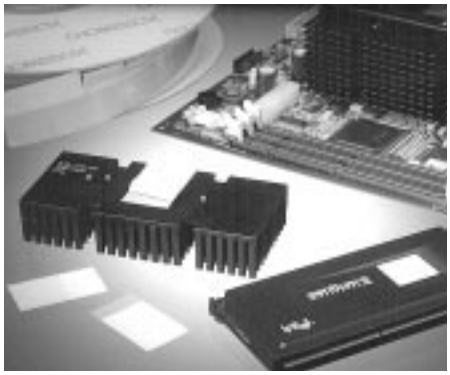
THERMFLOW™ Low Thermal Resistance Phase-Change Interface Pads



Chomerics' THERMFLOW phase-change materials are formulated for use with high performance components requiring minimal thermal resistance for maximum heat transfer efficiency. They combine the easy handling advantages of elastomeric pads with the low thermal impedance of thermal grease, making THERMFLOW materials an ideal choice for today's most demanding thermal management applications:

Microprocessors	***Memory Modules***	***Cache Chips***
DC/DC Converters	***IGBTs***	***Power Modules***
Power Semiconductors	***Solid State Relays***	***Bridge Rectifiers***

DESCRIPTION

THERMFLOW™ materials are thermally enhanced polymers designed to minimize the thermal resistance between power dissipating electronic components and their associated heat sinks. This low thermal resistance path maximizes heat sink performance and improves the reliability of microprocessors, memory modules, DC/DC converters and power modules.

The key feature of THERMFLOW materials is their phase-change characteristic. At room temperature, THERMFLOW materials are solid and easy to handle. This allows them to be consistently and cleanly applied as dry pads to a heat sink or component surface. THERMFLOW material softens as it reaches component operating temperatures. With light clamping pressure it will readily conform to both mating surfaces, similar to thermal grease. This ability to completely fill interfacial air gaps and voids typical of component packages and heat sinks allows THERMFLOW pads to outperform non-flowing elastomeric or graphite-based thermal pads and achieve performance comparable to thermal grease (see Figure 1).

THERMFLOW materials are electrically non-conductive. However, since metal-to-metal contact is possible after the material undergoes phase-change in a typical heat sink assembly, THERMFLOW pads should not be used as electrical insulators.

KEY FEATURES AND BENEFITS

- **Low thermal impedance**, 0.03°C-in^2/watt
- Automated **installation equipment** available
- **Proven solution** – years of production use in Personal Computer OEM applications
- **Demonstrated reliability** – no separation or dry-out after 3000 temperature cycles
- Can be **pre-applied** to heat sinks
- **PSA (pressure-sensitive adhesive)** versions allow "peel and stick" installation
- **Non-PSA versions** available for improved thermal performance
- **Protective release liner** prevents contamination of material prior to final component assembly
- **Tabs available** to ease removal of release liner
- Available in **custom die-cut shapes**, kiss-cut on rolls
- **45°C or 58°C** phase-change temperature
- **Thixotropic**, paste-like consistency at application temperatures ensures that material will not run or drip, even in vertically-oriented applications
- **Electrically non-conductive**

APPLICATION AND PERFORMANCE

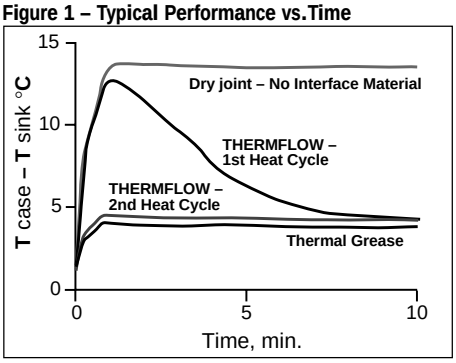
THERMFLOW pads can be supplied with pressure-sensitive adhesive (PSA) for easy pre-application to heat sinks. Contact your heat sink supplier or Chomerics for further information. Since PSAs tend to increase thermal impedance, non-PSA versions are also available for improved thermal performance. Most heat sink suppliers have the capability to "heat flux" non-PSA THERMFLOW pads in place onto their heat sinks.

Each THERMFLOW material has been designed to perform best within a specified clamping pressure range. See next page for the recommended material for some common applications.

THERMFLOW materials are not structural adhesives and should not be used to mechanically attach heat sinks to processors. Clips or other mechanical fasteners must be used to maintain heat sink to component clamping pressure.

