

Materials Engineering and Adhesive Expertise Help AOS Thermal Compounds Deliver Innovative Thermal Management Interface Pads



Thermal interface film offers the lowest thermal resistance without the mess of grease.

Among the many potential reasons for electronic failure, poor thermal management is the primary culprit. As electronic complexity, capability, and performance increase, temperature rises. In performance-intensive markets including microelectronics, automotive, and power generation, thermal grease is often used to aid thermal dissipation. While grease is great for heat dissipation, it can provide challenges in application and extended use. For AOS Thermal Compounds, the challenge was to retain the heat dissipation qualities of thermal grease, but provide it in a package that was easier to use. Working with Fabrico, AOS Thermal Compounds was able to meet these requirements.

What is thermal grease?

Whether it's called a gel, compound, or paste, thermal grease is used to help a heatsink to draw heat away from an electronic component – that could include power modules, insulated gate bipolar transistor (IGBT), dc/dc converter module, solid-state relay, diode (including an LED) power MOSFETs, and large power supplies. When the irregular surface of a heat generating component is pressed against the irregular surface of a heatsink, air gaps occur. Air is approximately 8,000 times less efficient at conducting heat than a common heatsink material. Thermally conductive grease improves the efficiency of a heatsink by filling in the air gaps. It provides a minimal thermal resistance path from the component to the heatsink.

When considering a thermal interface material, factors can include:

- Thermal conductivity
- Electrical conductivity
- Spreading characteristics
- Long-term stability and reliability
- Ease-of-application

Bonding, Joining
& Sealing



Thermal interface pads can be die-cut to a wide variety of shapes for easy application.

The higher the thermal conductivity of a material, the more efficient its heat transferring capabilities. Low electrical conductivity is desirable for the thermal interface material to prevent potential shorts. Conformability is important to ensure that the thermal grease spreads to fill the air gaps between component and heatsink. Any thermal grease needs to provide sufficient thermal conductance over extended periods of use – typically for the lifetime of the component. Finally, thermal grease should be easy to use/easy to apply – too much or too little can cause problems.

Types of Thermal Management Materials

The major categories of thermal management materials include grease, gel, thermally conductive adhesives, thermal tapes, elastomeric pads, and phase change materials. Grease is the oldest class of materials and the most widely used. It uses thermally conductive fillers either in silicone or hydrocarbon oils to form a paste. When enough grease is applied, it completely fills voids and eliminates interstitial air. On the other hand, it can flow out beyond the edges of an area and requires an additional removal step.

Gels provide lesser thermal conductivity with reduced pump out or migration. Gels do require processing/curing and conform only before curing.

The goal is to develop a thermal grease pad that delivers the performance of pure thermal grease.

Adhesives tapes conform to surface irregularities and avoid pump out but also need curing, which can stress the interfaces, and can fall victim to resin/filler separation. Elastomeric thermal pads are easy to apply and save time and effort, but will require significant loads to deform or do not effectively remove the air.

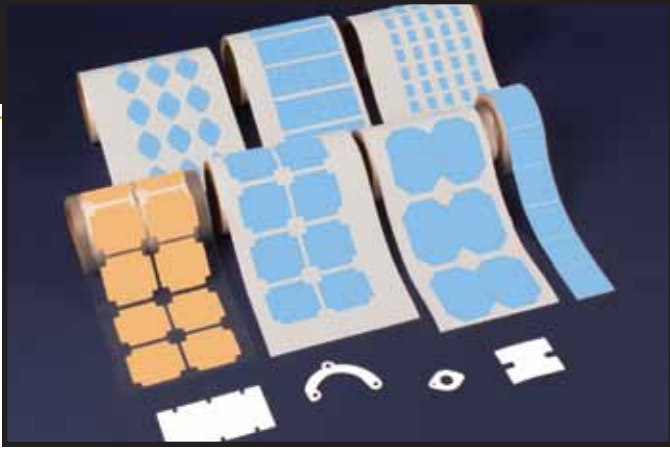
Phase change materials have good conformability and are easy to apply, but have lower conductivity than grease, can't be reworked, require carriers, and may introduce voids under constant pressure during thermal cycling.

Dependable Thermal Management

AOS Thermal Compounds manufactures thermal management solutions including thermal paste, heatsink compounds, and non-silicone grease. AOS Thermal Compounds is a leading innovator of dry-to-the-touch thermal grease pads.

AOS Thermal developed a new thermal grease pad called Micro-faze[®] that delivers the same kind of performance as pure thermal grease. Micro-faze[®] wets and lowers thermal resistance at lower temperatures, ambient to 60°C, whereas phase change materials are not as effective. This innovative product was designed to:

- Retain the good thermal performance of grease in a thermal pad form for maximum heat transfer;
- Require less pressure for optimum contact;
- Allow for total wetting to fill all voids without changing phase;
- Allow heat transfer to begin immediately at any temperature;
- Deliver a product that could be “dropped-in-place” for easy handling without mess;
- Prevent pump out/run out due to its thixotropic nature.



Fabrico is able to turn out customer-specific die-cuts in large volume, with a coating that allows for easy handling.

The innovative thermal grease pad delivers twice the thermal conductivity of non-silicone heatsink thermal compounds.

The product is developed with non-silicone thermal grease. This eliminates the tendency to separate and migrate – potentially contaminating electronic packages – that occurs with silicone. After several thermal cycles, silicone compound can dry out, crack, and separate. New air gaps can form and the component will lose contact with the heatsink. The result is a loss in thermal conduction. With a non-silicone compound, the thermal interface film stays in place and is fully operational for the life of the product.

Selecting the Right Converter

To ensure fail-safe, maintenance-free operation, AOS Thermal Compounds is working with a flexible materials converter, Fabrico, who has experience with materials and adhesives. AOS Thermal Compounds was looking for a converter that could handle the new product, provide the die-cutting capabilities necessary to turn out customer specific die-cuts in large volume.

Working with its large base of adhesive partners, Fabrico was able to deliver a product that has twice the thermal conductivity of standard non-silicone heatsink thermal compounds.

Fabrico's materials converting capabilities include: custom design solutions for applications that require slitting, laminating, and die-cutting. Laser die-cutting, kiss-cut, and water jet die-cutting are available depending on the application and materials being used.

With more than 30 years of materials experience, Fabrico engineers also understand the impact of a material selection on the overall manufacturing process, and design material systems that optimize production efficiency and improve overall cost-effectiveness.



The thermal grease pad is die-cut and coated for easy application.

With more than 30 years experience, Fabrico engineers understand the impact of materials selection on the manufacturing process.

Material Partners

Fabrico has strategic relationships with world-class materials suppliers, to assist its customers in selecting the best material for the intended use and to expedite materials sourcing. Whether adhesive films or liquids, all critical material properties are considered in any Fabrico project, including chemical, thermal, and moisture resistance.



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