

# THERMFLOW T443 Phase-Change Material Notes

## General Concept

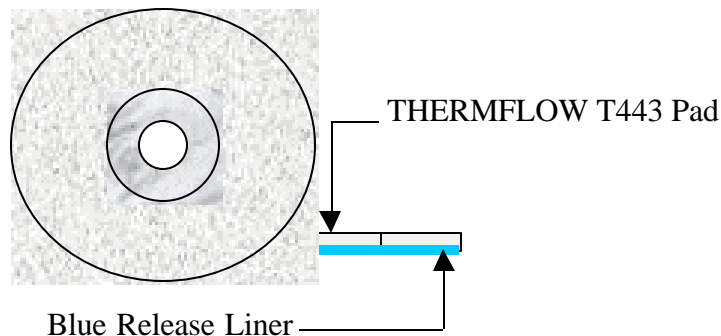
THERMFLOW T443 material is a phase change material coated onto a blue release liner. T443 material is available in three formats: continuous roll, roll of kiss-cut parts, or individual cut pieces shipped loose in a cardboard container. The individual cut pieces can include a pull tab to assist in removing of the blue liner, but makes automated application difficult. For most heat spreader plate applications, an additional cover liner is not needed to protect the T443 material during shipping and handling of the heat spreader plate after the T443 pad has been installed.

The T443 pad is attached to the heat spreader plate by reflowing the pad onto the plate at an elevated temperature. No pressure sensitive adhesives used.

The primary process parameter to consider when attaching the T443 pad to a heat spreader plate is the temperature of the heat spreader plate.

## Kiss-Cut or Continuous Format

Two cardboard end bells hold the roll of T443 material together. The end bells are twelve inches in diameter. The inner diameter of the rolls is 1.5 inches. The standard length of the roll of material is 500 feet long. An interleaf of three mils clear polyester material is provided to protect the phase change material during shipment. This material does not contribute to the production, use or dispense of the material. It is for shipping and storage purposes only.



## Preparation

The heat spreader plates should be clean and free from machining oils and aluminum dust. The plates can be cleaned with any common solvent, such as isopropyl alcohol. The surface of the plate may be anodized or bare aluminum.

## Cutting the Pad

THERMFLOW T443 material is delivered to the customer either on a continuous roll, a roll of kiss-cut parts, or as individual cut pieces shipped loose in a cardboard container. Chomerics can slit roll stock T443 material to the width required by the customer. However, the minimum slitting width for T443 material is 0.70 inches (17.8mm) wide with a tolerance of  $\pm 0.020$  inches ( $\pm 0.5$ mm). Individually cut pieces are also limited to pads no smaller than 0.70 inches (17.8mm) in width or length. Standard length and width tolerances for individual cut pieces are  $\pm 0.020$  inches ( $\pm 0.5$ mm).

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## Application

It is recommended that the T443 pad be placed onto the plate when the plate temperature is between 50°C to 60°C (122°F to 140°F). If the plate temperature is too high, the material has the potential to reflow too much, and become very slippery and difficult to place accurately. Little or no pressure is required during pad placement. Simply placing or dropping the T443 pad onto the plate is all the pressure needed when the plate temperature is between 50°C to 60°C (122°F to 140°F). *NOTE: If the heat spreader plate is brought to temperature in an oven or heating station, and then moved to another station for T443 pad application, be aware that the plate may cool below the recommended temperature range if significant time elapses. This would hinder application of the T443 pad to the heat spreader plate. Care should be taken to ensure that the plate doesn't cool to less than 50°C (122°F) before pad application.*

An alternative application method is to place the pad onto the heat sink using the natural tack of the T443 material to temporarily hold the material onto the heat sink. Some slight amount of hand pressure is required when placing the T443 pad onto the heat sink. The heat sink can be heated to 50°C to 60°C, causing the T443 material to be reflowed onto the heat sink.

Some amount of process development work is required for each application. These instructions are meant to be guidelines for that process development. Keep in mind that pressure, temperature, and surface roughness contribute to the adhesion of the T443 pad to the heat sink.

Several hundred thousand pads have been placed onto a heat sink with excellent results as part of the product's history.

## Material Storage and Handling

THERMFLOW T443 material is temperature sensitive material and should be stored below 35°C (95°F). It is best to use the material at cooler temperatures, below 30°C (86°F), to keep it solid. As the material warms, it softens, and gradually becomes more difficult to handle. When individual cut pieces are used with the blue liner as a protective cover, **do not** remove the blue liner when the temperature is above 30°C (86°F) since this may result in some of the softened T443 material coming off with the liner.

## Usage and Storage Temperature Recommendations

Maximum recommended storage temperature for THERMFLOW T433 material is 35°C (95°F). Maximum recommended usage temperature is 30°C (86°F). At higher temperatures, the material softens and becomes more difficult to work with. At cooler temperatures, the material remains firm and is easier to handle, dispense, and fabricate. The improved handling characteristics of a cooler material will contribute to improved yields during fabrication and assembly.

As temperature increases, the amount of gray haze left on the blue release liner after its removal will increase. This should not be a concern at temperatures below 30°C (86°F). Because of the ability of the material to "wet out" and flow with pressure and temperature in its end use application, the loss of this tiny amount of material on the blue release liner will not effect total system thermal performance. Small nicks, scratches and imperfections (small voids in material, etc.) in the applied pad can be tolerated without degradation in thermal performance.

It is recommended to store rolls of THERMFLOW material with optional release liner tabs so that the roll is resting on the THERMFLOW material-*not on the release tabs*. In this orientation, there is no weight pressing down on the release tab material, thus preventing wrinkling of the tabs and possible "telescoping" of the wound roll.

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## Initial Reflow of T443 Material

As with Chomerics THERMFLOW T710 and T705 phase change materials, the T443 material needs to undergo an initial phase change to achieve optimum thermal performance. The initial thermal performance will behave as a dry joint thermal interface because the material has not yet driven out the air gaps between the heat sink and the microprocessor. The time for this reflow and wetting of the surfaces is on the order of minutes. After the initial reflow, the interface resistance will behave as thermal grease, even after powering down of the microprocessor. Unless the heat sink is removed from the microprocessor (for upgrades, re-work, etc.), the initial high interface resistance will not be seen, once the initial reflow has occurred.