Executive Summary

Honeywell HT4500, a one-component, dispensable thermal gel with thermal conductivity of 4.5 W/m·K, ultra-high compressibility enables low stress and excellent conformity to mating surfaces. It is designed to minimize thermal resistance at interfaces, and maintain excellent performance through reliability testing.

Conclusion:
HT4500 has excellent thermal stability after different long term reliability tests including, D85(85°C & 85%RH) 1000hrs, Thermal Shock 1000cycles and HTB(High Temperature Baking) 150°C 1000hrs.
Introduction

• Purpose
  - This test is intended to provide the thermal performance stability data of Honeywell Thermal Interface Material via different accelerated conditions.

• Test Method
  - ASTM D5470

• Test Procedure
  - The test fixture is two nickel plated copper discs with a convex plate on one plate, The diameter of convex plate is 30mm, the thickness of convex plate is 3mm
  - The sample is placed between the two plates and compress to the thickness of 1mm. Then fix the fixture and sample by screws.
  - Put the fixture and sample in reliability test chamber.
  - Test the thermal resistance both fixture and sample before and after 250h, 500h, 750h, 1000h or 250 cycles, 500cycles, 750cycles and 1000cycles reliability test based on ASTM D5470.

Test Items/Condition

- 85°C & 85%RH 1000hrs
- Temperature Shock Test 1000x
- High Temperature Baking Test 125°C 1000hrs
Thermal Impedance Test Method: ASTM D5470

- Hot side heat flow: $Q_h = K_m \times A \times \frac{T_{h2} - T_{h1}}{X_1 + X_2}$
- Cold side heat flow: $Q_c = K_m \times A \times \frac{T_{c1} - T_{c3}}{X_5 + X_6}$
- Average heat flow: $Q_{ave} = \frac{Q_h + Q_c}{2}$
- Hot side surface temp.: $T_h = T_{h1} - \frac{X_3}{X_1 + X_2} (T_{h2} - T_{h1})$
- Cold side surface temp.: $T_c = T_{c1} - \frac{X_4}{X_5 + X_6} (T_{c3} - T_{c1})$
- Thermal impedance: $\text{Imp} = R \times A = \frac{T_h - T_c}{Q_{ave} \times A}$
Reliability Test Condition

• 85°C & 85%RH Test (D85)
  - Standard: IEC-68-2-30
  - Testing Condition: 85°C, 85%RH, **1000 hours**
  - Chamber supplier: ESPEC
  - Objective: High temperature with high humidity on the thermal performance of the test structure.

• Temperature Shock Test
  - Standard: IEC 60068-2-14
  - Testing Condition: -40°C to 150°C, **1000cycles**
  - Chamber supplier: ESPEC
  - Objective: Determine the resistance of TIM to extremes of high and low temperatures shock, and its ability to withstand cyclical stresses.

• High Temperature Baking
  - Standard: JESD22-A103C
  - Testing Condition: 150°C, **1000 hours**
  - Oven supplier: BINDER
  - Objective: Accelerate changes in TIM’s material and performance characteristics relative to prolonged and elevated temperature.
85°C & 85%RH (D85)

Standard: IEC-68-2-30

- **Testing Condition:** 85°C, 85%RH, 1000 hours
  - **Objective:** High temperature with high humidity on the thermal performance of the test structure

**HT4500 Thermal resistance of D85**

85°C/85%RHx1000hrs

*HT4500 remain reliable up to 1000hrs for D85*
Thermal Shock Test Testing  
Standard: IEC 60068-2-14

- Testing Condition: -40°C to 150°C, 1000 cycles
- Objective: Determine the resistance of TIM to extremes of high and low temperatures, and its ability to withstand cyclical stresses

HT4500 Thermal resistance of Thermal Shock  
-40°C~150°C x 1000cycles

- Ramp time: <20sec
- Dwelling time @-40°C and 150°C:1hr

HT4500 remain reliable up to 1000 cycles for thermal shock test.
High Temperature Baking
Standard: JESD22-A103C

- Testing Condition: 150°C, 1000 hours
- Objective: Accelerate changes in TIM’s material and performance characteristics relative to prolonged and elevated temperature.

HT4500 Thermal resistance of HTB
150°Cx1000hrs

HT4500 remain reliable up to 1000hrs for 150°C baking
THANK YOU

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