Laird TECHNOLOGIES®

ATD ELEKTRONIK s.r.o.

www.atd-elektronik.cz

global **solutions :**
local **support** ™

Thermal Management Solutions

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Laird Technologies is the world-leader in the design and supply of customized performance-critical products for wireless and other advanced electronic applications. Laird Technologies partners with its customers to help find solutions for applications in various industries such as:

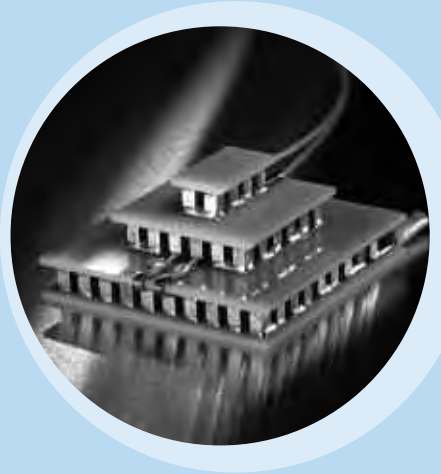
Network Equipment
Telecommunications
Data Communications
Automotive Electronics
Computers
Aerospace
Military
Medical Equipment
Consumer Electronics

Laird Technologies offers its customers unique product solutions, dedication to research and development and a seamless network of manufacturing and customer support facilities located all across the globe.

global solutions :
local support ™

CONTENTS





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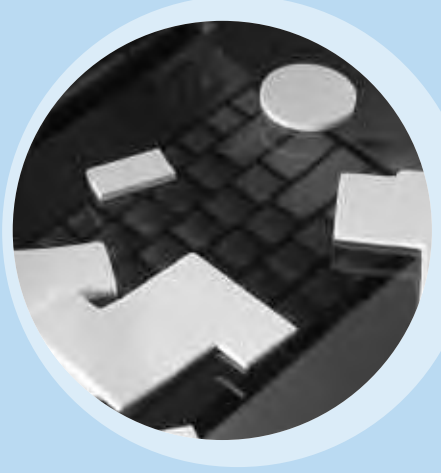
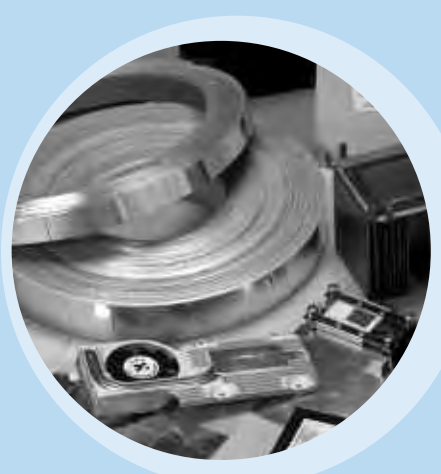







INTRODUCTION

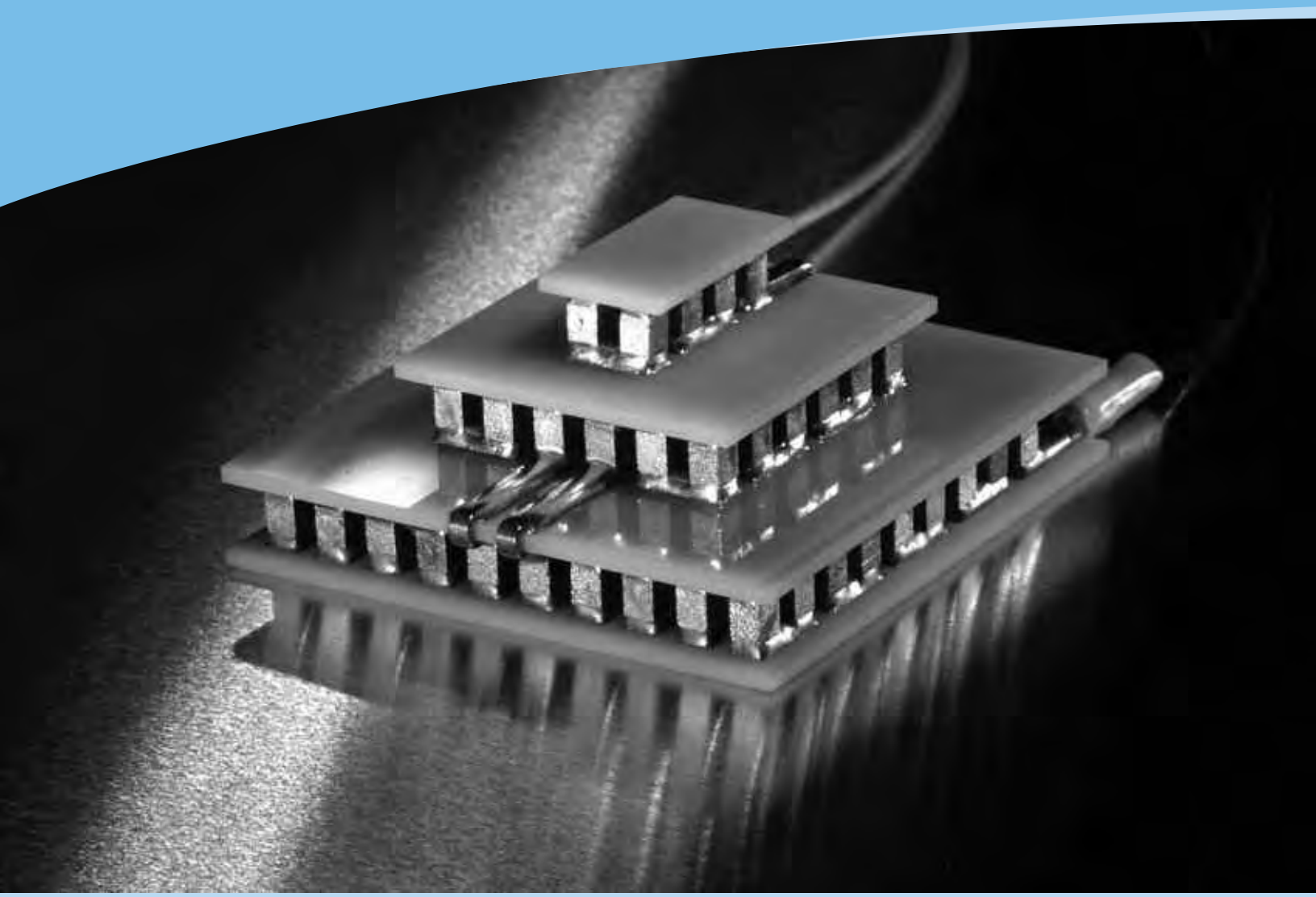
Laird Technologies produces some of the world's highest-rated thermally conductive materials for use in electronic packaging. Its thermal management products include gap fillers (including putties), phase change materials, thermal greases, thermally conductive circuit boards and thermally conductive insulator materials.

Partnering with Laird Technologies for your thermal requirements gives you access to the industry's broadest product line of thermal interface materials specially engineered to solve your toughest thermal problems.

The company's engineers around the globe collaborate with customers by supplying beginning to end thermal support from design through high volume production to provide the most cost-effective thermal solutions.

Laird Technologies provides the know-how, innovation and resources to ensure exceptional thermal performance and customer satisfaction. Let Laird Technologies' engineers help customize a thermal solution for your next application.

THERMOELECTRIC COOLING



Thermoelectrics

Thermoelectric coolers (TECs) are solid-state heat pumps that utilize the Peltier effect. During operation, DC current flows through the TEC, resulting in heat being transferred from one side of the TEC to the other, creating a cold and hot side. A single stage TEC can achieve temperature differences up to 70°C, or can transfer heat at a rate of 140 Watts. To achieve greater temperature differences (up to 130°C) select a multi-stage (cascade) TEC. To increase the amount of heat transferred, the TEC's modular design allows the use of multiple TECs teamed electrically in series or parallel.

Features and Benefits:

The special combination of benefits attained by TECs makes them the only effective solution for certain applications:

- Precision temperature control capability
- Quick and economical cooling to below ambient
- Reduced space, size and weight
- Reliable solid state operation no sound or vibration (lifetimes of more than 200,000 hours)
- Heating or cooling by changing direction of current flow
- Patented ThermaTEC cools at + 225°C
- All products are RoHS compliant

CP – Series

- The "world standard" pioneered by Melcor
- Quick and economical cooling below ambient temperature at reliable solid state operation
- Lifetime of more than 200.000 hours
- Cover 80% of various application demands
- With porch style ceramic as option for increased heat dissipation (71 and 127 Couples) and strong lead attachments

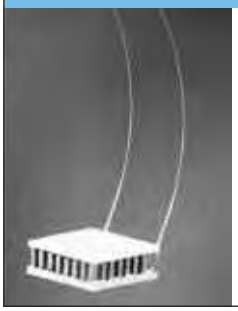
RH/SH – Series

- Features center hole for transmission of light, wires, probes or other hardware through the TEC
- Rounded and square configurations available

HT – Series

- Designed for high temperature applications and packaging
- Unique patented technology
- Superior and outsanding cycling capacity
- Be used in PCR cyclers

OT – Series



- Designed for Optoelectronic applications such as laser diodes, R detectors, CCD's etc.
- Qualification and screening to Telcordia (Bellcore)
- PB-free construction solders up to 271°C
- Gold metallization and pre-tinning available for packaging temperatures ranging from 93°C to 223°C

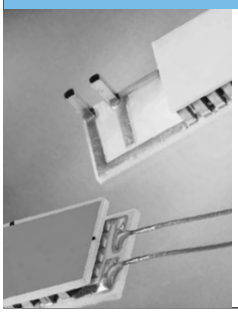
ZT – Series

- Improved manufacturing technique for high heat-pumping capacity within small surface area
- Patented method provides greater temperature differential for unique cost-performance ratio

PG – Series

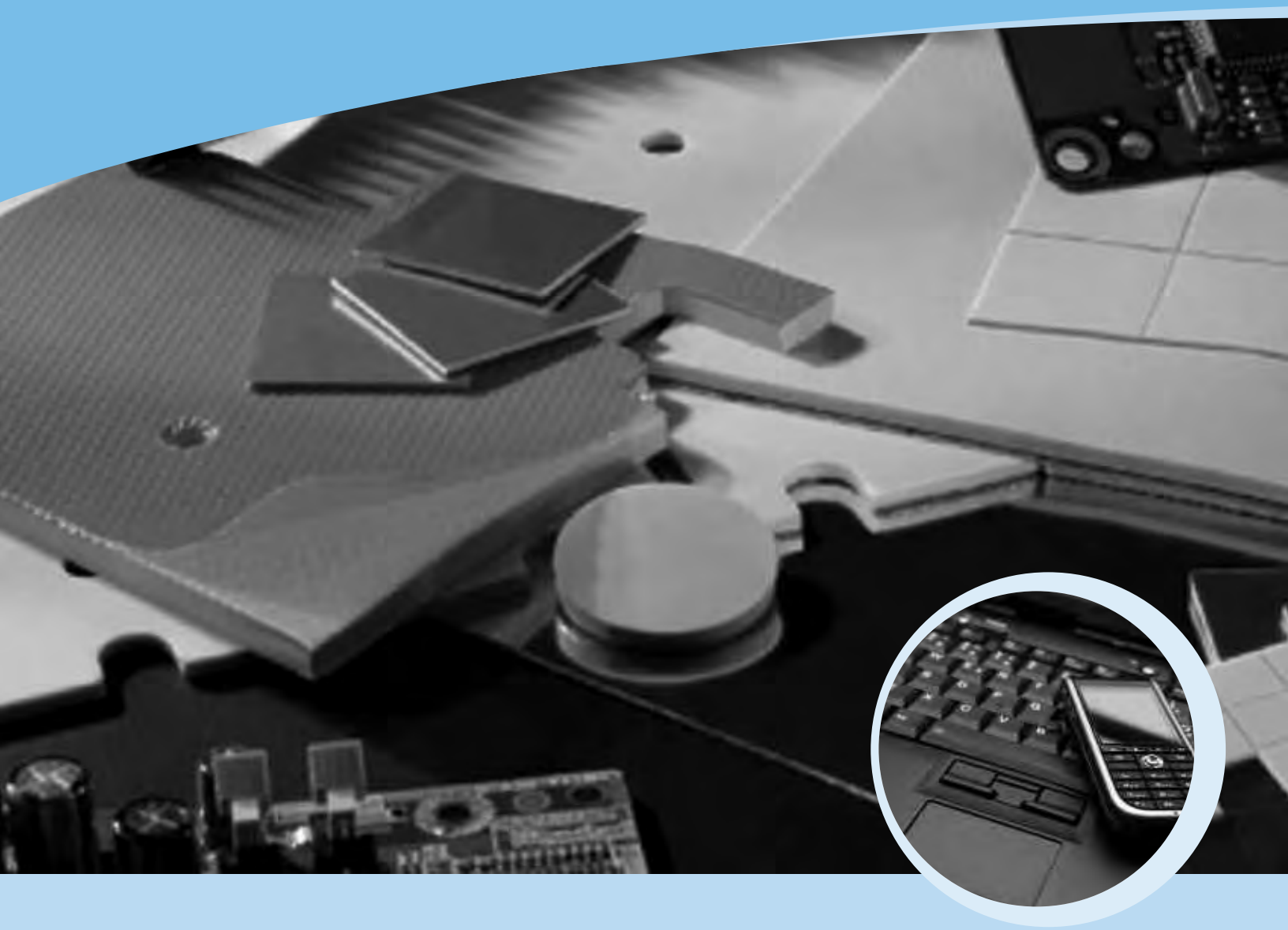
- Generates electrical power with up to 5% efficiency, depending on the temperature differentials applied
- Teamed modules--electrically in series and/or parallel--increases efficiency and total power output
- For more information about this future orientated product please contact Laird Technologies

