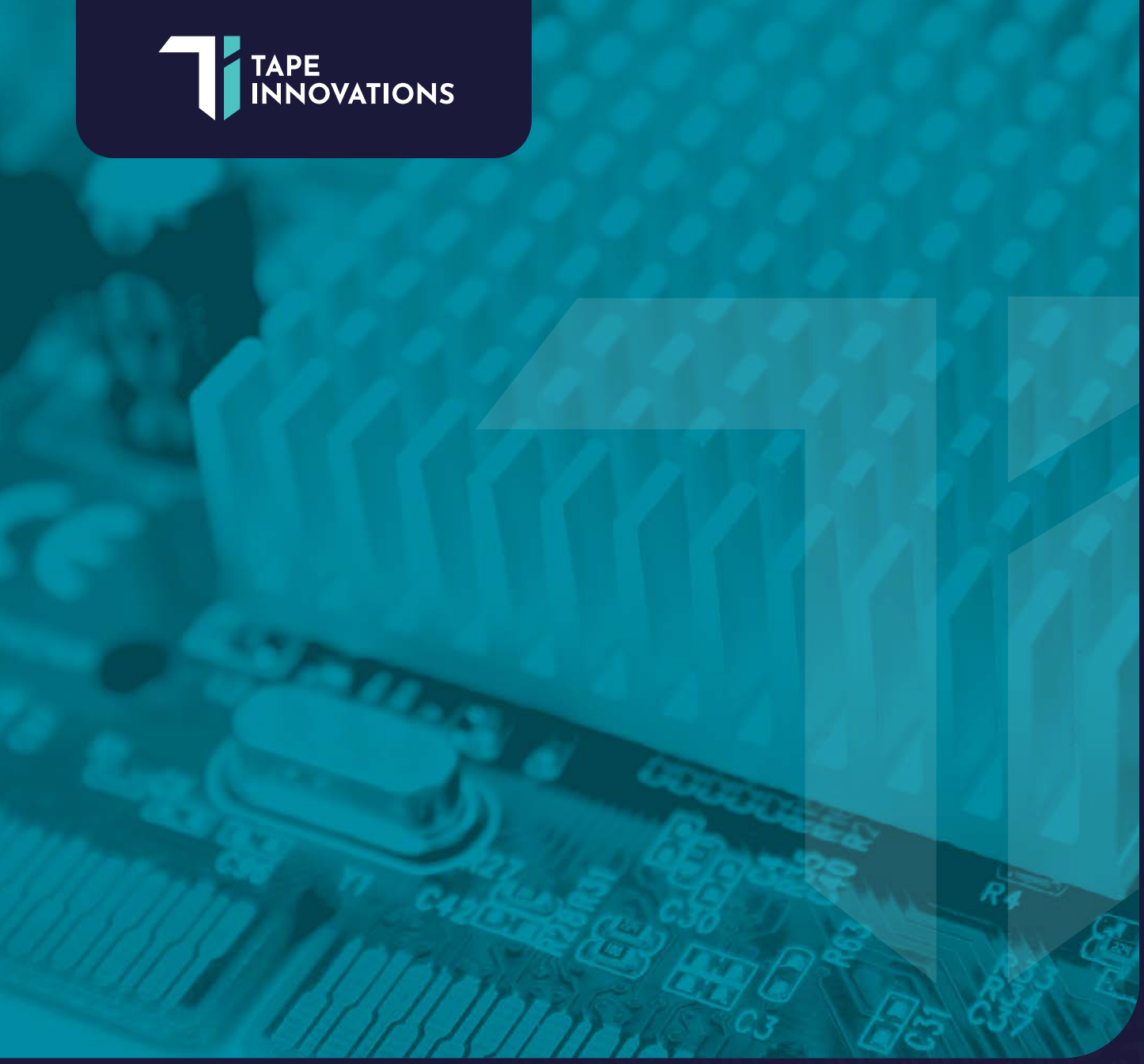
TAPE INNOVATIONS



Choosing the Right Thermal Interface Material

A COMPREHENSIVE GUIDE FOR ENGINEERS AND DESIGNERS

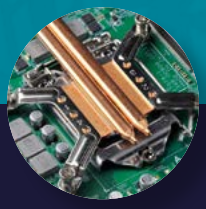
Thermal management plays a crucial role in ensuring the optimal performance and longevity of electronic devices.

