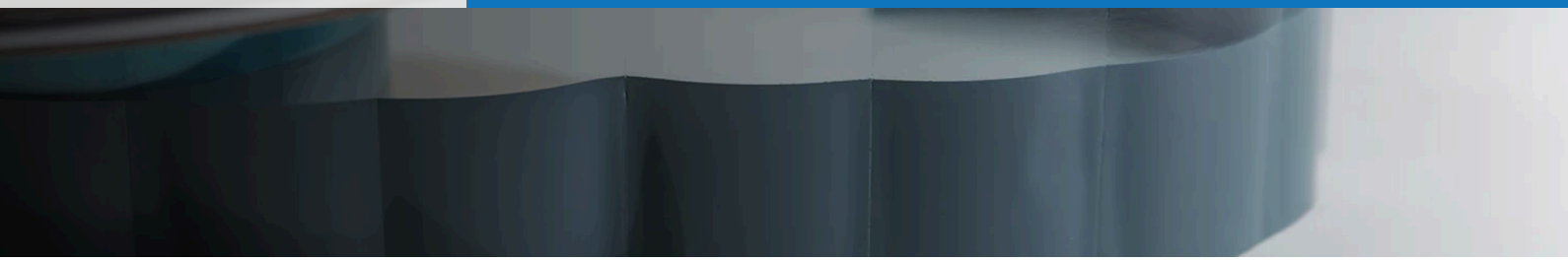
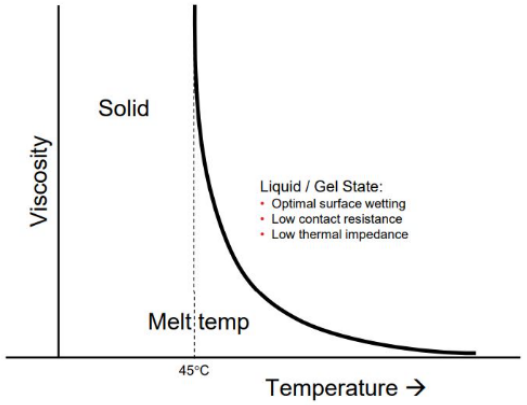
Product Handling Guide
Phase Change Thermal Interface Materials



Protection from Heat & Humidity

Phase change materials (PCM) are often used as matrix materials for thermal interface applications, because they are solid at room temperature, and soften when heated (>45 °C). It is specifically useful for applications requiring temperature stabilization around this range, as it melts at 45 °C, absorbing heat and preventing temperatures from rising above this point until it is fully melted.



Thermal Interface Material (TIM) Phase Change Pads are affected by heat and moisture. That is why we require controlled temperature and humidity during shipping, handling, and storage.

Heat (temperatures >40 °C) can cause TIM pads to melt between cuts, affecting the assembly process during module application. The recommended storage temperature is from 19 to 24 °C.

High humidity (>65%) can cause TIM pads to absorb moisture, which may lead to swelling, softening, and reduced mechanical stability and thermal performance. Moisture absorption can also create surface irregularities, increasing the risk of void formation during application and lowering heat transfer efficiency. The recommended humidity level during storage is <65%.

TIM Phase Change pads are typically shipped in with **cool gels** in the packaging to protect against high heat exposure, humidity, and contamination. These packages should only be opened once the TIM pad has acclimated to room temperature if it has been stored in cold conditions, as this helps prevent condensation on the pad surface and ensures optimal handling and performance.

Transport & Storage Instruction

Suggested transport and storage conditions. For long-term storage, we recommend maintaining a temperature range of 19-24˚C, while 40˚C serves as a guideline for the delivery process. If the 40˚C temperature indicator darkens, we advise storing the PCM at 19-24˚C for 24 hours before use. The material can then be used without concern. Additionally, ensure that the PCM is stored at a humidity level below 65% RH.

Shelf life. Shelf life refers to the period during which the product remains stable and maintains its specified properties under recommended storage conditions. Honeywell Phase Change Pads has a shelf life of 12 months at 23±2˚C after manufacture date

Receiving Instructions

1. **Move goods into controlled storage.** Upon receiving the TIM pads, immediately place them in controlled storage at 19-24˚C and relative humidity below 65%. CAPLINQ recommends storing materials at or below the temperatures specified on the technical data sheets.