MS – Series



- Ideal for requirements with large temperature differentials up to 123°C
- Surfaces metallized or tinned available
- Superior material characteristics
- Up to 5 stages available
- Standard design meet most requirements for CCD and IR detectors

GAP FILLER MATERIALS



Thermally Conductive Gap Fillers

Laird Technologies' thermally conductive gap fillers are future generation compliant cooling materials. These thermally conductive gap fillers are the softest and highest thermally conductive gap fillers available (in thicknesses ranging from 0.25 mm to 5.08 mm).

Laird Technologies' thermally conductive gap fillers deliver engineers and designers the most dimensional tolerance. Extreme compliancy reduces component stress while higher thermal conductivity provides thermal performance required for high thermal demands.

Applications:

- Notebook computers
- Handheld microprocessor devices
- Telecommunications hardware
- Semiconductor test equipment
- Servers and desktop computers
- Memory modules
- Mass storage devices
- Power conversion equipment
- Flat panel displays
- Audio and video components
- Consumer electronics

	T-pli™ 200	T-flex™ 200V0	T-flex™ 300	T-flex™ 500	T-flex™ 600	T-putty™ 502	T-putty™ 504	Test Method
Construction and Composition	Boron nitride filled silicone sheet	Ceramic filled silicone sheet	Ceramic filled silicone sheet	Ceramic filled silicone sheet	Boron nitride filled silicone sheet	Reinforced boron nitride filled silicone sheet	Ceramic filled dispensable silicone gel	-
Color	Multiple Colors	Light Gray	Mint	Blue	Blue-Violet	White	Light Gray	Visual
Thickness Range	0.010" (0.25 mm) – 0.20" (5.08 mm)	0.010" (0.25 mm) – 0.20" (5.08 mm)	0.020" (0.5 mm) 0.20" (5.08 mm)	0.020" (0.5 mm) – 0.20" (5.08 mm)	0.020" (0.5 mm) – 0.20" (5.08 mm)	0.020" (0.5 mm) – 0.20" (5.08 mm)	N/A	-
Thickness Tolerance	+/- 10%	+/- 10%	+/- 10%	+/- 10%	+/- 10%	+/- 10%	N/A	-
Density	1.44g/cc	1.73g/cc	1.75g/cc	3.0g/cc	1.34g/cc	1.38g/cc	2.78g/cc	Helium Pycnometer
Hardness	70 Shore 00	45 Shore 00	27 Shore 00	40 Shore 00	25 Shore 00	05 Shore 00	N/A	ASTM D2240
Tensile Strength	35 psi	48 psi	15 psi	66 psi	15 psi	N/A	N/A	ASTM D412
% Elongation	5	63	50	57	75	N/A	N/A	ASTM D412
Outgassing TML (Post Cured)	0.07%	0.34%	0.56%	0.29% (not post cured)	0.13%	0.11%	0.34%	ASTM E595
Outgassing CVCM (Post Cured)	0.02%	0.10%	0.1%	0.04% (not post cured)	0.05%	0.06%	0.09%	ASTM E595
UL Flammability Rating	94 HB	94 V0	94 V0	94 V0	94 HB	94 HB	94 V0	UL
Temperature Range	-45°C to 200°C	-45°C to 160°C	-40 to 160°C	-45°C to 200°C	-45°C to 200°C	-45°C to 200°C	-45°C to 200°C	-
Thermal Conductivity	6 W/mK	1.1 W/mK	1.2 W/mK	2.8 W/mK	3.0 W/mK	3.0 W/mK	1.8 W/mK	ASTM D5470 (modified)
Thermal Resistance @ 40 mils, 20 psi	0.37°C-in^2/W	1.57°C-in^2/W	1.812°C-in^2/W	0.50°C-in^2/W	0.62°C-in^2/W	0.49°C-in^2/W	N/A	ASTM D5470 (modified)
Thermal Resistance @ 1mm,138 KPa	2.45 °C-cm^2/W	10.13 °C-cm^2/W	11.62°C-in^2/W	3.23 °C-cm^2/W	4.00 °C-cm^2/W	3.16 °C- cm^2/W	N/A	ASTM D5470 (modified)
Percent Deflection @ 10 psi	4%	5%	30%	10%	20%	25%	30%	ASTM D575 (modified)
Percent Deflection @ 50 psi	6%	25%	60%	30%	40%	50%	55%	ASTM D575 (modified)
Percent Deflection @ 100 psi	10%	40%	72%	45%	60%	75%	85%	ASTM D575 (modified)
Thermal Expansion	51ppm / °C	229ppm / °C	517ppm / °C	37.4ppm / °C	430ppm / °C	92ppm / °C	N/A	IPC-TM-650 2,4,24
Volume Resistivity	5 x 10^{13}ohm-cm	4 x 10^{13}ohm-cm	6 x 10^{12}ohm-cm	9.6 x 10^{12}ohm-cm	9.6 x 10^{12}ohm-cm	5 x 10^{13}ohm-cm	>10^{14}ohm-cm	ASTM D257
Dielectric Constant @ 1MHz	3.2	5.5	4.4	13.61	3.31	3.20	N/A	ASTM D150

GAP FILLERS

T-pli™ 200 Series

Industry Leading Soft Elastomer Gap Filler

T-pli™ 200 Series is the premium gap filler. A unique blend of boron nitride and silicone produce Laird Technologies' highest performing gap filling pad.

T-pli™ 200's exceptional combination of high thermal conductivity and compliancy generate unmatched thermal resistances in a gap filling interface material. T-pli™ 200 absorbs shock and relieves stresses, thus minimizing potential damage to components. T-pli is electrically insulating, stable from -45°C to 200°C, and meets UL 94HB rating.

Features and Benefits

- Thermal performance leader
- 6 W/mK thermal conductivity
- Available in 22 thicknesses from 0.010" (0.25 mm) to 0.200" (5.00 mm)

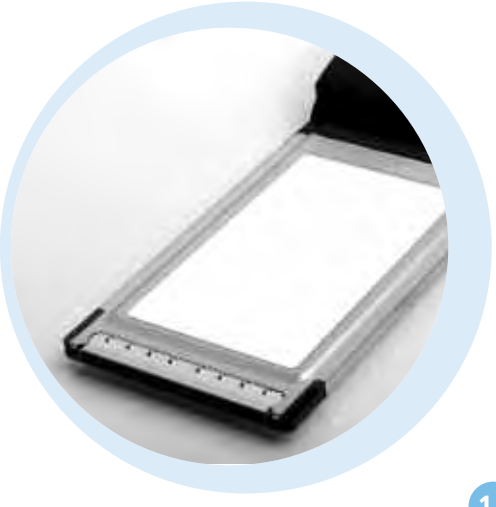
Applications:

- Notebook computers
- Handheld portable electronics
- Micro heat pipe thermal solutions
- Microprocessors, memory chips and graphic processors
- Automotive engine control modules
- Wireless communication hardware

T-pli™ 210-220 Product Data Table

Property	T-pli™ 210	T-pli™ 215	T-pli™ 220
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced
Color	Rose	Yellow	Blue
Thickness	0.01" (0.254 mm)	0.015" (0.381 mm)	0.02" (0.508 mm)
Thickness Tolerance	+/- 0.001"(0.025 mm)	+/- 0.001" (0.025 mm)	+/- 0.002" (0.05 mm)
Density	1.44 g/cc	1.44 g/cc	1.43 g/cc
Hardness	75 Shore OO	75 Shore OO	70 Shore OO
Tensile Strength	NA	NA	35 psi
Elongation %	NA	NA	5
Outgassing TML (Post Cured)	0.08%	0.08%	0.07%
Outgassing CVCM (Post Cured)	0.03%	0.03%	0.02%
UL Flammability Rating	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK
Thermal Impedance @ 10 psi	0.16°C-in^2/W	0.19°C-in^2/W	0.21°C-in^2/W
Thermal Impedance @ 69 KPa	1.03°C-cm^2/W	1.25°C-cm^2/W	1.35°C-cm^2/W
Coefficient of Thermal Expansion	51 ppm/°C	NA	123 ppm/°C
Volume Resistivity	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	3.21	3.21	3.26
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001

Note: T-pli™ 205 has been discontinued

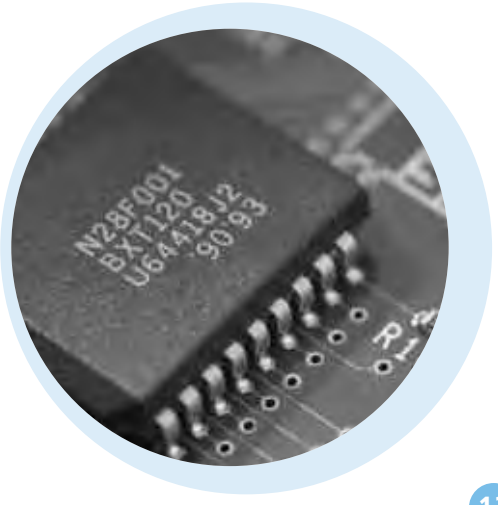


T-pli™ 225-250 Product Data Table

Property	T-pli™ 225	T-pli™ 230	T-pli™ 240	T-pli™ 250
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass option	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Green	Gray	Yellow	Gray
Thickness	0.025" (0.635 mm)	0.03" (0.762 mm)	0.04" (1.016 mm)	0.05" (1.270 mm)
Thickness Tolerance	+/- 0.002" (0.05 mm)	+/- 0.002" (0.05 mm)	+/- 0.002" (0.05 mm)	+/- 0.002" (0.05 mm)
Density	1.43 g/cc	1.43 g/cc	1.43 g/cc	1.38 g/cc
Hardness	70 Shore OO	70 Shore OO	70 Shore OO	70 Shore OO
Tensile Strength	35 psi	35 psi	35 psi	20 psi
Elongation %	5	5	5	5
Outgassing TML (Post Cured)	0.07%	0.07%	0.07%	0.10%
Outgassing CVCM (Post Cured)	0.02%	0.02%	0.02%	0.04%
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK	6 W/mK
Thermal Impedance @ 10 psi	0.27°C-in^2/W	0.32°C-in^2/W	0.37°C-in^2/W	0.43°C-in^2/W
Thermal Impedance @ 69 KPa	1.75°C-cm^2/W	2.06°C-cm^2/W	2.45°C-cm^2/W	3.03°C-cm^2/W
Coefficient of Thermal Expansion	NA	72 ppm/°C	72 ppm/°C	72 ppm/°C
Volume Resistivity	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	NA	3.21	3.26	3.21
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001