Due to the "grease-like" behavior of the material, actual thermal impedance in a specific application cannot be determined using only the material's bulk thermal conductivity unless the actual operating pressure, temperature, thickness, etc. are known. Therefore, to account for the unique situations associated with specific applications, Chomerics recommends customer testing to validate performance. Contact Chomerics Applications Engineering at 603-579-5764 for assistance or further information.

Figure 1 – Typical Performance vs.Time



Note: The THERMFLOW pad will exhibit high thermal impedance until it flows during the first heat cycle. This is a one time effect and will not be seen during subsequent heat cycles. These curves illustrate typical performance seen in a microprocessor heat sink application in a desktop PC.

THERMFLOW™ Low Thermal Resistance Phase-Change Interface Pads *continued*

	TYPICAL PROPERTIES	T725	T443	T310	T710	TEST METHOD
CONSTRUCTION	Carrier	None	Fiberglass	Fiberglass	Fiberglass	—
	Color	Pink	Light Gray	Light Gray	Light Gray	Visual
	Thickness, inch (mm)	0.005 (0.13)	0.005 (0.13)	0.007 (0.18)	0.005 (0.13)	ASTM D374
	PSA Options Dry Pad PSA One Side	 Std Available	 —	 Std Available	 Available Std	—
THERMAL	Thermal Impedance, °C-in²/W	0.03 @ 50 psi (no PSA)	0.10 @ 50 psi (no PSA)	0.17 @ 300 psi (no PSA)	0.10 @ 5 psi (no PSA) 0.18 @ 5 psi (PSA)	Modified ASTM D5470
	Apparent Thermal Conductivity, W/m-K	0.7	1.0	0.6	0.7	Modified ASTM D5470
	Phase-Change Temperature, °C	58	43	46	45	ASTM D3418
	Operating Temperature Range, °C	-60 to +125	-60 to +125	-60 to +125	-60 to +125	—
ELEC.	Volume Resistivity, ohm-cm	1×10^{15}	5×10^{15}	5×10^{14}	5×10^{16}	ASTM D257
MECH.	Specific Gravity	1.11	1.27	1.63	1.15	ASTM D792
	Suggested Heat Sink/ Component Clamping Pressure, psi (MPa)	5 to 100 (0.035 to 0.690)	20 to 60 (0.138 to 0.414)	50 to 300 (0.345 to 2.070)	5 to 20 (0.035 to 0.138)	—

TYPICAL APPLICATIONS

THERMFLOW T725
High End Microprocessors (P-III, Workstation Network Server, CPUs, etc.), Power Modules

THERMFLOW T443
Microprocessors (P-II, P-III, K-7, etc.), Exposed Die BGAs

THERMFLOW T310
DC/DC Converters, IGBTs and Other Power Modules

THERMFLOW T710
Microprocessors (P-II, K-6, M-II, etc.), Memory Modules, Power Semi's

Note: P-II, P-III (Intel®), K-6, K-7 (AMD®), M-II (Cyrix National)

ORDERING INFORMATION

THERMFLOW materials are supplied in several standard formats (see part number guide blow). Custom die-cut shapes can also be provided on kiss-cut rolls by Chomerics' extensive network of Distributor/ Fabricators. To ease release liner removal an optional tab can be added. Standard tolerances for slitting widths and individually cut pieces are ±0.020 inch (±0.51 mm). T443 rolls include a loose 3-mil polyester interfeaf to prevent pad material from sticking to the back side of the liner.

THERMFLOW Material – Part Numbers

WW –– XX –– YYYY –– T725, T443, T310 or T710

64 = Roll Stock
66 = Roll Stock with PSA
68 = Roll Stock with removal tab and PSA
69 = Custom Shapes

10 = 100 ft. (30.5m) Roll Stock
30 = 300 ft. (91.4m) Roll Stock
11 = Custom Die-Cut Shape, No PSA
12 = Custom Die-Cut Shape, PSA One Side

Roll Stock, Width.
0075 = 0.75 in. (1.91 cm)
0100 = 1.00 in. (2.54 cm)
0150 = 1.50 in. (3.81 cm)
0200 = 2.00 in. (5.08 cm)
0500 = 5.00 in. (12.7 cm)
1000 = 10.00 in. (25.4 cm)
2000 = 20.00 in. (50.8 cm)
For custom roll stock and die-cut parts, this 4 or 5 digit number will be assigned by Chomerics

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