2. **Unpacking Instructions.** Upon material acceptance, it is best practice to immediately remove the vacuum-sealed bags containing the reels and transfer them to a storage rack that adheres to the recommended storage conditions. It is essential not to leave the sealed bags in the styrofoam box with cool gel packs as this could introduce humidity into the sealed environment, potentially affecting the material quality. Proper storage in the designated rack will minimize the risk of moisture exposure and ensure the material maintains its optimal condition for future use.

3. **Check the temperature indicator readings**.
   CAPLINQ Europe Warehouse Storage Conditions: 19-24°C, RH <65%

   Thermax Irreversible Temperature Label Instruction for Reading:
   A color change from silver white to black indicates that the temperature has been reached.

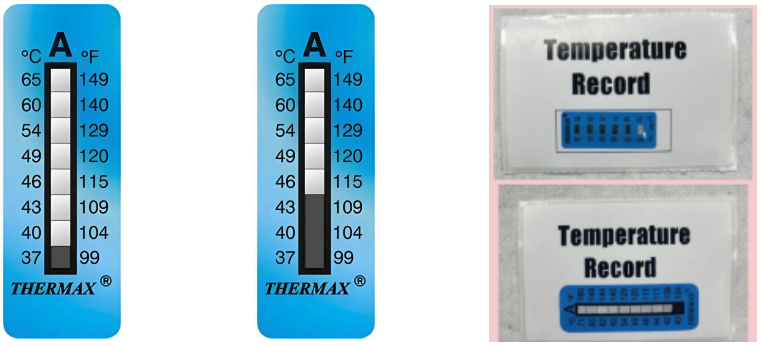


Image. Temperature indicator readings (left) below and (center) greater than 40 °C; (right) actual dark shading of temperature indicator

- If the temperature indicator reads below 40 °C, proceed with storage acceptance.
- If the temperature indicator reads greater than 40 °C, check for the following items:

Pad Cut

Inspect the inbetween pad cut of the reels for melting:

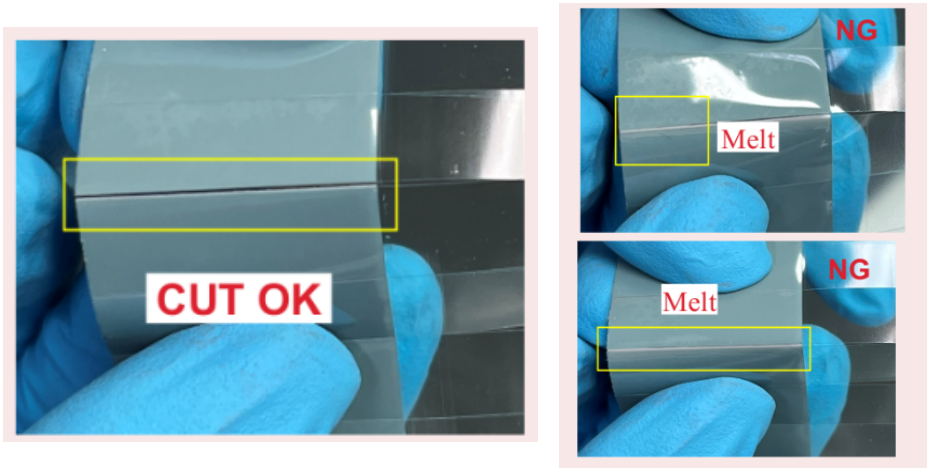


Image. Pad cut is still complete (left) Pad cut with minimal melting in between (right)

A. If pad cut is still complete proceed in acceptance

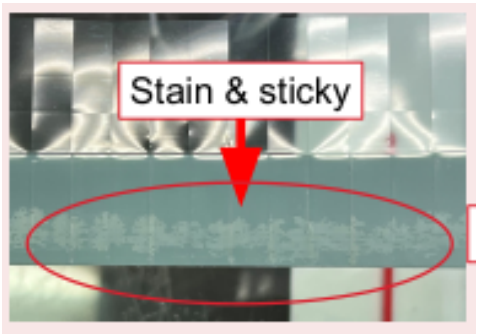
B. If minimal melting is observed during inspection, the material remains suitable for manual peeling without significant impact on its usability. (Refer to Troubleshooting Guide: 40 ℃ High Temperature Simulation Test)

C. If excessive melting is observed, the material may no longer be suitable for use, as it can compromise handling and application. We recommend evaluating storage conditions, or using a fresh batch to ensure proper functionality. If storage conditions and all other factors are in order, kindly contact **quality@caplinq.com** for further assistance.