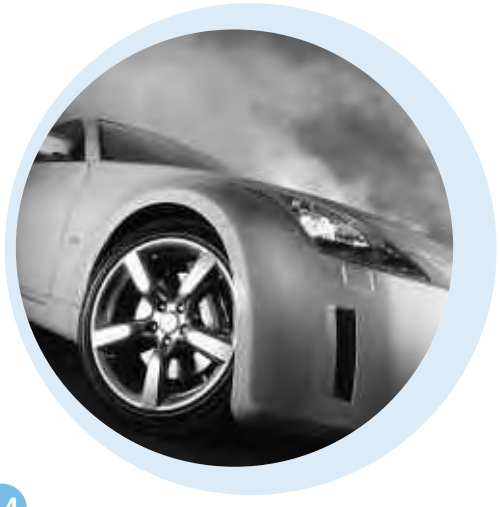
T-pli™ 260-290 Product Data Table

Property	T-pli™ 260	T-pli™ 270	T-pli™ 280	T-pli™ 290
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Gray	Gray	Gray	Gray
Thickness	0.06" (1.524 mm)	0.07" (1.778 mm)	0.08" (2.032 mm)	0.09" (2.286 mm)
Thickness Tolerance	+/- 0.003" (0.075 mm)	+/- 0.003" (0.075 mm)	+/- 0.004" (0.10 mm)	+/- 0.004" (0.10 mm)
Density	1.38 g/cc	1.38 g/cc	1.38 g/cc	1.38 g/cc
Hardness	70 Shore OO	70 Shore OO	70 Shore OO	70 Shore OO
Tensile Strength	20 psi	20 psi	15 psi	15 psi
Elongation %	5	5	5	5
Outgassing TML (Post Cured)	0.10%	0.10%	0.10%	0.10%
Outgassing CVCM (Post Cured)	0.04%	0.04%	0.04%	0.04%
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK	6 W/mK
Thermal Impedance @ 10 psi	0.49°C-in^2/W	0.55°C-in^2/W	0.65°C-in^2/W	0.75°C-in^2/W
Thermal Impedance @ 69 KPa	3.35°C-cm^2/W	3.55°C-cm^2/W	4.19°C-cm^2/W	4.87°C-cm^2/W
Coefficient of Thermal Expansion	72 ppm/°C	72 ppm/°C	72 ppm/°C	72 ppm/°C
Volume Resistivity	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	3.26	3.26	3.26	3.26
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001



T-pli™ 2100-2130 Product Data Table

Property	T-pli™ 2100	T-pli™ 2110	T-pli™ 2120	T-pli™ 2130
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Gray	Gray	Gray	Gray
Thickness	0.10" (2.54 mm)	0.11" (2.794 mm)	0.12" (3.048 mm)	0.13" (3.302 mm)
Thickness Tolerance	+/- 0.005" (0.13 mm)	+/- 0.005" (0.13 mm)	+/- 0.005" (0.13 mm)	+/- 0.006" (0.15 mm)
Density	1.36 g/cc	1.36 g/cc	1.36 g/cc	1.36 g/cc
Hardness	70 Shore OO	70 Shore OO	70 Shore OO	70 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	5	5	5	5
Outgassing TML (Post Cured)	0.15%	0.15%	0.15%	0.15%
Outgassing CVCM (Post Cured)	0.07%	0.07%	0.07%	0.07%
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK	6 W/mK
Thermal Impedance @ 10 psi	0.84°C-in^2/W	0.89°C-in^2/W	0.96°C-in^2/W	1.03°C-in^2/W
Thermal Impedance @ 69 KPa	5.81°C-cm^2/W	5.94°C-cm^2/W	6.00°C-cm^2/W	6.58°C-cm^2/W
Coefficient of Thermal Expansion	96 ppm/°C	96 ppm/°C	96 ppm/°C	96 ppm/°C
Volume Resistivity	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	3.40	3.40	3.40	3.40
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001



T-pli™ 2140-2170 Product Data Table

Property	T-pli™ 2140	T-pli™ 2150	T-pli™ 2160	T-pli™ 2170
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Gray	Gray	Gray	Gray
Thickness	0.14" (3.556 mm)	0.14" (3.556 mm)	0.16" (4.064 mm)	0.17" (4.138 mm)
Thickness Tolerance	+/- 0.006" (0.15 mm)	+/- 0.007" (0.18 mm)	+/- 0.007" (0.18 mm)	+/- 0.008" (0.20 mm)
Density	1.36 g/cc	1.36 g/cc	1.36 g/cc	1.36 g/cc
Hardness	70 Shore OO	70 Shore OO	70 Shore OO	70 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	5	5	5	5
Outgassing TML (Post Cured)	0.15%	0.15%	0.15%	0.15%
Outgassing CVCM (Post Cured)	0.07%	0.07%	0.07%	0.07%
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK	6 W/mK
Thermal Impedance @ 10 psi	1.11°C-in^2/W	1.17°C-in^2/W	1.24°C-in^2/W	1.28°C-in^2/W
Thermal Impedance @ 69 KPa	7.16°C-cm^2/W	7.87°C-cm^2/W	8.06°C-cm^2/W	8.19°C-cm^2/W
Coefficient of Thermal Expansion	96 ppm/°C	96 ppm/°C	96 ppm/°C	96 ppm/°C
Volume Resistivity	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm
Dielectric Constant @ 1 MHz	3.40	3.40	3.40	3.40
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001

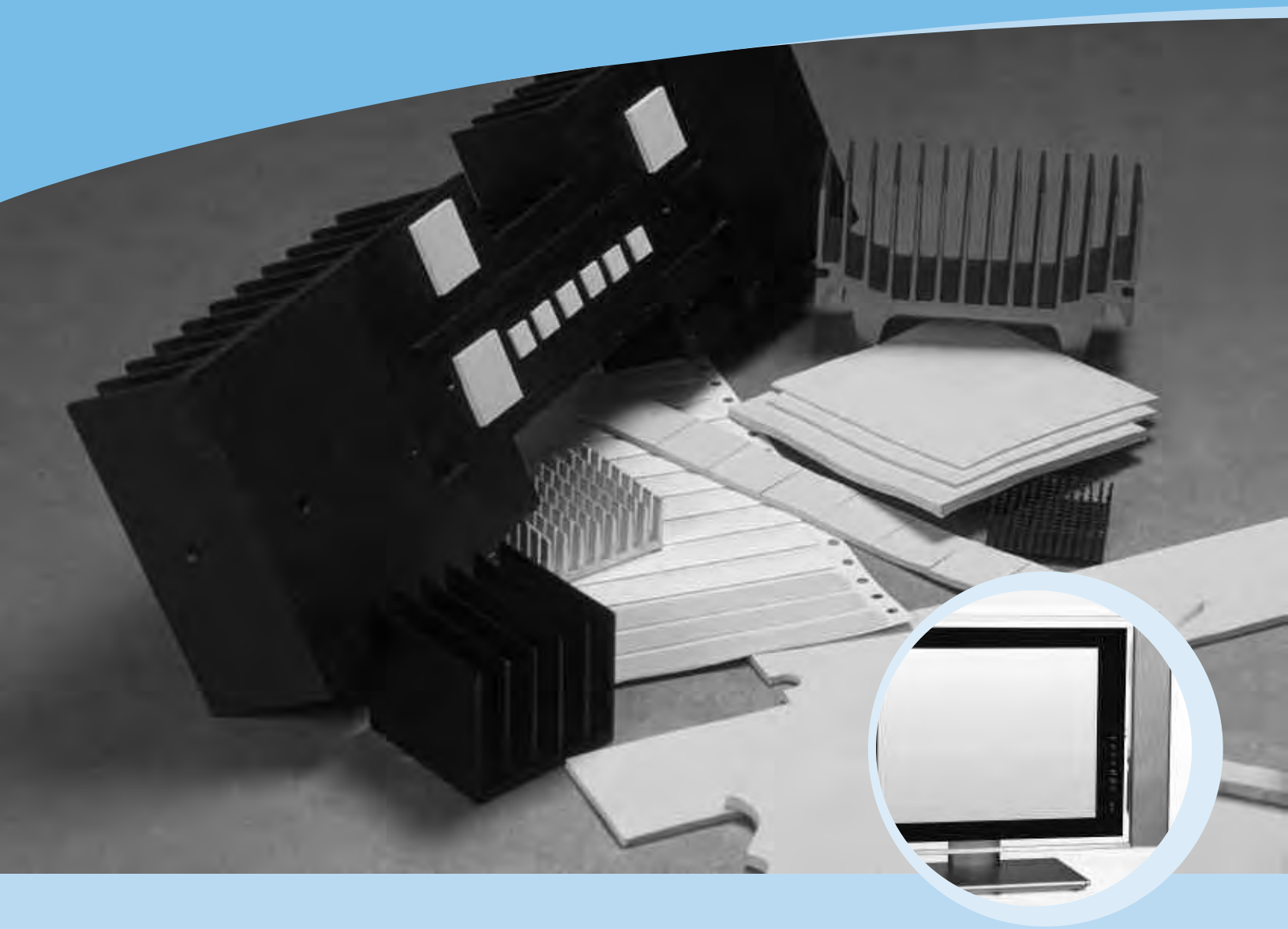
T-pli™ 2180-2200 Product Data Table

Property	T-pli™ 2180	T-pli™ 2190	T-pli™ 2200	Test Method
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	-
Color	Gray	Gray	Gray	Visual
Thickness	0.18" (4.572 mm)	0.19" (4.826 mm)	0.20" (5.08 mm)	-
Thickness Tolerance	+/- 0.008" (0.20 mm)	+/- 0.008" (0.20 mm)	+/- 0.010" (0.25 mm)	-
Density	1.36 g/cc	1.36 g/cc	1.36 g/cc	Helium Pycnometer
Hardness	70 Shore OO	70 Shore OO	70 Shore OO	ASTM D2240
Tensile Strength	15 psi	15 psi	15 psi	ASTM D412
Elongation %	5	5	5	ASTM D412
Outgassing TML (Post Cured)	0.15%	0.15%	0.15%	ASTM E595
Outgassing CVCM (Post Cured)	0.07%	0.07%	0.07%	ASTM E595
UL Flammability Rating	94 HB	94 HB	94 HB	UL
Shelf Life	Indefinite	Indefinite	Indefinite	-
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-
Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK	ASTM D5470 (modified)
Thermal Impedance @ 10 psi	1.36°C-in^2/W	1.45°C-in^2/W	1.57°C-in^2/W	ASTM D5470 (modified)
Thermal Impedance @ 69 KPa	8.52°C-cm^2/W	8.90°C-cm^2/W	10.13°C-cm^2/W	ASTM D5470 (modified)
Coefficient of Thermal Expansion	96 ppm/°C	96 ppm/°C	96 ppm/°C	IPC-TM-650 2,4,24
Volume Resistivity	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	ASTM D257
Dielectric Constant @ 1 MHz	3.40	3.40	3.40	ASTM D150
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	ASTM D150

