THERMFLOW® T725 Material Application Guidelines

Introduction

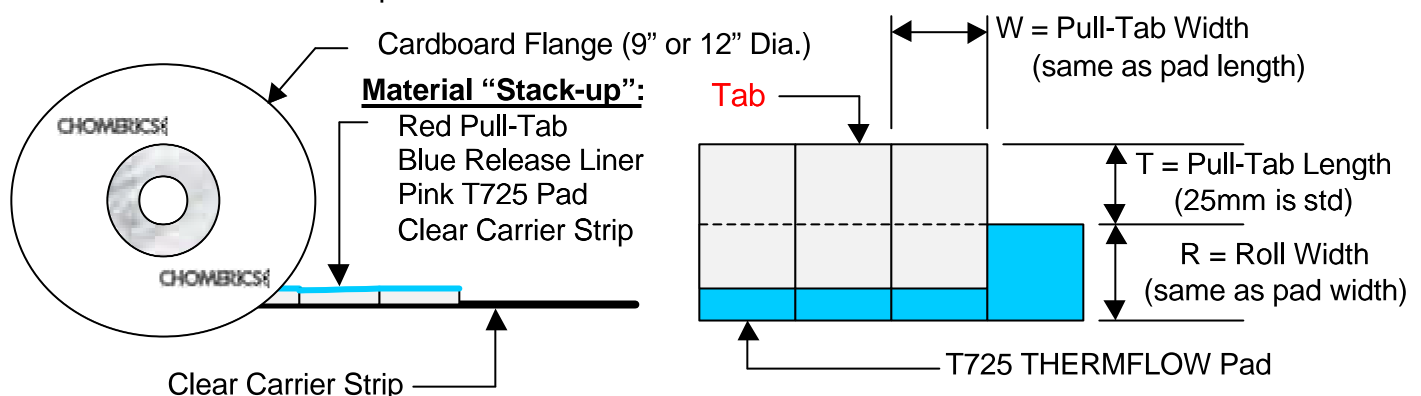
T725 material is a new addition to Chomerics' THERMFLOW family of phase change materials. These grease replacement materials can be used wherever high thermal transfer and low thermal impedance are required. Typical applications are thermal interface pads for microprocessors, ASIC's, DSP's, power modules and anywhere else thermal grease is used. Unlike thermal grease, T725 is solid at room temperature and is easy to handle during manufacturing. However, at typical application operating temperatures T725 softens and flows to give the high thermal performance typical of thermal grease.

This Application Note contains recommendations on how best to specify, handle and install T725 thermal interface pads. If a specific application raises questions not addressed here, please call Chomerics' Applications Engineering Department at 781-939-4620.

T725 Material Form

T725 is a free standing, unsupported film, pink in color, which is supplied between two polyester release liners, see Figure below. As a free film, T725 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 T725 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 T725 is 58°C. For complete details on typical material characteristics see THERMFLOW Technical Bulletin 77 (available on www.chomerics.com)

T725 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 T725 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 blue protective liner removal prior to installation of the heat sink onto the component.



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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 T725 Pads

T725 material is supplied in one of the forms noted above. Chomerics can slit roll stock T725 material to the width required by the customer. However, the minimum slitting width for T725 material is 0.5 inches (12.5mm) 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 +/-0.02 inches (+/-0.5mm). For custom widths, please contact your Chomerics Representative, or call Chomerics' Applications Engineering at 781-939-4620 to discuss size and tooling options.

T725 Pad Size Selection

A T725 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 T725 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 T725 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. Free samples of T725 material and Applications Engineering assistance are available from Chomerics for such trials.

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Installation of T725 Pads

T725 material does not require pre-heating of the heat sink prior to installing the T725 pad onto the heat sink. The inherent "sticky or tacky" nature of T725 is sufficient for the pad to adhere to the heat sink surface. However, because of the phase change nature of the T725 material, please follow the process temperature/pressure guidelines below to ensure the best results for a specific assembly process:

Process Step	Recommended Range
Removing pad from clear carrier liner	Temp of Roll: less than 100°F (38°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 blue release liner	Temp of Heat Sink/Pad Assembly: Less than 100°F (38°C)

*Apply pressure to the T725 pad with a soft "press-pad" for 2 to 3 seconds

Typical T725 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 T725 pad (with blue release liner and pull-tab still in place) from the clear carrier strip.
3. Place the T725 pad on the heat sink with the pink side down and apply pressure on the blue release liner side to ensure intimate "wetting" of the T725 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 blue release liner serves to prevent the T725 pad from being contaminated with dirt and dust during shipping/handling of the heat sink to the final system assembly location. The blue 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 T725 pad and heat sink. To ensure optimal "wetting" of the T725 pad to the heat sink it is recommended that the parts be allowed to dwell one hour prior to attempting release liner removal.
6. With heat sink and pad in place on the component, install heat sink clip, screws or mechanical fasteners.