Note: The pads have also undergone thermal simulations at 40°C and 55°C over different time scales to assess their pad cut structure. For more details, please refer to the CAPLINQ Honeywell Thermal Interface Material Pad Troubleshooting Guide.

Oil/Humidity Stain

Due to torque pressure in the reel, the pads tend to experience compression, which can lead to oil bleeding. To mitigate this, only a limited number of layers should be stacked. An ongoing study is being conducted to improve the packaging and minimize this issue.



(1) If oil or humidity stains are observed on the pads. These stains can affect adhesion, and overall handling.

Adhesion Issue: The presence of oil increases the adhesion between PCM pad and liner, which makes the liner removal difficult.
Resolution: In case, the liner can be removed, pad can still adhere to heatsink without any issue

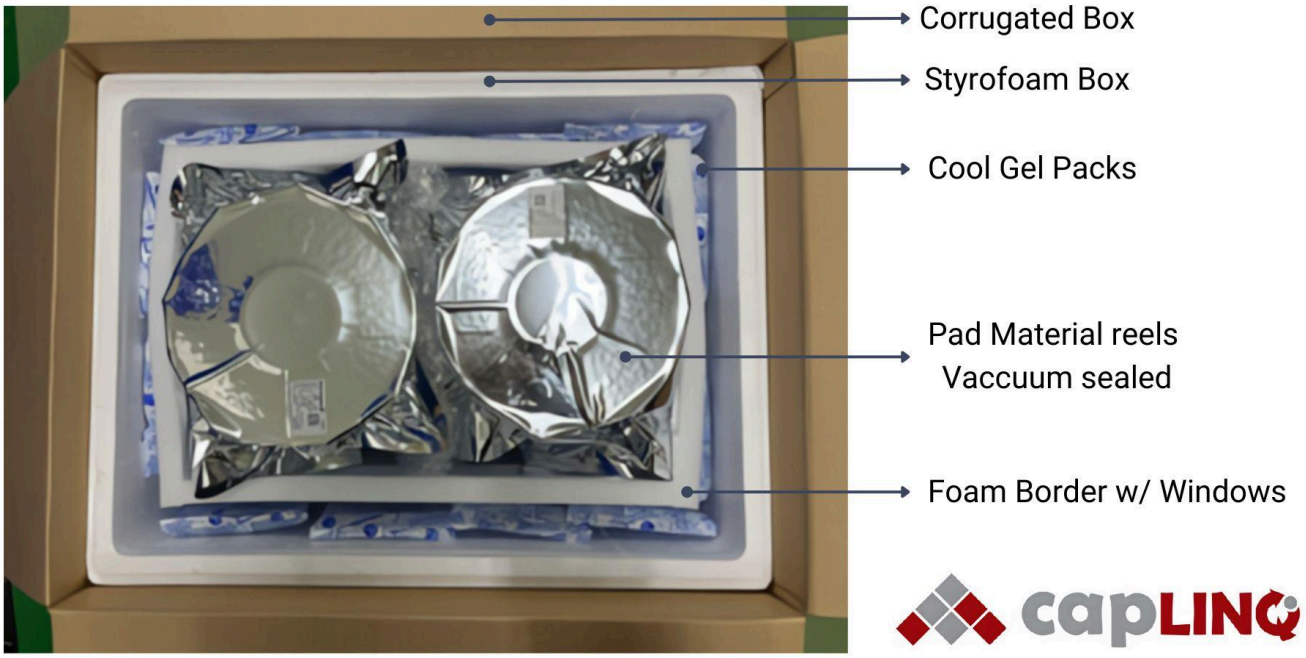
Note: We initiated FTIR testing to compare fresh pads with those experiencing oil occurrence wherein we determine that the initial materials are still present on all samples. For more information, please refer to the CAPLINQ Honeywell Thermal Interface Material Pad Troubleshooting Guide.

Usage Instructions

Thawing. Based on experience, to extend the shelf life of the material, customers store it at the lower temperature limit of 19˚C. Before use, the material should be properly thawed at room temperature to ensure optimal performance.

Note: For detailed usage instructions, kindly refer to the Honeywell PCM Application Note.

Packaging Information



Pad Packaging Form

Cool gel information. The part was packed with cool gel and can maintain the recommended temperature for approx. 3 days. Beyond 3 days, the material may be exposed to >40°C temperature.