THERMFLOW T557

MULTIPHASE™ Thermal Interface Material
APPLICATION GUIDE

Introduction

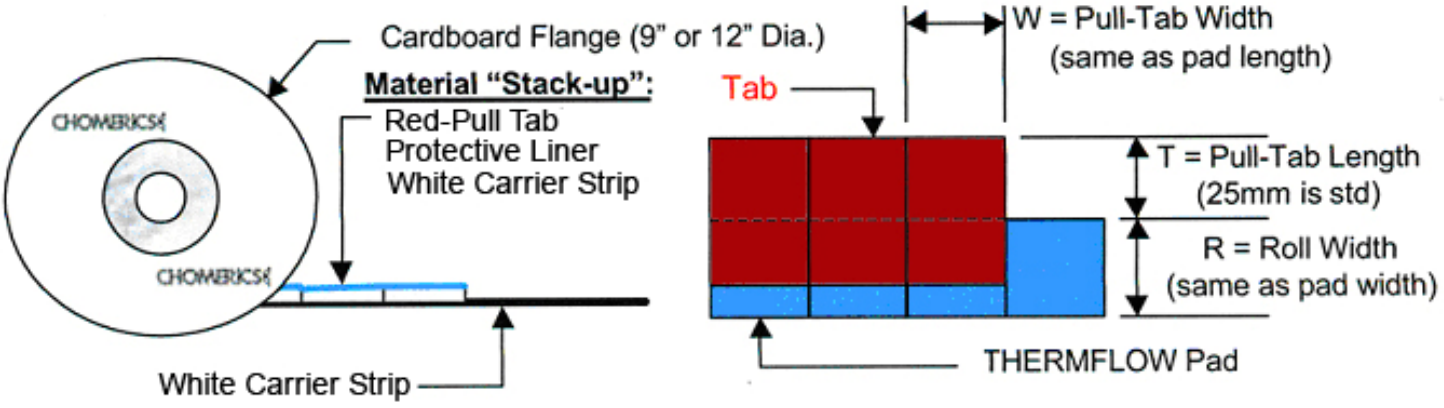
THERMFLOW T557 material is one of Chomerics' THERMFLOW family of phase change materials. These grease replacement materials can be used wherever high thermal transfer and low thermal impedance are required. Typical applications are thermal interface pads for microprocessors, ASIC's, DSP's, power modules and anywhere else thermal grease is used. Unlike thermal grease, T557 is solid at room temperature and is easy to handle during manufacturing. However, at typical application operating temperatures T557 softens and flows to give the high thermal performance typical of high performance thermal grease.

This Application Note contains recommendations on how best to specify, handle and install T557 thermal interface pads. If a specific application raises questions not addressed here, please call HITEK Electronic Materials on +44 (0) 1724 851678.

T557Material Form

T557 is a free standing, unsupported film, grey in color, which is supplied between two poly release liners, see Figure below. As a free film, T557 can achieve a thin bond line (the average distance between the hot component and its heat sink) resulting in a very low thermal impedance connection between the component and its heat sink. The surface texture of T557 is inherently tacky and will stick to most surfaces with light to moderate pressure and therefore does not require a pressure sensitive adhesive (PSA). The phase change temperature of T557 is 65°C.

T557 material is supplied on rolls, either in continuous format or as individually kiss-cut pads. Rolls contain two cardboard protective flanges that are 9 or 12 inches in outside diameter. The inside diameter of the metal "end bells" in the cardboard flanges is 1.5 inches (38mm). When T557 pads are supplied as rolls of kiss-cut parts, a 25mm pull-tab is included as a standard item. The pull-tab makes it easier to remove the protective liner prior to installation of the heat sink onto the component.



Mounting Surface Preparation

The mounting surface, usually the heat sink, should be clean and free from machining oils and aluminum dust, and may be cleaned with any common solvent, such as isopropyl alcohol (IPA) if necessary. The surface of the heat sink may be anodized, chromate coated or unfinished aluminum.

Cutting of T557 Pads

T557 material is supplied in one of the forms noted above. HITEK can slit roll stock T557 material to the width required by the customer. However, the minimum slitting width for T557 material is 0.5 inches (1 2.5mm) wide with a tolerance of +/-0.02 inches (+/-0.5mm). Individually kiss-cut pieces are limited to pads no smaller than 0.4 inches (10mm) in width or length. Standard length and width tolerances for individual cut pieces are also *+1-0.02* inches (+/-0.5mm). For custom widths, please contact HITEK to discuss size and tooling options.

