High Power Density Applications Enabled by New Thermal Interface Material

Danny Leong
Henkel Adhesive Electronics

From automotive to telecommunications to computing and power conversion applications, form factors continue to decrease and power densities are on the rise. The never-ending push to pack more function into smaller spaces puts tremendous pressure on thermal management materials. With fewer components handling multiple functions, hot spots are often the result and can have detrimental effects on performance and reliability. These conditions have made effective thermal management absolutely critical for next-generation high power density devices, as robust heat transfer across the interface with minimal resistance is an absolute necessity.

However, it's not only capable heat management that's required for today's higher power density applications. The thermal material used to facilitate the required transfer of heat from the component to the heat sink must also take into account the level of stress placed on the device leads or solder interconnects, as too much mechanical stress can cause device damage. A conforming, soft material that is not only capable of robust thermal management, but one that also limits compression stress and lowers in-use relaxed stress should be considered for these types of applications.

Henkel's line of BERGQUIST thermal interface materials has historically led the market in high thermal conductivity solutions. While the company has delivered exceptionally capable W/m-K solutions for years, it recognized the increasing requirement for lower-stress materials for next-generation high power density devices. The result is a brand new GAP PAD material, GAP PAD HC 5.0, which is formulated on an entirely new chemistry platform with unique filler technology.

GAP PAD HC 5.0 is a very soft and compliant gap filling material with a thermal conductivity of 5.0 W/m-K, providing extremely low compression stress combined with excellent thermal performance. The low modulus resin formulation puts very little mechanical strain on
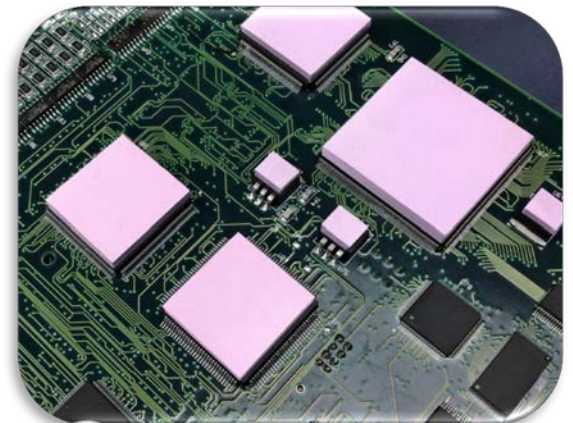
components during assembly and the conformity of the material allows for thorough interfacing and wet out even on rough surfaces or challenging topographies. Low thermal resistance ensures robust heat transfer from the component through the material and to the heat sink. With high compliance materials, low thixotropic stress during assembly and through power and thermal cycling is important for minimizing pressure and potential damage to solder interconnects. Compared to previous-generation materials, GAP PAD HC 5.0 offers better handling, an enhanced dielectric constant, improved volume resistivity and better thermal impedance performance. The material is manufactured with a natural tack on both sides so there are no thermally-impeding adhesive layers, and its construction is resistant to shear and tearing for added durability.

Though only recently introduced, GAP PAD HC 5.0 has already been qualified by several customers in various market sectors. For automotive applications, GAP PAD HC 5.0 has delivered improved thermal performance for an infotainment platform with a new, higher power generating chipset; and for a heads up display (HUD) system. The high compliance material is also lending its advantages to telecom products including base band units (BBUs), remote radio units (RRUs), servers and routers – all of which require better thermal performance for newer designs. It should be noted that many automotive, computing and telecom applications are extremely high-value products, so any failures in the field are an expensive proposition. This makes getting the thermal piece right the first time very important, as performance and reliability are essential. GAP PAD HC 5.0 provides lower junction temperatures and improvements in device performance – and customers are experiencing the benefits.

To learn more about GAP PAD HC 5.0 or any of Henkel's advanced thermal solutions, visit www.henkel-adhesives.com/thermal or call +1-952-835-2322.