To maintain reliability and user safety of electrical systems, whether it's a medical device, a laptop or automotive accessory, implement the right thermal management solution is essential.

What does thermal management accomplish? In electrical components, any air gaps that are present between components and the heat spreader (or heat sink) creates an increase in thermal resistance. As the heat builds and raises operating temperatures well above optimal levels, that can lead to performance degradation, ranging from increased lag time to damage caused by high heat.

Here's how thermal management materials bridge the thermal resistance gap between electrical components and the heat sink:

- Effectively extract heat from the components, transferring to the heat sink, allowing it to safely escape and dissipate.
- Reduce heat resistance to help maintain a safe operating temperature for electrical systems.
- Compared to putties, gels and greases, thermal management pads and thermally conductive adhesives offer a hassle-free installation process minus the mess.

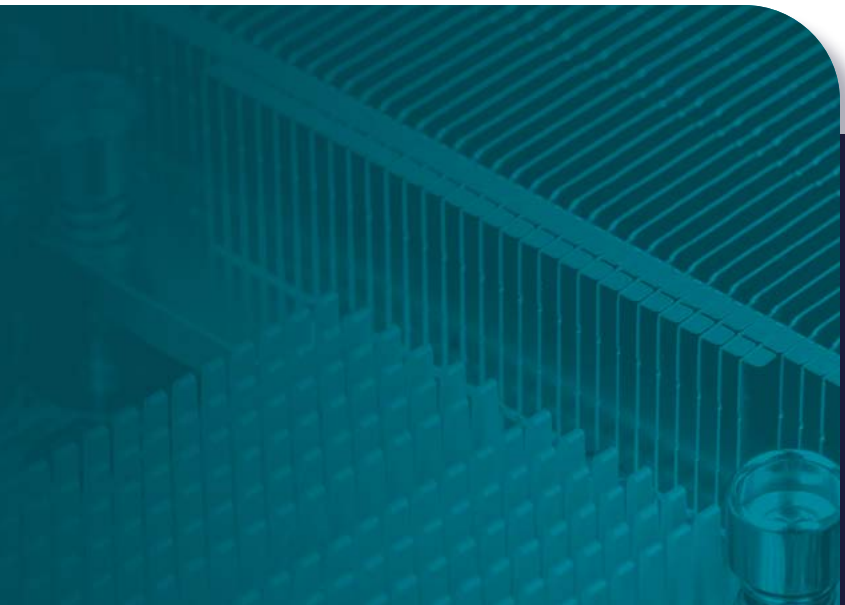

Launch your search for thermal management solutions

Selecting the best materials for thermal resistance management of your product requires careful consideration. To streamline your decision-making process, we have provided a concise guide that outlines key questions and highlights the benefits and applications of gap fillers, phase changing materials and thermally conductive insulating pads. As you work your way through the top-level considerations, you'll quickly identify the type of thermal management solution that is most likely to deliver optimal performance for your specific application.

Launch your search for thermal management solutions

The performance of your thermal interface material often comes down to a few imperceptible gaps of air that are measured in microns.

When you choose, you'll want to understand factors such as the dimensions of the gaps between components and how well the chosen material will maintain wetting and performance. It's equally important to weigh other factors, such as vibration and thermal cycling, which can cause displacement of the material and diminish performance.



Finding answers to the following questions is an important first step in finding the best thermal management material.