T557 Pad Size Selection

A T557 pad will soften and flow under the temperature and pressure conditions encountered in a typical application between a hot component and its heat sink. During the initial power cycle, as the T557 pad softens and flows to displace air in the interface gap the average thickness of the pad will decrease and the total area covered by the pad will increase. Because of this area change it is important that the initial pad size be smaller than the final desired size in the application to avoid excess material buildup along the edges of the heat sink/component assembly. A T557 pad will typically increase on the order of 30% in length and width, or about 60% in area. This 30% length/width increase was determined using a “generic” heat sink, its associated metal spring clip, and a microprocessor with a copper heat spreader in the center. The key goal is to at least cover the hot spot on the component. Each application will vary in terms of flatness, co-planarity, applied clamping pressure, operating temperatures, etc., so it is recommended that the pad size be verified through actual testing to be sure that thermal requirements are met.

Installation of T557 Pads

T557 material does not require pre-heating of the heat sink prior to installing the T557 pad onto the heat sink. The inherent “sticky or tacky” nature of T557 is sufficient for the pad to adhere to the heat sink surface. However, because of the phase change nature of the T557 material, please follow the process temperature/pressure guidelines below to ensure the best results for a specific assembly process:

Installation of T557 Pads (Continued)

Process Step	Recommended Range
Removing pad from white carrier liner	Temp of Roll: less than 70°F (21°C)
Installing pad onto “cold” heat sink	Heat Sink Temp: 60°F to 100°F (16°C to 38°C) Roll Temp: 70°F to 100°F (21°C to 38°C) *installation Pressure: 25 to 50 psi
Installing pad onto “warm” heat sink	Heat Sink Temp: 75°F to 100°F (24°C to 38°C) Roll Temp: 70°F to 100°F (21°C to 38°C) *installation Pressure: 5 to 10 psi
Removing protective release liner	Temp of Heat Sink/Pad Assembly: Less than 100°F (38°C)

**Apply pressure to the pad with a soft “press-pad” for 2 to 3 seconds*

Typical T557 Pad Installation Steps

1. If necessary, clean the heat sink base of any machine oils, greases, hand oils, or other contaminants. Wiping with a solvent such as isopropyl alcohol, MEK, or toluene will work.
2. Peel the T557 pad (with release liner and pull-tab still in place) from the white carrier strip.
3. Place the T557 pad on the heat sink with the tacky side down and apply pressure on the protective release liner side to ensure intimate “wetting” of the T557 pad to the heat sink surface. This pressure, approximately 3,000 grams (6 pounds) on a 1-inch by 1-inch pad can typically be achieved manually by rolling a soft rubber wheel (like a small wallpaper roller) back and forth over the pad. The table above gives some recommended temperature/pressure conditions for best installation performance.
4. The protective release liner serves to prevent the T557 pad from being contaminated with dirt and dust during shipping/handling of the heat sink to the final system assembly location. The protective liner should be removed just prior to mounting the heat sink onto the component.
5. When removing the pull-tab, use a quick, lifting motion. This is preferable over peeling the pull-tab from the T557 pad and heat sink. To ensure optimal “wetting” of the T557 pad to the heat sink, it is recommended that the parts be allowed to dwell one hour prior to attempting protective liner removal.
6. With heat sink and grey unprotected T557 pad in place on the component, install heat sink clip, screws or mechanical fasteners.

Material Storage and Shipping

T557 is a temperature sensitive material, and as such should be stored below *10°C* (50°F). Short term exposure to higher temperatures, up to 35°C (95°F) during product shipment will not affect product performance.

It is recommended that rolls of THERMFLOW material be stored with release liner pull-tabs such that the roll is resting on the THERMFLOW material not on the pull-tabs. In this orientation there is no weight pressing down onto the pull-tab material, thus preventing wrinkling of the pull-tabs and possible “telescoping” of the wound roll.

Initial Re-Flow of T557

As with any (PCM) phase change material, T557 material requires an initial phase change to achieve optimum thermal performance. 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 component. Re-flow and wetting of the surfaces typically takes only a few minutes once the 65°C phase change temperature is achieved. Pressure enhances and accelerates the effect. After this initial re-flow, the interface resistance will behave as a high performance thermal grease, even after powering down of the microprocessor. Unless the heat sink is removed from the component (for upgrades, re-work, etc.) the initial high interface resistance will not be seen during subsequent power cycles.

Rework Information

T557 material is very soft and tacky when at elevated temperatures. When removing heat sinks from components, it is best to separate the heat sink from the component at an elevated temperature if possible. Then allow the component and heat sink to cool. A razor blade can then be used to scrap the residual material away. Chemically, the material can be softened with either MEK (methyl ethyl ketone) or toluene. The residual material can be removed by wiping with a cloth.

If separating the heat sink at elevated temperature is not possible, then a screwdriver or razor blade may be necessary to separate the heat sink from the component. Then using a razor blade, scrape away the residual material, or use the chemicals mentioned above to soften and wipe away the materials.