TC-3040 Thermally Conductive Gel

Product Briefing
for
3DInCites Award Nomination
TC-3040 Thermally Conductive Gel

- Material has been designed and optimized for high performance flip chip applications
- TC-3040 has the following key attributes:
  - Low modulus and moderate elongation to accommodate warpage and prevent delamination
  - Good wetting to yield intimate interfacial contact between chip and lid

Target Application: Lidded Flip Chip Packages

TIM: Thermal Interface Material
TC-3040 Thermally Conductive Gel Overview

TC-3040 attributes
• One-Part
• Freezer stored (-20°C)
• Heat curable
• Capable of low cure temperatures
• Lightly curable silicone matrix for low modulus
• High filler loading for enhanced thermal properties
• Optimized for thin BLT
• Low viscosity and solvent-less for ease-of-processing

<table>
<thead>
<tr>
<th>Property</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>NA</td>
<td>Gray</td>
</tr>
<tr>
<td>Viscosity</td>
<td>cP</td>
<td>90,000</td>
</tr>
<tr>
<td></td>
<td>mPa-sec</td>
<td>90,000</td>
</tr>
<tr>
<td></td>
<td>Pa-sec</td>
<td>90</td>
</tr>
<tr>
<td>Thixotropic Index</td>
<td>NA</td>
<td>2.5</td>
</tr>
<tr>
<td>Modulus</td>
<td>kPa</td>
<td>18</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>W/mK</td>
<td>4.3</td>
</tr>
<tr>
<td>Ionics content (Cl⁻)</td>
<td>ppm</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Ionics content (Na⁺)</td>
<td>ppm</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Ionics content (K⁺)</td>
<td>ppm</td>
<td>&lt;10</td>
</tr>
</tbody>
</table>
TC-3040 Reliability and Stress Testing

• Through joint effort with collaborator for device level testing on this material, this material:
  – Has successfully been demonstrated to integrate well with standard HVM processes
  – Has been demonstrated to be compatible with standard substrates, lids, heat sinks, and other flip chip-related materials
  – Able to withstand downstream processing conditions, in particular multiple refractions at Pb-free solder conditions

• Live devices called Thermal Test Vehicle (TTVs)
• This TTV-level thermal performance has been demonstrated for battery of reliability testing
TC-3040 Thermally Conductive Gel

TTV Level Testing
Material performs well versus the industry benchmark
**TC-3040 Thermally Conductive Gel**

Material performance is reproducible (37 TTVs in qualification build)

- **Current available materials**
  - Avg $\sim 12 \text{ mm}^2\text{C}/\text{W}$, Avg $+3\sigma \sim 15 \text{ mm}^2\text{C}/\text{W}$

- **Avg $+3\sigma = 9.1 \text{ mm}^2\text{C}/\text{W}$**

- **Avg = 6.0 \text{ mm}^2\text{C}/\text{W}**

**Thermal Test Vehicle Testing**

Post-reliability testing demonstrates **better and consistent** thermal resistance on TTVs
TC-3040 TIM1 Gel Summary

• TC-3040 offers an effective and reliable TIM1 thermal management solutions, reduced stress and excellent under-die coverage for demanding flip chip, high-end computing applications.

• This new generation TIM1 material delivers nearly two times the thermal performance of other industry standard TIMs, and targets a high thermal conductivity of 4W/mK with robust reliability.

• Consistent and reliable thermal performance was demonstrated through the validation with industry collaborator
Thank You
The information contained in this communication does not constitute an offer, does not give rise to binding obligations, and is subject to change without notice to you. The creation of binding obligations will occur only if an agreement is signed by authorized representatives of Dow Corning and your company. Any reference to competitor materials contained in this communication is not an endorsement of those materials by Dow Corning or an endorsement by the competitor of Dow Corning materials.

To the fullest extent permitted by applicable law, Dow Corning disclaims any and all liability with respect to your use or reliance upon the information. **DOW CORNING DOES NOT MAKE ANY WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, WITH RESPECT TO THE UTILITY OR COMPLETENESS OF THE INFORMATION AND DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.**