- Do you need electrically isolating materials? (**Solution:** thermally conductive insulators)
- Does the material require a small gap interface? (**Solution:** phase change)
- Does the thermal interface material need to fill a large gap? (**Solution:** phase change, gap filler and thermally conductive insulators)
- Does the surface have any irregularities?
- Do the components in contact with the thermal interface material have any pressure considerations? (**Solution:** high-deflection gap filler pad)
- Are there large component tolerances? (**Solution:** gap filler pad)
- What is the maximum operating temperature? (**Solution:** phase change pads for high heat applications)
- Will it be used for a static application? Or would it require additional bonding to reinforce the interface material for a dynamic application? (**Solution:** thermally conductive adhesive tapes)
- Is low-oil bleed a requirement? (**Solution:** silicone free gap filler pad)

3 thermal interface materials and how they compare

To achieve a tailor fit and reduce waste, the following materials can be die cut into custom shapes.

GAP FILLER PADS

Gap filler pads provide optimal heat displacement solutions that fill irregular sized and wider voids and gaps between the component and heat sink with exceptional abilities to conform to irregular surfaces.

Benefits

- Ease of installation and rework. Removal leaves behind no residue, unlike thermal paste and thermally conductive adhesives.
- Gap filler pads may be die cut to exact lengths and widths.
- The sticky surface provides excellent surface wetting to achieve low contact resistance.
- Provides shock and vibration absorption to reduce noise and protect electronic components from mechanical stress
- Can be die cut into many shapes and eliminate waste material used in customer applications.

Considerations

- Limited thermal conductivity for electrical components
- Not suited for reaching very thin gap interfaces
- Compression setting and decreased thermal performance can occur over time due to temperature cycling and sustained pressure.

PHASE CHANGE PADS

Phase change pads provide optimal thermal management for high heat applications. They transform from a solid to a liquid state in higher temperatures, granting its abilities to absorb and release large volumes of heat.

Benefits

- Drops in place, offering a simple and clean installation, conforming to irregular surfaces for optimized thermal contact.
- At room temperature, solid state allows for ease of handling, providing an advantage to thermal greases.
- Fluid state at elevated operating temperature maintains wetting and conformability.

Considerations

- Performance degradation over multiple thermal cycles and exposure to high temperature, losing its phase change capabilities.
- High viscosity at high temperature liquid state can create difficulties in application and removal.

THERMALLY CONDUCTIVE INSULATING PADS

Thermally conductive insulating pads are effective at transferring heat away from components, with the added benefit of providing electrical isolation.

Benefits

- Enhances performance and function by preventing electrical shorts and interference between components
- High thermal conductivity effectively transfers heat between the heat source and the heat sink
- Gap filling capabilities fill voids and gaps between components and heat sink to reduce thermal resistance
- Provides puncture resistance for additional protection of components

Considerations

- Limited compressibility in certain applications

TAPE INNOVATIONS

Tape Innovations: Your trusted guide to the best thermal management solutions

Since each application is unique and involves various factors such as the operating environment, you'll want to select the best product that ensures both safety and reliable performance. To complete your selection process, rely on the professionals at Tape Innovations.

In-house experts: For decades, we've built our reputation on expert guidance in materials selection. We're dedicated to helping you find the most effective thermal management solutions for achieving the desired operating temperature.

Partnerships with top brands: Our strong partnership with Laird showcases our expertise, as they partner only with custom converters who exhibit excellence and specialized knowledge in these materials. This partnership also grants us access to the latest innovations and a team of product experts who are ready to tackle your most challenging problems.

Custom die cutting: Once we've pinpointed the optimal thermal management solutions for your application, we'll design and manufacture the components as we design the process to maximize value to you. We die-cut thermal gap pads for a custom fit, but we also die-cut conductive tapes and foils to contain and optimize thermal greases.

With our unmatched service and abilities to source your specific materials, Tape Innovation is where you start searching for your complete thermal management solution.

Ready to build your complete thermal management solution?

Reach out today to Tape Innovations to get started.