

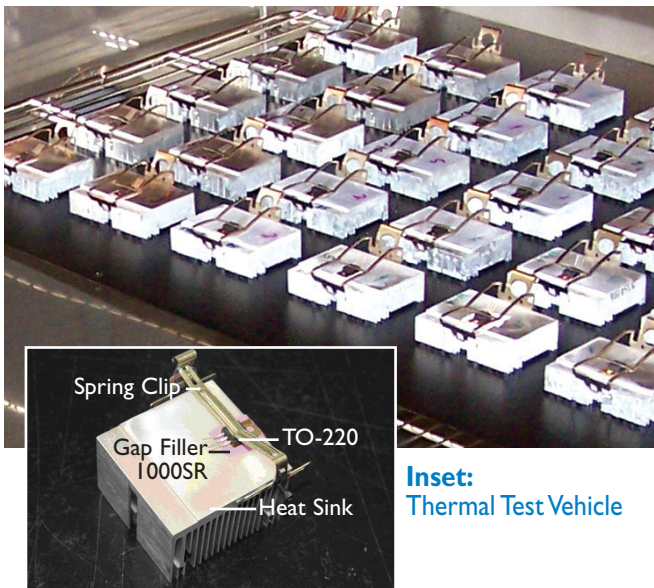
Environmental Reliability

Introduction

This report outlines Bergquist Laboratory results of the environmental reliability testing conducted on Gap Filler 1000SR (Two-Part). Gap Filler 1000SR is a high performance, thermally conductive gap filling material that is ideal for fragile assemblies or for filling intricate air gaps between electrical components. Gap Filler 1000SR has demonstrated consistent and reliable thermal performance, even when exposed to extreme environments.

The Bergquist Laboratory tests Thermal Interface Materials (TIMs) in the following environments: 85°C/85% relative humidity, high temperature continuous bake and thermal cycling. 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.

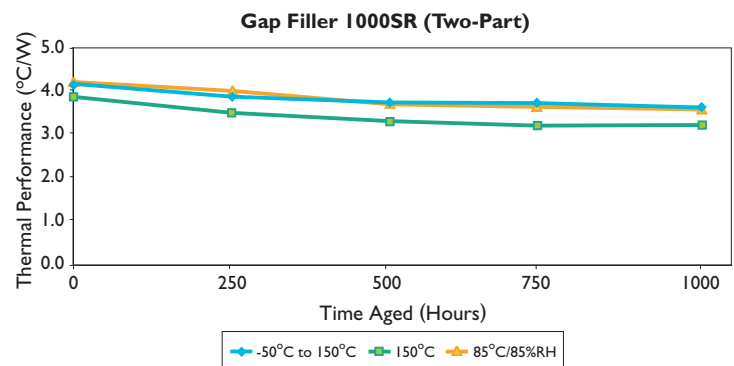
Figure 1: Oven Chamber



Inset: Thermal Test Vehicle

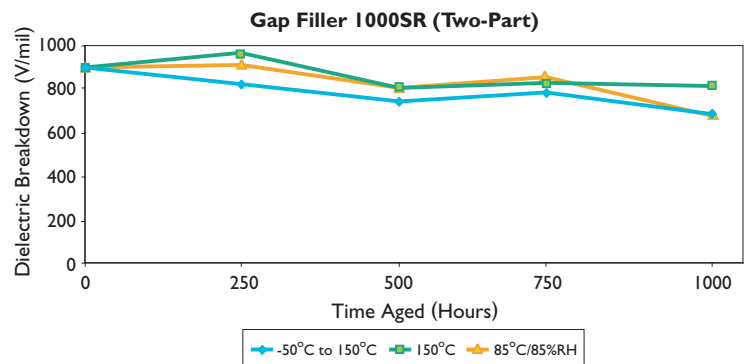
The goal of the environmental reliability testing is to accelerate aging of the TIM and determine the effect on the key material characteristics of thermal performance and voltage breakdown while in a controlled laboratory setting. The TO-220 Thermal Performance Test utilizes the thermal test vehicle shown in the Figure 1 inset. Gap Filler 1000SR is subjected to constant pressure throughout the test via spring clip. At regular intervals the thermal test vehicle is removed from the oven chamber and powered on. 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. See Graph 1, below.

Graph 1: TO-220 Thermal Performance Testing



Gap Filler 1000SR was exposed to 85°C/85% relative humidity, high temperature continuous bake and thermal cycling tests for 1,000 hours and was tested for voltage breakdown. See Graph 2, below.

Graph 2: Voltage Breakdown Testing



Conclusion

Gap Filler 1000SR provided consistent thermal performance and voltage breakdown throughout the duration of the Bergquist laboratory environmental reliability testing.