans, power, or moving parts making them useful for every electrical design sensitive to the effects of thermal energy.

ThermaBridges™ operate by providing an electrically isolated, thermally active link between high heat generating areas and low temperature heat sinks or other locations within a circuit. According to Fourier, maximizing heat flow from one high temperature area to a lower one is made efficient by limiting the distance between the two points, maximizing the area of the conductive path and optimizing the material's conductive heat properties. ThermaBridges™ do this by using Aluminum Nitride ceramic and offering a variety of thicknesses, lengths and widths to suit any thermal/ mechanical requirement.

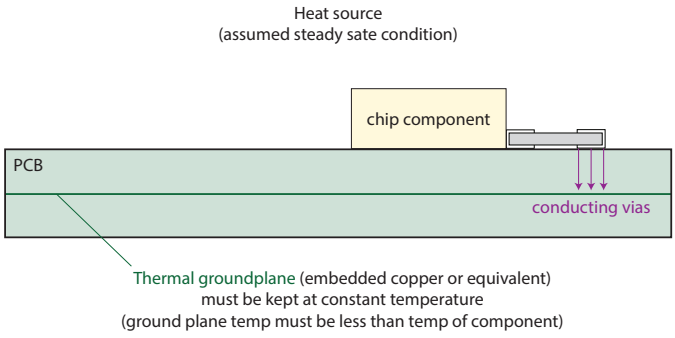
For example if we take the BG3-0510WA ThermaBridge™ (0.05 x 0.10 x 0.025 inches). If we assume a source of 120 °C and a heat sink of 70 °C, we have a 50 °C temperature difference (ΔT) between the ends of the device.

After converting inch units to meters, we present the following relationship:

$$Q/T = (170 * 1.6129 \text{ e-}6 * 50) / .00127$$
Or
$$Q/T = 10.8 \text{ W}$$

In this example you can see just how important the small .050"X.100" ThermaBridge™ can be in transferring heat without impacting electrical design. Imagine this represents an IC touching an aluminum case, but using a ThermaBridge™ to create the thermal bridge without fear of grounding the electrically active device that is producing the heat.

The image below shows a basic method of managing heat at the board level. Chances are, most designers already use vias to connect devices to a mezzanine level for electrical ground. If this plane is kept at a constant temperature, it serves as an excellent heat sink.



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The IMS Thermabridges™ were tested for AC voltage breakdown (see table below). The BG3-3725WA for example withstands up to 6KV without breakdown, in this case the DC equivalent Hipot voltage would be 6KV *√2 = 8.5KV. This extremely high level of dielectric withstand voltage is one of the features that makes the ThermabridgeTM a suitable thermal management solution that also meets the isolation requirement of most High-Reliability designs.

IMS ThermaBridge™ High Potential Test Table

ThermaBridge™ by Sizes	Test time (seconds)	Withstand Test Voltage (AC)	Breakdown Voltage (AC)
0505-0805	60	1500-2000V	2300V or Higher
1005-2010	60	2500-3500V	4000V or Higher
2512-3725	60	5000-6000V	7500V or Higher

Certainly, when components operate at excessive temperatures or are exposed to high localized temperatures, their functionality and operational life can be severely compromised. The Thermabridge™ will extend component life so to ensure optimum performance and reliability by transporting the excess heat away from critical components and system hot-spots with a relatively small foot print.

Contact the experts at IMS to discuss your thermal applications and needs.

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