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Automated Installation of T725 Pads

Chomerics has developed several versions of automated pad installation equipment. Contact Chomerics' Applications Engineering at 781-939-4620 to determine the best approach for a specific component/heat sink configuration and assembly process.

Material Storage and Shipping

T725 is a temperature sensitive material, and as such should be stored below 35°C (95°F). Short term exposure to higher temperatures, up to 45°C (113°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 T725

As with any phase change material, T725 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 58°C phase change temperature is achieved. Pressure enhances and accelerates the effect. After this initial re-flow, the interface resistance will behave as 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

T725 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.

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T725 Part Numbers

Existing part numbers for T725 pads are shown in the Table below. Use of the existing part numbers can cut down on lead times and tooling costs. If necessary, please contact the Thermal Business Unit (603-880-4807), Applications Engineering (781-939-4620) or your local Chomerics Sales Representative for information on new pad sizes.

Part Number	Length (inches)	Width (inches)
60-11-0600-T725	0.60	0.60
60-11-0700-T725	0.70	0.70
60-11-1000-T725	1.00	1.00
60-11-1125-T725	1.125	1.125
60-11-1250-T725	1.250	1.250
60-11-2323-T725	1.625	1.84

Part Number Notes:

- 5,000 parts per roll is standard
- 25mm Release Liner Pull-Tab is standard
- PSA is not available or required for T725

Thermal Performance vs. Contact Pressure

The ASTM test procedure was utilized to determine the thermal performance of T725 vs. the amount of contact pressure. The pressure was set initially at the desired pressure, and then the test was started. The data and graph follow.

The material tested was batch number 2969, manufactured on October 22nd, 1999, from roll #4. As expected, increasing the contact pressure results in improved thermal transfer. The lack of a fiberglass carrier allows the T725 to have as thin a bond line as possible.

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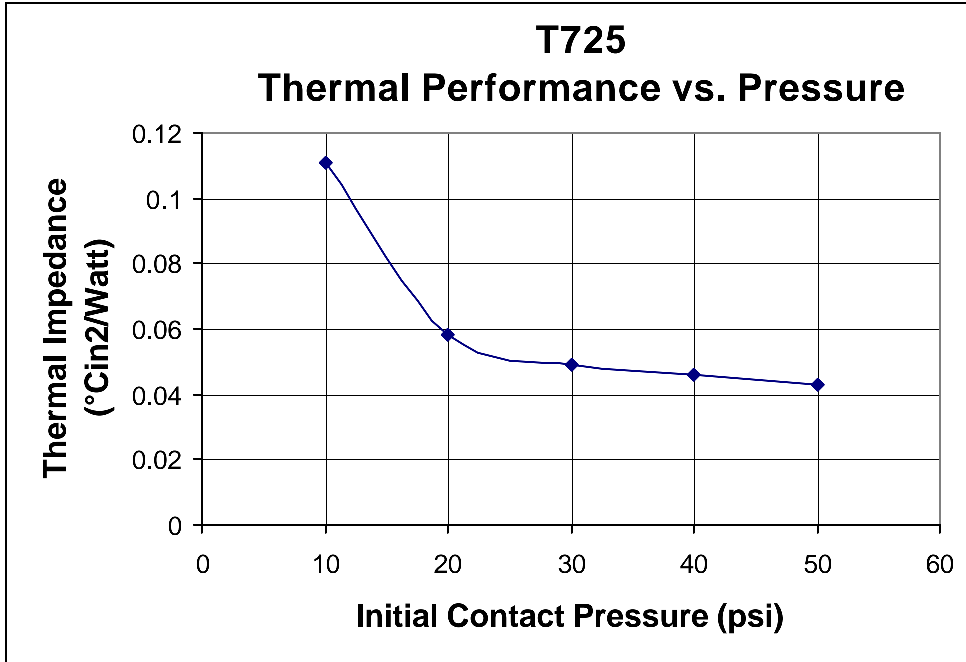

CONTACT PRESSURE	THERMAL IMPEDANCE
(psi)	(°C in^2 / Watt)
10	0.1
20	0.06
30	0.05
40	0.05
50	0.04