Product Options

Standard Thicknesses	Standard Sheets Sizes
0.010″ (0.25 mm) 0.015″ (0.38 mm) 0.020″ (0.51 mm) 0.025″ (0.64 mm) 0.030″ (0.76 mm) 0.040″ (1.02 mm) 0.050″ (1.27 mm) 0.060″ (1.52 mm) 0.070″ (1.78 mm) 0.080″ (2.03 mm) 0.090″ (2.29 mm) 0.100″ (2.54 mm) 0.110″ (2.79 mm) 0.120″ (3.05 mm) 0.130″ (3.30 mm) 0.140″ (3.56 mm) 0.150″ (3.81 mm) 0.160″ (4.06 mm) 0.170″ (4.32 mm) 0.180″ (4.57 mm) 0.190″ (4.83 mm) 0.200″ (5.08 mm) Please contact Customer Service for alternative thicknesses	8″ x 8″ (203 mm x 203 mm) 16″ x 16″ (406 mm x 406 mm) T-pli™ 200 is available in individual die-cut shapes **Pressure Sensitive Adhesive** Request no adhesive with ″A0″ suffix Request adhesive one side with ″A1″ suffix Double sided adhesive is not available **Reinforcement** Fiberglass is required in 0.005″(0.13 mm) thru 0.015″ (0.38 mm) Fiberglass is optional in 0.020″ (0.5 mm) and 0.025″ (0.63 mm), Indicate fiberglass by -FG″ suffix Fiberglass is not an option in material thicknesses above 0.025″ (0.063 mm)

GAP FILLERS



T-flex™ 200 V0

Commercial Grade Elastic Gap Fillers

The T-flex™ 200 V0 Series is a very soft, free standing gap filler that is more compliant than most gap fillers. T-flex™ 200 V0 combines good thermal conductivity of 1.1 Wm/K with high compliancy to produce low thermal resistance. The alumina filler allows T-flex™ 200 V0 to remain a cost effective solution where moderate thermal performance is acceptable. T-flex™ 200 V0 is naturally tacky and does not need an additional adhesive coating that can inhibit thermal performance.
T-flex™ 200 V0 is electrically insulating, stable from -40°C to 160°C and meets UL 94V0 rating.

Features and Benefits

- Soft and compliant for low stress applications
- Naturally tacky needing no further adhesive coating
- 1.1 W/mK thermal conductivity
- Available in 20 thicknesses from 0.010" (0.25 mm) to 0.200" (5.00 mm)

Applications:

- Cooling multiple components to the chassis or frame
- Plasma display panels
- High speed mass storage drives
- RDRAM memory modules
- Heat pipe thermal solutions
- Automotive engine control units
- Wireless communication hardware
- Base station

T-flex™ 210-240 V0 Product Data Table

Property	T-flex™ 210	T-flex™ 220 V0	T-flex™ 230 V0	T-flex™ 240 V0
Construction and Composition	Alumina filled, silicone elastomer, fiberglass reinforced	Ceramic filled, silicone elastomer, fiberglass reinforced	Ceramic filled, silicone elastomer, fiberglass reinforced	Ceramic filled, silicone elastomer, fiberglass
Color	Gray	Light Gray	Light Gray	Light Gray
Thickness	0.01" (0.254 mm)	0.02" (0.508 mm)	0.03" (0.762 mm)	0.04" (1.016 mm)
Thickness Tolerance	+/- 0.002" (0.05 mm)	+/- 0.002" (0.05 mm)	+/- 0.003" (0.075 mm)	+/- 0.004" (0.10 mm)
Specific Gravity	2.20 g/cm^3	1.75 g/cm^3	1.74 g/cm^3	1.73 g/cm^3
Hardness	50 Shore OO	50 Shore OO	50 Shore OO	45 Shore OO
Tensile Strength	TBD	464 psi	464 psi	48 psi
Elongation %	TBD	10.5	10.5	63.0
Outgassing TML (Post Cured)	0.07%	0.34%	0.34%	0.34%
Outgassing CVCM (Post Cured)	0.05%	0.10%	0.10%	0.10%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-40 to 200°C	-40 to 160°C	-40 to 160°C	-40 to 160°C
Thermal Conductivity	1.1 W/mK	1.1 W/mK	1.1 W/mK	1.1 W/mK
Thermal Impedance @ 10 psi	0.58°C-in^2/W	0.80°C-in^2/W	1.20°C-in^2/W	1.57°C-in^2/W
Thermal Impedance @ 69 KPa	3.77°C-cm^2/W	5.13°C-cm^2/W	7.74°C-cm^2/W	10.13°C-cm^2/W
Coefficient of Thermal Expansion	TBD	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C
Volume Resistivity	2x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	5.85	5.50	5.50	5.50
Dissipation Factor @ 1 MHz	<0.001	0.002	0.002	0.002

T-flex™ 250-280 V0 Product Data Table

Property	T-flex™ 250 V0	T-flex™ 260 V0	T-flex™ 270 V0	T-flex™ 280 V0
Construction Composition	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer
Color	Light Gray	Light Gray	Light Gray	Light Gray
Thickness	0.05" (1.270 mm)	0.06" (1.524 mm)	0.07" (1.778 mm)	0.08" (2.032 mm)
Thickness Tolerance	+/- 0.005" (0.13 mm)	+/- 0.006" (0.15 mm)	+/- 0.007" (0.18 mm)	+/- 0.008" (0.20 mm)
Specific Gravity	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3
Hardness	45 Shore OO	45 Shore OO	45 Shore OO	45 Shore OO
Tensile Strength	48 psi	48 psi	48 psi	48 psi
Elongation %	63.0	63.0	63.0	63.0
Outgassing TML (Post Cured)	0.34%	0.34%	0.34%	0.34%
Outgassing CVCM (Post Cured)	0.10%	0.10%	0.10%	0.10%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 160°C	-40 to 160°C	-40 to 160 C	-45 to 160°C
Thermal Conductivity	1.1 W/mK	1.1 W/mK	1.1 W/mK	1.1 W/mK
Thermal Impedance @ 10 psi	1.82°C-in^2/W	2.05°C-in^2/W	2.28°C-in^2/W	2.51°C-in^2/W
Thermal Impedance @ 69 KPa	11.72°C-cm^2/W	13.25°C-cm^2/W	14.74°C-cm^2/W	16.70°C-cm^2/W
Coefficient of Thermal Expansion	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C
Volume Resistivity	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	5.50	5.50	5.50	5.50
Dissipation Factor @ 1 MHz	0.002	0.002	0.002	0.002

T-flex™ 290-2120 V0 Product Data Table

Property	T-flex™ 290 V0	T-flex™ 2100 V0	T-flex™ 2110 V0	T-flex™ 2120 V0
Construction Composition	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer
Color	Light Gray	Light Gray	Light Gray	Light Gray
Thickness	0.09" (2.286 mm)	0.10" (2.54 mm)	0.11" (2.794 mm)	0.12" (3.048 mm)
Thickness Tolerance	+/- 0.009" (0.23 mm)	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)
Specific Gravity	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3
Hardness	45 Shore OO	45 Shore OO	45 Shore OO	45 Shore OO
Tensile Strength	48 psi	48 psi	48 psi	48 psi
Elongation %	63.0	63.0	63.0	63.0
Outgassing TML (Post Cured)	0.34%	0.34%	0.34%	0.34%
Outgassing CVCM (Post Cured)	0.10%	0.10%	0.10%	0.10%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-45 to 160°C
Thermal Conductivity	1.1 W/mK	1.1 W/mK	1.1 W/mK	1.1 W/mK
Thermal Impedance @ 10 psi	2.72°C-in^2/W	2.93°C-in^2/W	3.12°C-in^2/W	3.31°C-in^2/W
Thermal Impedance @ 69 KPa	17.55°C-cm^2/W	18.88°C-cm^2/W	20.16°C-cm^2/W	21.38°C-cm^2/W
Coefficient of Thermal Expansion	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C
Volume Resistivity	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	5.50	5.50	5.50	5.50
Dissipation Factor @ 1 MHz	0.002	0.002	0.002	0.002

T-flex™ 2130-2160 V0 Product Data Table

Property	T-flex™ 2130 V0	T-flex™ 2140 V0	T-flex™ 2150 V0	T-flex™ 2160 V0
Construction and Composition	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer
Color	Light Gray	Light Gray	Light Gray	Light Gray
Thickness	0.13" (3.302 mm)	0.14" (3.556 mm)	0.15" (3.810 mm)	0.16" (4.064 mm)
Thickness Tolerance	+/- 0.012" (0.30 mm)	+/- 0.012" (0.30 mm)	+/- 0.013" (0.32 mm)	+/- 0.013" (0.32 mm)
Specific Gravity	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3
Hardness	45 Shore OO	45 Shore OO	45 Shore OO	45 Shore OO
Tensile Strength	48 psi	48 psi	48 psi	48 psi
Elongation %	63.0	63.0	63.0	63.0
Outgassing TML (Post Cured)	0.34%	0.34%	0.34%	0.34%
Outgassing CVCM (Post Cured)	0.10%	0.10%	0.10%	0.10%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-45 to 160°C
Thermal Conductivity	1.1 W/mK	1.1 W/mK	1.1 W/mK	1.1 W/mK
Thermal Impedance @ 10 psi	3.50°C-in^2/W	3.67°C-in^2/W	3.84°C-in^2/W	3.99°C-in^2/W
Thermal Impedance @ 69 KPa	22.56°C-cm^2/W	23.68°C-cm^2/W	24.75°C-cm^2/W	25.77°C-cm^2/W
Coefficient of Thermal Expansion	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C
Volume Resistivity	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	5.50	5.50	5.50	5.50
Dissipation Factor @ 1 MHz	0.002	0.002	0.002	0.002

T-flex™ 2170-2200 V0 Product Data Table

Property	T-flex™ 2170 V0	T-flex™ 2180 V0	T-flex™ 2190 V0	T-flex™ 2200 V0
Construction and Composition	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer	Ceramic filled, silicone elastomer
Color	Light Gray	Light Gray	Light Gray	Light Gray
Thickness	0.17" (4.318 mm)	0.18" (4.572 mm)	0.19" (4.826 mm)	0.20" (5.080 mm)
Thickness Tolerance	+/- 0.016" (0.40 mm)	+/- 0.016" (0.40 mm)	+/- 0.016" (0.40 mm)	+/- 0.018" (0.45 mm)
Specific Gravity	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3	1.73 g/cm^3
Hardness	45 Shore OO	45 Shore OO	45 Shore OO	45 Shore OO
Tensile Strength	48 psi	48 psi	48 psi	48 psi
Elongation %	63.0	63.0	63.0	63.0
Outgassing TML (Post Cured)	0.34%	0.34%	0.34%	0.34%
Outgassing CVCM (Post Cured)	0.10%	0.10%	0.10%	0.10%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-45 to 160°C
Thermal Conductivity	1.1 W/mK	1.1 W/mK	1.1 W/mK	1.1 W/mK
Thermal Impedance @ 10 psi	4.14°C-in^2/W	4.29°C-in^2/W	4.42°C-in^2/W	4.55°C-in^2/W
Thermal Impedance @ 69 KPa	26.74°C-cm^2/W	27.65°C-cm^2/W	28.52°C-cm^2/W	29.33°C-cm^2/W
Coefficient of Thermal Expansion	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C	229 ppm/°C 35 to 130°C
Volume Resistivity	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm	4x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	5.50	5.50	5.50	5.50
Dissipation Factor @ 1 MHz	0.002	0.002	0.002	0.002

