

T454 and T506 THERMFLOW™ Application Note

General Concept – Grease Replacement

The T454 and T506 materials are phase change materials, or a grease replacement materials. They are a freestanding film with no carrier, such as fiberglass mesh or metal foil. T454 and T506 provide one of the best thermal interfaces between two surfaces where the air gap does not exceed the thickness of the material. There is no PSA option available for this material. See details below for the attachment options.

Format

Thermflow T454 and T506 materials are supplied on a roll, either kiss cut or in continuous format. The material is packaged with two cardboard end bells to hold the roll together. The end bells are twelve inches in diameter. The inner diameters of the rolls are 1.5 inches. A 20mm pull tab option is available attached to the blue top liner. The pull tab is recommended for ease in removal of the liner and also to act as a “flag” in manufacturing to signal the liner has not been removed. A clear liner carries the material. Kiss cutting (or butt cutting) process cuts through the pull-tab material, through the blue liner, and into the T454 material, but does not cut all the way through the clear liner. This process allows the material to be in a cut format on a continuous liner.

Pad Size Selection

T454 and T506, like other Chomerics Thermflow materials, will soften under temperature and pressure in the assembled state between the processor and heat sink. A pad as large as the heat sink base is not necessary. Instead, we recommend covering the hot spot on the component. The T454 and T506 pads will typically increase on the order of 30% in length and width. To avoid excess material from moving outside the heat sink/component assembly, please undersize the pad by 30% in length and 30% in width from the desired final pad size.

The 30% value was determined using a generic heat sink, the associated metal spring clip, and a ceramic microprocessor with a copper heat spreader in the center. Each application will vary in terms of flatness and co-planarity; so please verify the pad size through actual testing to be sure thermal requirements are met. Samples of material are available from Chomerics.

Standard Released Part Numbers

The following are current part numbers available from Chomerics. Please contact your local Chomerics Applications Engineering to discuss custom sizes.

Part Number	<u>Length</u>	<u>Width</u>	<u>Tab</u>
60-11-22070-T454	0.750	0.700	Y
60-11-22236-T454	1.000	0.700	N
60-11-22247-T454	0.700	0.700	Y
60-11-22305-T454	1.125	1.125	Y

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60-11-22248-T454	1.250	1.200	Y
60-11-22306-T454	1.250	1.250	Y
60-11-22302-T454	1.378	1.378	N
60-11-22312-T454	1.378	1.378	Y
60-11-22313-T454	1.625	1.840	Y

Notes:

- Please note that part numbers are 60- numbers. Chomerics owns the tools for such STANDARD size parts.
- PSA option not available

Assembly and Storage Temperature Recommendations

The T454 and T506 materials are temperature sensitive material, and as such should be stored below 25°C (77°F). It is best to use the material at this temperature. This limit is for handling and assembly reasons only. As the material warms, it softens, and becomes gradually more difficult to handle as temperature increases.

The maximum recommended storage temperature for THERMFLOW™ material is 25°C (77°F). The maximum recommended assembly temperature is also 25°C (77°F). The material will soften and be less user friendly to work with at higher temperatures. At cooler temperatures the material remains firmer and will be easier to handle, dispense, and fabricate. The improved handling characteristics of a cooler material will contribute to improved yields during fabrication and assembly.

For shipping purposes, a maximum of 35°C is recommended, and a temperature recorder indicating this upper limit is included with each shipment.

NOTE : The maximum continuous usage temperature is 125°C. This is after the T454 is placed on the heat sink, and the heat sink is assembled to the component.

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

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 if necessary.

Application

The suggested method is to apply a cool pad onto the heat sink base using a combination of pressure and temperatures in the ranges specified. Secondly, the heat sink and the pad need to be cooled to a specified temperature for 30 minutes. Finally, the pull-tab can be removed from the pad.

Generally speaking, a low application pressure needs a high heat sink base temperature. Or, a low

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heat sink temperature requires higher application pressure. In all cases, the pad should be removed from the roll at 25°C or lower. Here are the process variables :

Temperature of the heat sink

- Acceptable range : 45°C to 70°C

Temperature of the roll of T454

- Definition : bulk temperature of the entire roll of material
- Acceptable range : 25°C (77°C) or lower

Pressure between the pad and the heat sink

- Acceptable range : 10 psi up to 50 psi

Dwell time and temperature of the heat sink and T454 pad

- Acceptable range : 25°C (77°C) or lower for 30 minutes minimum

The following combinations had successful results in applying the T454 material to the heat sink.

Roll Temperature	Heat sink temperature	Application pressure	Dwell temperature	Dwell Time	Process Yield
25°C	45°C	15 psi	25°C	30 minutes	100 %

Some amount of process development work will be required for each application. These are meant to be guidelines for that process development. Please keep in mind that pressure and temperature contribute to the adhesion of the T454 to the heat sink. The above combinations of pressure, temperature, and peel temperature have demonstrated a successful process.

Initial Flow of T454 and T506

As with all phase change materials, the T454 and T506 material needs to undergo an initial phase change to get the desired thermal performance. The initial thermal performance will behave as a dry joint thermal interface. This is because the material has not yet driven out the air gaps between the heat sink and the microprocessor. The time for this phase change and wetting of the surfaces is on the order of minutes. After this initial phase change, 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 phase change has taken place.