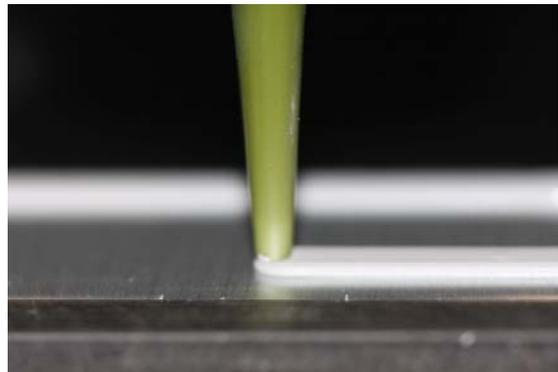


Thermal Solutions for Any Application

by Jason Brandi, Henkel Electronic Materials LLC

When it comes to addressing the thermal management demands of today's advanced electronics devices, there is no "one size fits all" solution. Different applications and user preferences dictate the material type and performance to be selected. One thing is universal, however: effective thermal management – especially at the TIM2 level – is more critical than ever, as devices continue to shrink in footprint and increase in functionality and, therefore, keep getting hotter. Recognizing that robust, cost-effective heat management must also cater to differing applications and user requirements, Henkel has developed a complete range of solutions to meet varying specifications.

Long considered a leader in phase-change films with its PowerstrateXtreme (PSX) products, Henkel has engineered liquid systems that offer similar performance characteristics to that of its highly regarded film technologies. The new materials, called PSX Dispensable and PSX Printable are phase change materials in liquid form that offer many of the advantages of thermal greases in terms of usability and throughput without the challenges that are inherent with greases. Henkel's PSX Dispensable and PSX Printable are pastes that can either be dispensed or screen printed and, over time, the paste will dry and yield a phase change pad. The reliability and performance of the materials are consistent with film phase change materials but, because they are liquids, thickness can be adjusted depending on the requirement. Films come in a variety of thicknesses but extremely thin films are difficult to manufacture and often do not release cleanly from the liner. PSX Dispensable and Printable alleviate these issues. As the liquid materials can be fully automated, throughput is improved and adaptable to current equipment, allowing manufacturers to use standard dispensing or screen printing systems.



Some of Henkel's more popular thermal solutions are its Loctite brand Thermstrate and Isostrate materials. These are classic phase change materials in pad format that offer a replacement for traditional thermal greases. Thermstrate is ideal for applications that dictate extremely high reliability, but aren't bound by requirements for high thermal performance or electrical isolation. Examples of applications where Thermstrate has shown its effectiveness include base stations and power electronics. Isostrate is an electrically isolating version that delivers excellent thermal performance, cut-through resistance and dielectric strength. This Kapton® MT-based film material is phase-change coated and offers exceptional performance. Both Thermstrate and Isostrate are excellent alternatives to thermal greases, which may suffer from reliability problems over time due to material migration or "pump out".

However, for manufacturers with a preference for thermal grease, Henkel also has material solutions. The first, Loctite NSWC100 is a non-silicone, water cleanable grease that is an excellent option for devices that have flatness or coplanarity issues, as greases have a tendency to easily compensate for voids. For assembly specialists that need higher thermal conductivity, Henkel's Loctite TG100 delivers

on this requirement. While phase change liquids have to go through a step whereby they require a phase change transition to achieve desired performance, greases are functional as soon as they are applied. Greases offer a viable alternative for manufacturers who want to avoid the extra processing requirements associated with phase change materials. Though phase change products generally offer better long-term reliability because they don't pump out over time like greases, there are extra process steps required. One must carefully evaluate their specific application to determine the thermal solution that is most appropriate.



Finally, to address emerging requirements for device size and weight reductions and improved processability, many thermal management experts are turning to thermal adhesives. As an added benefit, the permanent bond these materials provide eliminates the need for fastening devices such as screws and clips. Henkel has designed an entire suite of thermal adhesives in both paste and film formats for manufacturing flexibility. Three paste formulations have emerged as leading materials for Henkel's customers and include; Hysol ECCOBOND TE3530, a high performance epoxy-based formulation with heat cure; Loctite 3873, a room temperature cure formula that delivers a controlled bondline and electrical isolation; and Loctite 3874, a room temperature cure adhesive without the glass bead composition of Loctite 3873.

When thermal specialists want the advantages of an adhesive but require consistent thicknesses, the ability to bond large devices with complex patterns, and minimized voids, adhesive films are the obvious solution. Henkel's Emerson & Cuming CF3350 provides outstanding performance in an electrically conductive film and is available in thicknesses of 2 and 4 mil. When an electrically isolating film is required for specific applications, electronics professionals choose Emerson and Cuming 563K.

Suffice it to say that whatever the thermal challenge, Henkel has a solution. From thermal greases, to phase change films and liquids to adhesives, Henkel's full suite of thermal management products provide the control you need.

To find out more about any of Henkel's thermal management materials, call the company's headquarters at 714-368-8000 or log onto www.henkel.com/electronics.

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