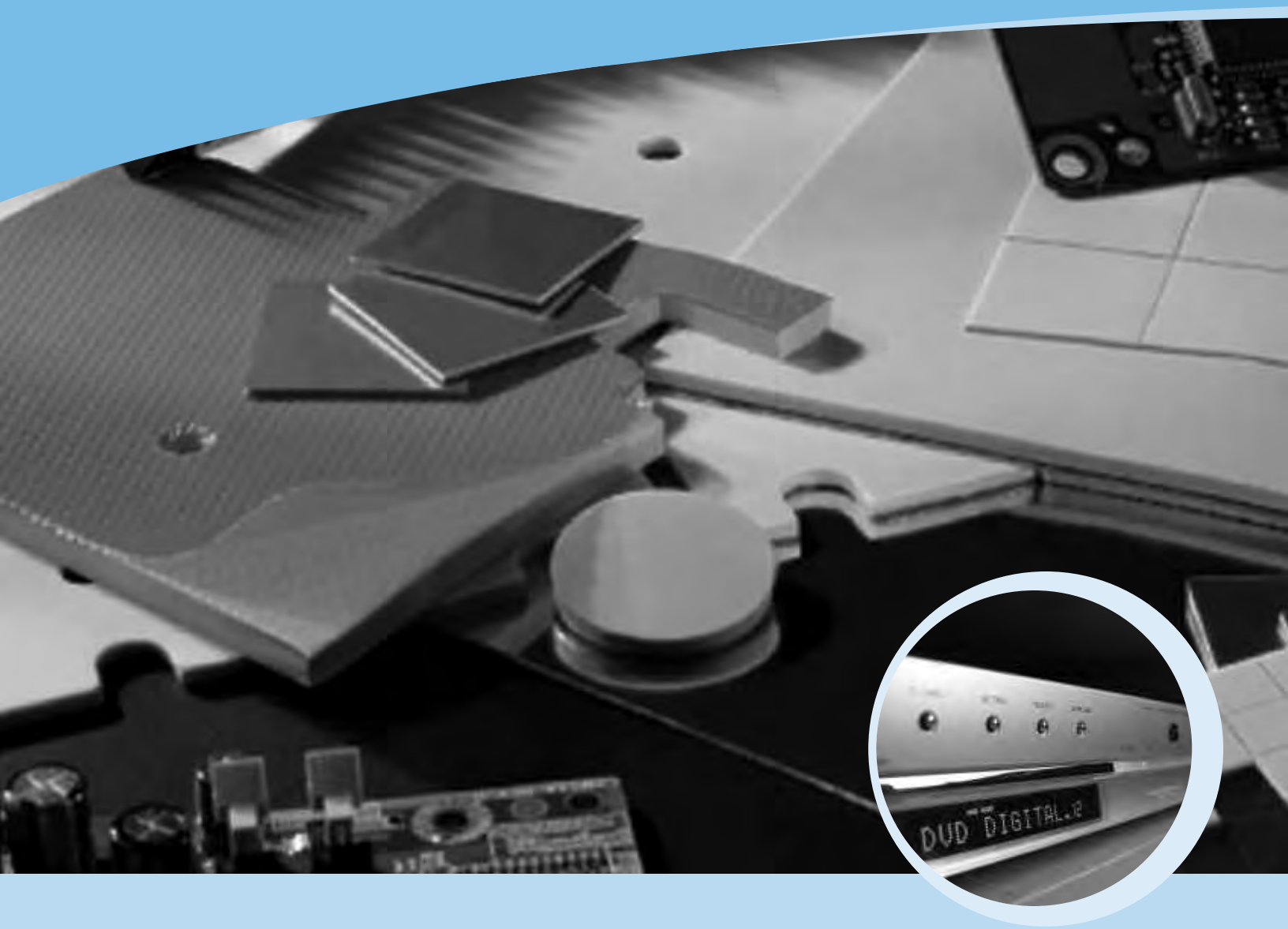
T-flex™ 200 V0 Testing Options

Property	Test Method
Construction and Composition	-
Color	Visual
Thickness	-
Thickness Tolerance	-
Density	Helium Pycnometer
Hardness	ASTM D2240
Tensile Strength	ASTM D412
Elongation %	ASTM D412
Deflection vs. Pressure Chart	ASTM D575
Outgassing TML (Post Cured)	ASTM E595
Outgassing CVCM (Post Cured)	ASTM E595
UL Flammability Rating	UL
Shelf Life	-
Temperature Range	-
Thermal Conductivity	ASTM D5470 (modified)
Thermal Impedance @ 10 psi	ASTM D5470 (modified)
Thermal Impedance @ 69 KPa	ASTM D5470 (modified)
Thermal Impedance vs. Pressure	-
Coefficient of Thermal Expansion	IPC-TM-650 2,4,24
Breakdown Voltage	ASTM D149
Volume Resistivity	ASTM D257
Dielectric Constant @ 1 MHz	ASTM D150
Dissipation Factor @ 1 MHz	ASTM D150

T-flex™ 200 V0 Product Options

Standard Thicknesses	Standard Sheets Sizes
0.010″ (0.25 mm) 0.020″ (0.51 mm) 0.030″ (0.76 mm) 0.040″ (1.02 mm) 0.050″ (1.27 mm) 0.060″ (1.52 mm) 0.070″ (1.78 mm) 0.080″ (2.03 mm) 0.090″ (2.29 mm) 0.100″ (2.54 mm) 0.110″ (2.79 mm) 0.120″ (3.05 mm) 0.130″ (3.30 mm) 0.140″ (3.56 mm) 0.150″ (3.81 mm) 0.160″ (4.06 mm) 0.170″ (4.32 mm) 0.180″ (4.57 mm) 0.190″ (4.83 mm) 0.200″ (5.08 mm) Contact Customer Service for alternative thicknesses	9″ x 9″ (229 mm x 229 mm) and 18″ x 18″ (457 mm x 457 mm) 9″ x 9″ only over 0.100″ thickness T-flex™ 200V0 may be die-cut into individual shapes **Pressure Sensitive Adhesive** Pressure sensitive adhesive is not applicable for T-flex™ products **Reinforcement** Fiberglass is required in 0.010″(0.25 mm) through 0.030″ (0.76 mm) Fiberglass is not an option in material thicknesses from 0.040″ (1.02 mm) and above

GAP FILLERS



T-flex™ 300 Series

Ultra Compliant, Thermal Gap Filler for High-Speed Computing and Telecommunications Applications

T-flex™ 300 is a silicone gel combined with a ceramic powder to offer an unique combination of compliancy, thermal resistance and price.

T-flex™ 300, at pressures of 50 psi, deflect over 50% the original thickness. This high rate of compliancy allows the material to "totally blanket" the component, enhancing thermal transfer. The material has a very low compression set enabling the pad to be reused many times.

T-flex™ 300, in achieving its stellar compliancy, does not sacrifice thermal performance. With a thermal conductivity of 1.2 W/mK, low thermal resistances can be achieved at low pressures.

Features and Benefits

- Extreme compliancy
- Thermal conductivity of 1.2 W/mK
- Thickness ranges from 0.5 mm – 5 mm

Applications:

- Notebook and desktop computers
- Telecommunications hardware
- Hard disk drives
- DVD players
- Flat panel displays
- Memory modules
- Power conversion equipment

T-flex™ 300 Series - 20 - 40 mil Data Table

Property	20 mil	30 mil	40 mil	40 mil
Construction and Composition	Ceramic filled silicone elastomer fiberglass reinforced	Ceramic filled silicone elastomer fiberglass reinforced	Ceramic filled silicone elastomer fiberglass reinforced	Ceramic filled silicone elastomer
Color	Mint	Mint	Mint	Mint
Thickness	0.020" (0.51 mm)	0.030" (0.76 mm)	0.040" (1.02 mm)	0.040" (1.02 mm)
Thickness Tolerance	+/- 0.002" (+/- 0.051 mm)	+/- 0.003" (+/- 0.076 mm)	+/- 0.004" (+/- 0.102 mm)	+/- 0.004" (+/- 0.102 mm)
Density	1.78 g/cc	1.78 g/cc	1.78 g/cc	1.75 g/cc
Hardness	56 Shore OO	56 Shore OO	56 Shore OO	27 Shore OO
Tensile Strength	NA	NA	NA	15 psi
Elongation %	NA	NA	NA	50
@ 10 psi	4	4.8	5.6	21
@ 50 psi	22.5	29.8	37.1	48.2
@ 100 psi	42.5	48.15	53.8	60.8
Outgassing TML	0.56%	0.56%	0.56%	0.56%
Outgassing CVCM	0.1%	0.1%	0.1%	0.1%
UL Flammability Rating	94V0	94V0	94V0	94V0
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-40 to 160°C
Thermal Conductivity	1.2 W/mK	1.2 W/mK	1.2 W/mK	1.2 W/mK
Thermal Resistance				
@ 10 psi	0.844°C-in^2/W	1.050°C-in^2/W	1.380°C-in^2/W	1.144°C-in^2/W
@ 69 KPa	5.41°C-cm^2/W	6.74°C-cm^2/W	8.85°C-cm^2/W	7.34°C-cm^2/W
Thermal Expansion (ppm/°C)				
38 - 58°C	517	517	517	517
58 - 103°C	754	754	754	754
103 - 135°C	906	906	906	906
Volume Resistivity	6x10^{12} ohm-cm	6x10^{12} ohm-cm	6x10^{12} ohm-cm	6x10^{12} ohm-cm
Dielectric Constant @ 1 kHz/1 mHz	5.5/4.4	5.5/4.4	5.5/4.4	5.5/4.4

T-flex™ 300 Series - 50 - 80 mil Data Table

Property	50 mil	60 mil	70 mil	80 mil
Construction and Composition	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer
Color	Mint	Mint	Mint	Mint
Thickness	0.050" (1.27 mm)	0.060" (1.52 mm)	0.070" (1.78 mm)	0.080" (2.03 mm)
Thickness Tolerance	+/- 0.005" (+/- 0.127 mm)	+/- 0.006" (+/- 0.152 mm)	+/- 0.007" (+/- 0.178 mm)	+/- 0.008" (+/- 0.203 mm)
Density	1.75 g/cc	1.75 g/cc	1.75 g/cc	1.75 g/cc
Hardness	27 Shore OO	27 Shore OO	27 Shore OO	27 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	50	50	50	50
Deflection %				
@ 10 psi	23.55	26.10	27.85	29.60
@ 50 psi	50.35	52.50	55.35	58.20
@ 100 psi	63.75	66.70	69.55	72.40
Outgassing TML	0.56%	0.56%	0.56%	0.56%
Outgassing CVCM	0.1%	0.1%	0.1%	0.1%
UL Flammability Rating	94V0	94V0	94V0	94V0
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-40 to 160°C
Thermal Conductivity	1.2 W/mK	1.2 W/mK	1.2 W/mK	1.2 W/mK
Thermal Resistance				
@ 10 psi	1.320°C-in²/W	1.490°C-in²/W	1.654°C-in²/W	1.812°C-in²/W
@ 69 KPa	8.47°C-cm²/W	9.56°C-cm²/W	10.61°C-cm²/W	11.62°C-cm²/W
Thermal Expansion (ppm/°C)				
38 - 58°C	517	517	517	517
58 - 103°C	754	754	754	754
103 - 135°C	906	906	906	906
Volume Resistivity	$6x10^{12}$ ohm-cm	$6x10^{12}$ ohm-cm	$6x10^{12}$ ohm-cm	$6x10^{12}$ ohm-cm
Dielectric Constant @ 1 kHz/1 mHz	5.5/4.4	5.5/4.4	5.5/4.4	5.5/4.4

