

GAP PAD HC 5.0

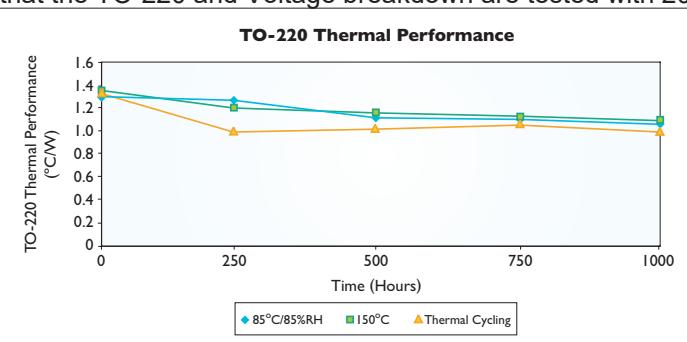
Henkel Laboratory Reliability Testing

This report outlines Henkel's BERGQUIST brand laboratory results of the environmental reliability testing conducted on GAP PAD HC 5.0. GAP PAD HC 5.0 is a highly compliant, thermally conductive GAP PAD material that is ideal for applications requiring low stress on fragile components during assembly. Expect consistent and reliable thermal performance with GAP PAD HC 5.0, even when exposed to extreme environments.

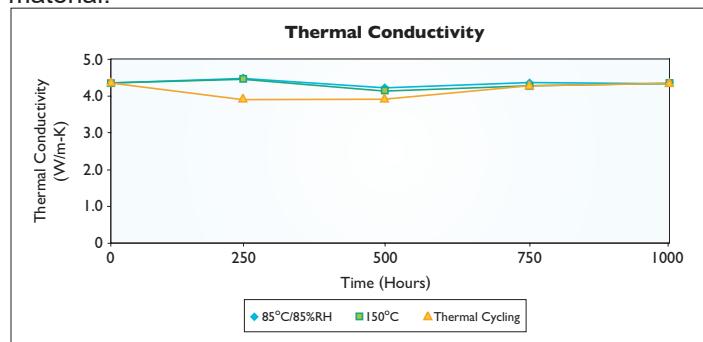
The Henkel Laboratory tests Thermal Interface Materials (TIMs) in the following environments: 85°C/85% Relative Humidity, Continuous Bake and Thermal Cycling (-50°C to 150°C at 30 minute intervals). The 85°C/85% Relative Humidity environments can quickly degrade test materials that react with water and/or have a tendency to oxidize.

The High Temperature Continuous Bake environment accelerates changes in material characteristics for TIMs with temperature sensitivity. The TO-220 Thermal Test Vehicle utilizes copper and aluminum components. In the Thermal Cycling environment the CTE mismatch of metals creates a great deal of stress, in turn inducing significant internal and external stress upon the test material, potentially resulting in a reduction in performance.

The goal of the environmental reliability testing is to accelerate aging of the TIM and determine the effect on the key material characteristics, thermal performance and voltage breakdown while in a controlled laboratory setting. The reliability testing utilizes the thermal test vehicle as shown in the Figure 1. GAP PAD HC 5.0 is subjected to constant pressure throughout the test via spring clip on the TO-220 testing. The thermal test vehicle is removed at each time interval for testing from the oven chamber. Thermocouples are utilized to measure the transistor junction, transistor base, heat sink and ambient temperatures. Thermal Performance is reported as the temperature delta between the transistor junction and the heat sink divided by the power dissipated by the TO-220. GAP PAD HC 5.0 was exposed to 85°C/85% Relative Humidity, Continuous Bake and Thermal Cycling tests for 1,000 hours. Reliability testing over time are reported on next page across a few variety thicknesses to ensure coverage of the product portfolio. Due to the numerous of thicknesses available, customers are always advised to test in their applications for their specific testing. Please note that the TO-220 and Voltage breakdown are tested with 20 mil material.



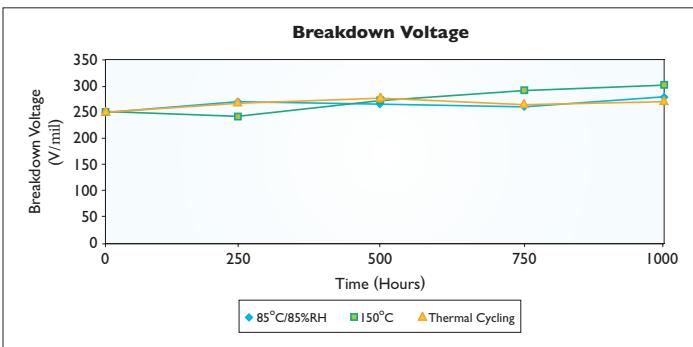
Graph 1: TO-220 Thermal Performance Testing



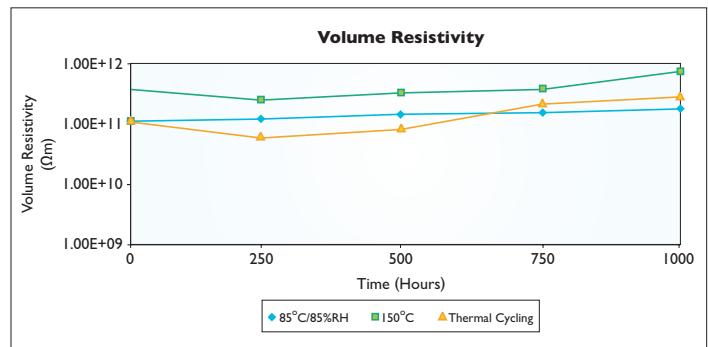
Graph 2: Thermal Conductivity Testing



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Graph 3: Breakdown Voltage Testing



Graph 4: Volume Resistivity Testing

Conclusion

Overall, GAP PAD HC 5.0 exhibits minimal changes over the extended 1000 hours of testing across the three thicknesses. GAP PAD HC 5.0 consistently provided superior thermal performance, thermal conductivity, voltage breakdown and volume resistivity throughout the duration of the Henkel laboratory environmental reliability testing.

**USA**

Henkel Electronics Materials, LLC.

18930 W. 78th Street

Chanhassen, MN 55317 USA

Toll-Free: (800) 347-4572

www.henkel-adhesives.com/thermal