T-flex™ 300 Series - 90 - 120 mil Data Table

Property	90 mil	100 mil	110 mil	120 mil
Construction and Composition	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer
Color	Mint	Mint	Mint	Mint
Thickness	0.090" (2.29 mm)	0.100" (2.54 mm)	0.110" (2.79 mm)	0.120" (3.05 mm)
Thickness Tolerance	+/- 0.009" (+/- 0.229 mm)	+/- 0.010" (+/- 0.254 mm)	+/- 0.011" (+/- 0.279 mm)	+/- 0.012" (+/- 0.305 mm)
Density	1.75 g/cc	1.75 g/cc	1.75 g/cc	1.75 g/cc
Hardness	27 Shore OO	27 Shore OO	27 Shore OO	27 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	50	50	50	50
Deflection %				
@ 10 psi	31.4	33.2	33.64	34.08
@ 50 psi	60.6	63	63.95	64.9
@ 100 psi	74.95	77.5	78.45	79.4
Outgassing TML	0.56%	0.56%	0.56%	0.56%
Outgassing CVCM	0.1%	0.1%	0.1%	0.1%
UL Flammability Rating	94V0	94V0	94V0	94V0
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-40 to 160°C
Thermal Conductivity	1.2 W/mK	1.2 W/mK	1.2 W/mK	1.2 W/mK
Thermal Resistance				
@ 10 psi	1.964°C-in^2/W	2.110°C-in^2/W	2.250°C-in^2/W	2.384°C-in^2/W
@ 69 KPa	12.60°C-cm^2/W	13.53°C-cm^2/W	14.43°C-cm^2/W	15.29°C-cm^2/W
Thermal Expansion (ppm/°C)				
38 - 58°C	517	517	517	517
58 - 103°C	754	754	754	754
103 - 135°C	906	906	906	906
Volume Resistivity	6x10^{12} ohm-cm	6x10^{12} ohm-cm	6x10^{12} ohm-cm	6x10^{12} ohm-cm
Dielectric Constant @ 1 kHz/1 mHz	5.5/4.4	5.5/4.4	5.5/4.4	5.5/4.4

T-flex™ 300 Series - 130 - 160 mil Data Table

Property	130 mil	140 mil	150 mil	160 mil
Construction and Composition	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer
Color	Mint	Mint	Mint	Mint
Thickness	0.130" (3.30 mm)	0.140" (3.56 mm)	0.150" (3.81 mm)	0.160" (4.06 mm)
Thickness Tolerance	+/- 0.013" (+/- 0.330 mm)	+/- 0.014" (+/- 0.356 mm)	+/- 0.015" (+/- 0.381 mm)	+/- 0.016" (+/- 0.406 mm)
Density	1.75 g/cc	1.75 g/cc	1.76 g/cc	1.75 g/cc
Hardness	27 Shore OO	27 Shore OO	27 Shore OO	27 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	50	50	50	76
Deflection %				
@ 10 psi	34.545	35.01	35.43	35.85
@ 50 psi	65.665	66.43	67.165	67.9
@ 100 psi	80.1	80.8	81.5	82.2
Outgassing TML	0.56%	0.56%	0.56%	0.56%
Outgassing CVCM	0.1%	0.1%	0.1%	0.1%
UL Flammability Rating	94V0	94V0	94V0	94V0
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-40 to 160°C
Thermal Conductivity	1.2 W/mK	1.2 W/mK	1.2 W/mK	1.2 W/mK
Thermal Resistance				
@ 10 psi	2.512°C-in^2/W	2.634°C-in^2/W	2.750°C-in^2/W	2.860°C-in^2/W
@ 69 KPa	16.11°C-cm^2/W	16.89°C-cm^2/W	17.64°C-cm^2/W	18.34°C-cm^2/W
Thermal Expansion (ppm/°C)				
38 - 58°C	517	517	517	517
58 - 103°C	754	754	754	754
103 - 135°C	906	906	906	906
Volume Resistivity	6x10^{12} ohm-cm	6x10^{12} ohm-cm	6x10^{12} ohm-cm	6x10^{12} ohm-cm
Dielectric Constant @ 1 kHz/1 mHz	5.5/4.4	5.5/4.4	5.5/4.4	5.5/4.4

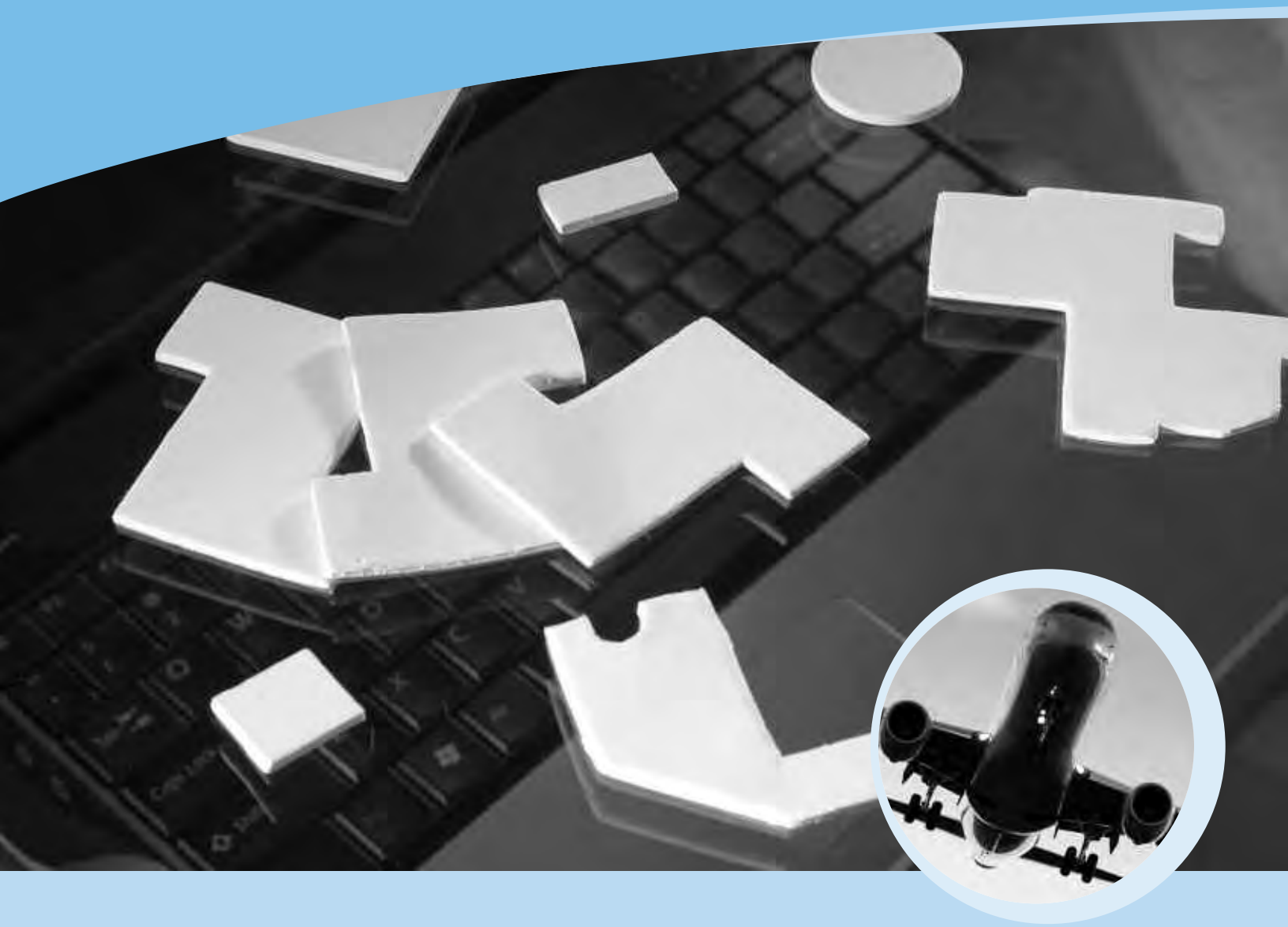
T-flex™ 300 Series - 170 - 200 mil Data Table and Test Methods

Property	170 mil	180 mil	190 mil	200 mil	Test Method
Construction and Composition	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	Ceramic filled silicone elastomer	-
Color	Mint	Mint	Mint	Mint	Visual
Thickness	0.170" (4.32 mm)	0.180" (4.57 mm)	0.190" (4.83 mm)	0.200" (5.08 mm)	-
Thickness Tolerance	+/- 0.017" (+/- 0.432 mm)	+/- 0.018" (+/- 0.457 mm)	+/- 0.019" (+/- 0.483 mm)	+/- 0.020" (+/- 0.508 mm)	-
Density	1.75 g/cc	1.75 g/cc	1.76 g/cc	1.75 g/cc	Helium Pycnometer
Hardness	27 Shore OO	27 Shore OO	27 Shore OO	27 Shore OO	ASTM D2240
Tensile Strength	15 psi	15 psi	15 psi	15 psi	ASTM D412
Elongation %	76	76	76	76	ASTM D412
Deflection %					
@ 10 psi	36.36	36.87	37.335	37.8	-
@ 50 psi	68.69	69.48	70.24	71	
@ 100 psi	82.9	83.6	84.3	85	
Outgassing TML	0.56%	0.56%	0.56%	0.56%	ASTM E595
Outgassing CVCM	0.1%	0.1%	0.1%	0.1%	ASTM E595
UL Flammability Rating	94V0	94V0	94V0	94V0	UL
Temperature Range	-40 to 160°C	-40 to 160°C	-40 to 160°C	-40 to 160°C	-
Thermal Conductivity	1.2 W/mK	1.2 W/mK	1.2 W/mK	1.2 W/mK	ASTM D5470 (modified)
Thermal Resistance					
@ 10 psi	2.964°C in^2/W	3.062°C in^2/W	3.154°C in^2/W	3.240°C in^2/W	ASTM D5470
@ 69 KPa	19.01°C-cm^2/W	19.64°C-cm^2/W	20.23°C-cm^2/W	20.78°C-cm^2/W	(modified)
Thermal Expansion (ppm/°C)					IPC-TM-650 2,4,24
38 - 58°C	517	517	517	517	
58 - 103°C	754	754	754	754	
103 - 135°C	906	906	906	906	
Volume Resistivity	$6x10^{12}$ ohm-cm	$6x10^{12}$ ohm-cm	$6x10^{12}$ ohm-cm	$6x10^{12}$ ohm-cm	ASTM D257
Dielectric Constant @ 1 kHz/1 mHz	5.5/4.4	5.5/4.4	5.5/4.4	5.5/4.4	ASTM D150

T-flex™ 300 Product Options

Standard Thicknesses			Standard Sheets Sizes
0.020" (0.51 mm)	0.090" (2.29 mm)	0.160" (4.06 mm)	9" x 9" (229 mm x 229 mm) 18" x 18" (457 mm x 457 mm) 9" x 9" only over 0.100" thickness
0.030" (0.76 mm)	0.100" (2.54 mm)	0.170" (4.32 mm)	Fiberglass reinforcement is optional in only 0.040" thick ness:"FG"suffix (Ex:T-flex™340-FG)
0.040" (1.02 mm)	0.110" (2.79 mm)	0.180" (4.57 mm)	Tacky one side only:"DCI"suffix (Ex:T-flex™340-DC1)
0.050" (1.27 mm)	0.120" (3.05 mm)	0.190" (4.83 mm)	Metallized carrier on one side:"H"suffix (Ex:T-flex™340-H)
0.060" (1.52 mm)	0.130" (3.30 mm)	0.200" (5.08 mm)	
0.070" (1.78 mm)	0.140" (3.56 mm)		
0.080" (2.03 mm)	0.150" (3.81 mm)		
Contact Customer Service for alternative thickness			

GAP FILLERS



T-flex™ 500 Series

Highly Compliant Thermal Gap Filler with 2.8 W/mK

T-flex™ 500 is a highly compliant gap filler designed to provide excellent thermal performance while remaining cost effective. This soft interface pad conforms well with minimal pressure, resulting in little or no stress on mating parts. T-flex™ 500's unique silicone formulation has extremely low silicone extractables compared to other silicone interface materials and also meets NASA outgassing requirements.

T-flex™ 500 is naturally tacky, requiring no adhesive coating to inhibit thermal performance. T-flex™ 500 is electrically insulating, stable from -45°C to 200°C and meets UL 94V0 rating.

Features and Benefits

- Highly compliant and cost effective
- Low thermal resistance at low pressures
- Designed to have very low silicone extractables
- Meets NASA Outgassing requirements
- Available in 19 thicknesses 0.020" to 0.200"
- Naturally tacky needing no additional adhesive coating

Applications:

- Cooling components to the chassis or frame
- High speed mass storage drives
- RDRAM memory modules
- Heat pipe thermal solutions
- Automotive engine control units
- Telecommunications hardware

T-flex™ 500 Series 520 - 550

Property	T-flex™ 520	T-flex™ 530	T-flex™ 540	T-flex™ 550
Construction and Composition	Silicone elastomer, fiberglass reinforced	Silicone elastomer, fiberglass reinforced	Silicone elastomer	Silicone elastomer
Color	Light Blue	Light Blue	Light Blue	Light Blue
Thickness	0.02" (0.508 mm)	0.03" (0.762 mm)	0.04" (1.016 mm)	0.05" (1.270 mm)
Thickness Tolerance	+/- 0.002" (0.05 mm)	+/- 0.003" (0.075 mm)	+/- 0.004" (0.10 mm)	+/- 0.005" (0.13 mm)
Density	3.0 g/cc	3.0 g/cc	3.0 g/cc	3.0 g/cc
Hardness	70 Shore OO	70 Shore OO	40 Shore OO	40 Shore OO
Tensile Strength	NA	66 psi	66 psi	66 psi
Elongation %	NA	56.6	56.6	56.6
Outgassing TML	0.29%	0.29%	0.29%	0.29%
Outgassing CVCM	0.04%	0.04%	0.04%	0.04%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	2.8 W/mK	2.8 W/mK	2.8 W/mK	2.8 W/mK
Thermal Impedance @ 10 psi	0.40°C-in^2/W	0.54°C-in^2/W	0.50°C-in^2/W	0.57°C-in^2/W
Thermal Impedance @ 69 KPa	2.56°C-cm^2/W	3.48°C-cm^2/W	3.23°C-cm^2/W	3.65°C-cm^2/W
Coefficient of Thermal Expansion	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C
Volume Resistivity	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm
Dielectric Constant @ 1 MHz	13.61	13.61	13.61	13.61
Dissipation Factor @ 1 MHz	0.012	0.012	0.012	0.012

T-flex™ 500 Series 560 - 590

Property	T-flex™ 560	T-flex™ 570	T-flex™ 580	T-flex™ 590
Construction and Composition	Silicone elastomer	Silicone elastomer	Silicone elastomer	Silicone elastomer
Color	Light Blue	Light Blue	Light Blue	Light Blue
Thickness	0.06" (1.524 mm)	0.07" (1.778 mm)	0.08" (2.032 mm)	0.09" (2.286 mm)
Thickness Tolerance	+/- 0.006" (0.15 mm)	+/- 0.007" (0.18 mm)	+/- 0.008" (0.20 mm)	+/- 0.009" (0.23 mm)
Density	3.0 g/cc	3.0 g/cc	3.0 g/cc	3.0 g/cc
Hardness	40 Shore OO	40 Shore OO	40 Shore OO	40 Shore OO
Tensile Strength	66 psi	46 psi	46 psi	46 psi
Elongation %	56.6	97.5	97.5	97.5
Outgassing TML	0.29%	0.29%	0.29%	0.29%
Outgassing CVCM	0.04%	0.04%	0.04%	0.04%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	2.8 W/mK	2.8 W/mK	2.8 W/mK	2.8 W/mK
Thermal Impedance @ 10 psi	0.63°C-in^2/W	0.70°C-in^2/W	0.77°C-in^2/W	0.84°C-in^2/W
Thermal Impedance @ 69 KPa	4.07°C-cm^2/W	4.51°C-cm^2/W	4.96°C-cm^2/W	5.41°C-cm^2/W
Coefficient of Thermal Expansion	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C
Volume Resistivity	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm
Dielectric Constant @ 1 MHz	13.61	13.61	13.61	13.61
Dissipation Factor @ 1 MHz	0.012	0.012	0.012	0.012

T-flex™ 500 Series 5100 - 5130

Property	T-flex™ 5100	T-flex™ 5110	T-flex™ 5120	T-flex™ 5130
Construction and Composition	Silicone elastomer	Silicone elastomer	Silicone elastomer	Silicone elastomer
Color	Light Blue	Light Blue	Light Blue	Light Blue
Thickness	0.10" (2.54 mm)	0.11" (2.794 mm)	0.12" (3.048 mm)	0.13" (3.302 mm)
Thickness Tolerance	+/- 0.010" (0.25 mm)	+/- 0.011" (0.28 mm)	+/- 0.012" (0.30 mm)	+/- 0.013" (0.32 mm)
Density	3.0 g/cc	3.0 g/cc	3.0 g/cc	3.0 g/cc
Hardness	40 Shore OO	40 Shore OO	40 Shore OO	40 Shore OO
Tensile Strength	46 psi	29 psi	29 psi	29 psi
Elongation %	97.5	96.9	96.9	96.9
Outgassing TML	0.29%	0.29%	0.29%	0.29%
Outgassing CVCM	0.04%	0.04%	0.04%	0.04%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	2.8 W/mK	2.8 W/mK	2.8 W/mK	2.8 W/mK
Thermal Impedance @ 10 psi	0.91°C-in^2/W	0.98°C-in^2/W	1.06°C-in^2/W	1.14°C-in^2/W
Thermal Impedance @ 69 KPa	5.87°C-cm^2/W	6.35°C-cm^2/W	6.84°C-cm^2/W	7.34°C-cm^2/W
Coefficient of Thermal Expansion	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C
Volume Resistivity	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm
Dielectric Constant @ 1 MHz	13.61	13.61	13.61	13.61
Dissipation Factor @ 1 MHz	0.012	0.012	0.012	0.012

T-flex™ 500 Series 5140 - 5170

Property	T-flex™ 5140	T-flex™ 5150	T-flex™ 5160	T-flex™ 5170
Construction and Composition	Silicone elastomer	Silicone elastomer	Silicone elastomer	Silicone elastomer
Color	Light Blue	Light Blue	Light Blue	Light Blue
Thickness	0.14" (3.556 mm)	0.15" (3.81 mm)	0.16" (4.064 mm)	0.17" (4.318 mm)
Thickness Tolerance	+/- 0.014" (0.36 mm)	+/- 0.015" (0.38 mm)	+/- 0.016" (0.40 mm)	+/- 0.017" (0.43 mm)
Density	3.0 g/cc	3.0 g/cc	3.0 g/cc	3.0 g/cc
Hardness	40 Shore OO	40 Shore OO	40 Shore OO	40 Shore OO
Tensile Strength	29 psi	29 psi	29 psi	29 psi
Elongation %	96.9	96.9	96.9	96.9
Outgassing TML	0.29%	0.29%	0.29%	0.29%
Outgassing CVCM	0.04%	0.04%	0.04%	0.04%
UL Flammability Rating	94 V0	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	2.8 W/mK	2.8 W/mK	2.8 W/mK	2.8 W/mK
Thermal Impedance @ 10 psi	1.22°C-in^2/W	1.30°C-in^2/W	1.38°C-in^2/W	1.46°C-in^2/W
Thermal Impedance @ 69 KPa	7.84°C-cm^2/W	8.36°C-cm^2/W	8.88°C-cm^2/W	9.43°C-cm^2/W
Coefficient of Thermal Expansion	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C
Volume Resistivity	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm	9.6x10^{12} ohm-cm
Dielectric Constant @ 1 MHz	13.61	13.61	13.61	13.61
Dissipation Factor @ 1 MHz	0.012	0.012	0.012	0.012

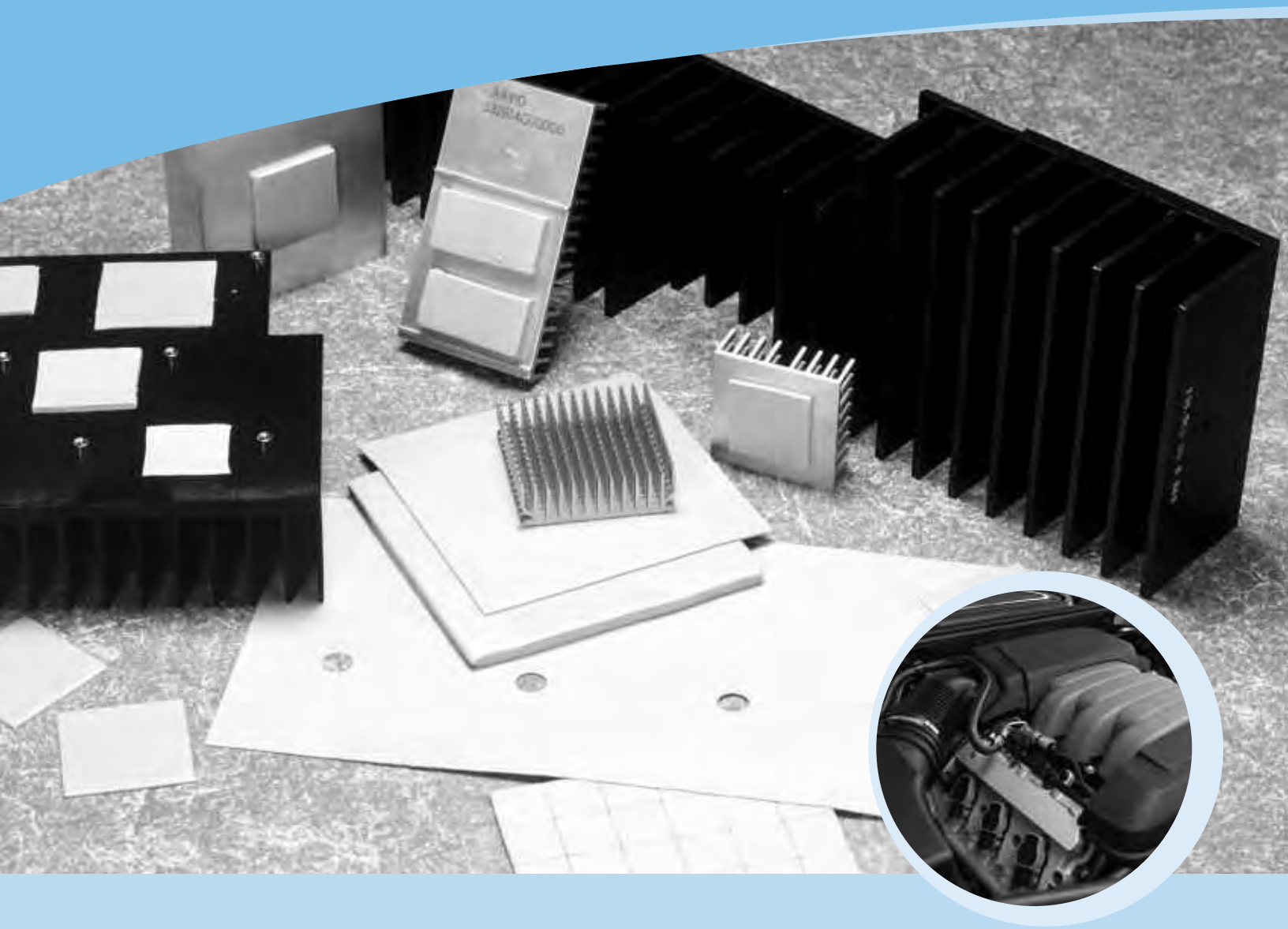
T-flex™ 500 Series 5180 - 5200 and Test Method

Property	T-flex™ 5180	T-flex™ 5190	T-flex™ 5200	Test Method
Construction and Composition	Silicone elastomer	Silicone elastomer	Silicone elastomer	-
Color	Light Blue	Light Blue	Light Blue	Visual
Thickness	0.18" (4.572 mm)	0.19" (4.826 mm)	0.20" (5.08 mm)	-
Thickness Tolerance	+/- 0.018" (0.45 mm)	+/- 0.019" (0.48 mm)	+/- 0.020" (0.51 mm)	-
Density	3.0 g/cc	3.0 g/cc	3.0 g/cc	Helium Pycnometer
Hardness	40 Shore OO	40 Shore OO	40 Shore OO	ASTM D2240
Tensile Strength	29 psi	29 psi	29 psi	ASTM D412
Elongation %	96.9	96.9	96.9	ASTM D412
Outgassing TML	0.29%	0.29%	0.29%	ASTM E595
Outgassing CVCM	0.04%	0.04%	0.04%	ASTM E595
UL Flammability Rating	94 V0	94 V0	94 V0	UL
Shelf Life	Indefinite	Indefinite	Indefinite	-
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-
Thermal Conductivity	2.8 W/mK	2.8 W/mK	2.8 W/mK	ASTM D5470 (modified)
Thermal Impedance @ 10 psi	1.55°C-in²/W	1.63°C-in²/W	1.72°C-in²/W	ASTM D5470 (modified)
Thermal Impedance @ 69 KPa	9.97°C-cm²/W	10.53°C-cm²/W	11.10°C-cm²/W	ASTM D5470 (modified)
Coefficient of Thermal Expansion	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	37.4 ppm/°C 70 to 130°C	IPC-TM-650 2,4,24
Volume Resistivity	$9.6x10^{12}$ ohm-cm	$9.6x10^{12}$ ohm-cm	$9.6x10^{12}$ ohm-cm	ASTM D257
Dielectric Constant @ 1 MHz	13.61	13.61	13.61	ASTM D150
Dissipation Factor @ 1 MHz	0.012	0.012	0.012	ASTM D150

T-flex™ 500 Product Options

Standard Thicknesses		Standard Sheets Sizes
0.020" (0.51 mm)	0.120" (3.05 mm)	9 x 9" (229 mm x 229 mm)
0.030" (0.76 mm)	0.130" (3.30 mm)	T-flex™ 500 is available in individual die-cut shapes
0.040" (1.02 mm)	0.140" (3.56 mm)	**Tacky One Side Only**
0.050" (1.27 mm)	0.150" (3.81 mm)	T-flex™ 500 is naturally tacky on both sides. T-flex™ 500 can be provided tacky on one side only. This is indicated by the suffix "DC1". This option offers good separation properties allowing the tacky side to stick to the heat sink/chassis/cold plate/etc. and the other "dry" side to release easily from the component(s)
0.060" (1.52 mm)	0.160" (4.06 mm)	
0.070" (1.78 mm)	0.170" (4.32 mm)	
0.080" (2.03 mm)	0.180" (4.57 mm)	
0.090" (2.29 mm)	0.190" (4.83 mm)	
0.100" (2.54 mm)	0.200" (5.08 mm)	**Reinforcement**
0.110" (2.79 mm)		Fiberglass is required in 0.020"(0.51 mm) through 0.030" (0.762 mm)
Contact Customer Service for other alternative thicknesses		Fiberglass is not an option in material thicknesses of 0.040 (1.02 mm) and above

GAP FILLERS



T-flex™ 600 Series

Highly Compliant Gap Filler with 3.0 W/mK

T-flex™ 600 Series is an exceptionally soft, highly compliant gap filling interface pad with a thermal conductivity of 3.0 W/mK. These outstanding properties are the result of a proprietary boron nitride filler in the composition.

The high conductivity, in combination with extreme softness, produces incredibly low thermal resistances. While extremely soft, T-flex™ 600 recovers to over 90% of its original thickness after compression under low pressure.

T-flex™ 600 is naturally tacky and requires no additional adhesive coating that can inhibit thermal performance. T-flex™ 600 is electrically insulating, stable from -45°C to 200°C and meets UL 94HB rating.

Features and Benefits

- Very high compliancy for low stress applications
- 3.0 W/mK thermal conductivity
- Available in 19 thicknesses 0.020" (0.5 mm) to 0.200" (5.0 mm)
- Naturally tacky needing no additional adhesive coating
- Release coating available on one side

Applications:

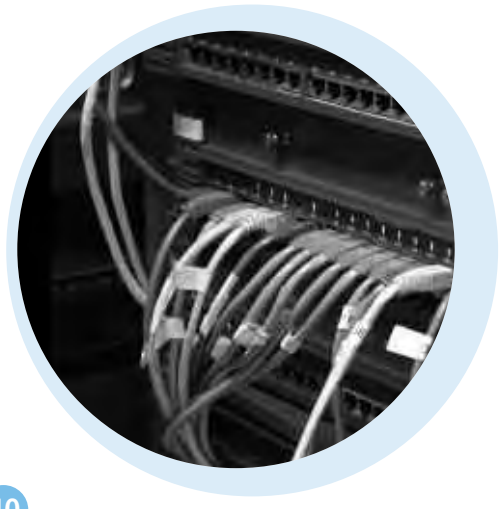
- Cooling multiple components to the chassis or frame
- High speed mass storage drives
- RDRAM memory modules
- Heat pipe thermal solutions
- Automotive engine control units
- Telecommunications hardware
- Fiberoptic transmission hardware

T-flex™ 600 Series 620 - 650

Property	T-flex™ 620	T-flex™ 630	T-flex™ 640	T-flex™ 650
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Blue Violet	Blue Violet	Blue Violet	Blue Violet
Thickness	0.02" (0.508 mm)	0.03" (0.762 mm)	0.04" (1.016 mm)	0.05" (1.270 mm)
Thickness Tolerance	+/- 0.003" (0.075 mm)	+/- 0.003" (0.075 mm)	+/- 0.004" (0.10 mm)	+/- 0.005" (0.13 mm)
Density	1.38 g/cc	1.37 g/cc	1.34 g/cc	1.34 g/cc
Hardness	40 Shore OO	40 Shore OO	25 Shore OO	25 Shore OO
Tensile Strength	NA	NA	15 psi	15 psi
Elongation %	NA	NA	75	75UL
Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	0.46°C-in^2/W	0.58°C-in^2/W	0.62°C-in^2/W	0.71°C-in^2/W
Thermal Impedance @ 69 KPa	2.97°C-cm^2/W	3.74°C-cm^2/W	4.00°C-cm^2/W	4.58°C-cm^2/W
Coefficient of Thermal Expansion	600 ppm/°C	600 ppm/°C	430 ppm/°C	430 ppm/°C
Volume Resistivity	2x10^{13} ohm-cm	2x10^{13} ohm-cm	2x10^{13} ohm cm	2x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	3.31	3.31	3.31	3.31
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001

T-flex™ 600 Series 660 - 690

Property	T-flex™ 660	T-flex™ 670	T-flex™ 680	T-flex™ 690
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Blue Violet	Blue Violet	Blue Violet	Blue Violet
Thickness	0.06" (1.524 mm)	0.07" (1.778 mm)	0.08" (2.032 mm)	0.09" (2.286 mm)
Thickness Tolerance	+/- 0.006" (0.15 mm)	+/- 0.007" (0.18 mm)	+/- 0.008" (0.20 mm)	+/- 0.009" (0.23 mm)
Density	1.34 g/cc	1.34 g/cc	1.34 g/cc	1.34 g/cc
Hardness	25 Shore OO	25 Shore OO	25 Shore OO	25 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	75	75	75	75
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	0.85°C-in^2/W	0.96°C-in^2/W	1.09°C-in^2/W	1.16°C-in^2/W
Thermal Impedance @ 69 KPa	5.50°C-cm^2/W	6.17°C-cm^2/W	7.04°C-cm^2/W	7.48°C-cm^2/W
Coefficient of Thermal Expansion	430 ppm/°C	430 ppm/°C	430 ppm/°C	430 ppm/°C
Volume Resistivity	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm
Dielectric Constant @ 1 MHz	3.31	3.31	3.31	3.31
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001

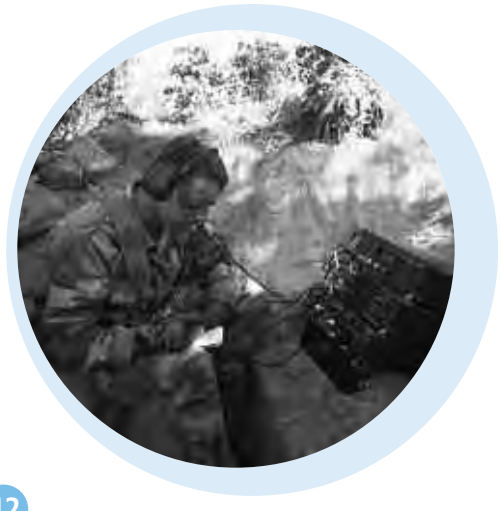


T-flex™ 600 Series 6100 - 6130

Property	T-flex™ 6100	T-flex™ 6110	T-flex™ 6120	T-flex™ 6130
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Blue Violet	Blue Violet	Blue Violet	Blue Violet
Thickness	0.10" (2.54 mm)	0.11" (2.794 mm)	0.12" (3.048 mm)	0.13" (3.302 mm)
Thickness Tolerance	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)
Density	1.34 g/cc	1.34 g/cc	1.34 g/cc	1.34 g/cc
Hardness	25 Shore OO	25 Shore OO	25 Shore OO	25 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	75	75	75	75
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	1.23°C-in^2/W	1.33°C-in^2/W	1.40°C-in^2/W	1.54°C-in^2/W
Thermal Impedance @ 69 KPa	7.94°C-cm^2/W	8.57°C-cm^2/W	9.04°C-cm^2/W	9.94°C-cm^2/W
Coefficient of Thermal Expansion	430 ppm/°C	430 ppm/°C	430 ppm/°C	430 ppm/°C
Volume Resistivity	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm
Dielectric Constant @ 1 MHz	3.31	3.31	3.31	3.31
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001

T-flex™ 600 Series 6140 - 6170

Property	T-flex™ 6140	T-flex™ 6150	T-flex™ 6160	T-flex™ 6170
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer
Color	Blue Violet	Blue Violet	Blue Violet	Blue Violet
Thickness	0.14" (3.556 mm)	0.15" (3.81 mm)	0.16" (4.064 mm)	0.17" (4.318 mm)
Thickness Tolerance	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)	+/- 0.010" (0.25 mm)
Density	1.34 g/cc	1.34 g/cc	1.34 g/cc	1.34 g/cc
Hardness	25 Shore OO	25 Shore OO	25 Shore OO	25 Shore OO
Tensile Strength	15 psi	15 psi	15 psi	15 psi
Elongation %	75	75	75	75
UL Flammability Rating	94 HB	94 HB	94 HB	94 HB
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	1.65°C-in^2/W	1.71°C-in^2/W	1.79°C-in^2/W	1.86°C-in^2/W
Thermal Impedance @ 69 KPa	10.65°C-cm^2/W	11.03°C-cm^2/W	11.53°C-cm^2/W	12.00°C-cm^2/W
Coefficient of Thermal Expansion	430 ppm/°C	430 ppm/°C	430 ppm/°C	430 ppm/°C
Volume Resistivity	2x10^{13} ohm-cm	2x10^{13} ohm-cm	2x10^{13} ohm-cm	2x10^{13} ohm-cm
Dielectric Constant @ 1 MHz	3.31	3.31	3.31	3.31
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	<0.001



T-flex™ 600 Series 6180 - 6200 and Test Methods

Property	T-flex™ 6180	T-flex™ 6190	T-flex™ 6200	Test Method
Construction and Composition	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	Boron nitride filled, silicone elastomer	-
Color	Blue Violet	Blue Violet	Blue Violet	Visual
Thickness	0.18" (4.572 mm)	0.19" (4.826 mm)	0.20" (5.08 mm)	-
Thickness Tolerance	+/- 0.012" (0.30 mm)	+/- 0.012" (0.30 mm)	+/- 0.015" (0.38 mm)	-
Density	1.34 g/cc	1.34 g/cc	1.34 g/cc	Helium Pycnometer
Hardness	25 Shore OO	25 Shore OO	25 Shore OO	ASTM D2240
Tensile Strength	15 psi	15 psi	15 psi	ASTM D412
Elongation %	75	75	75	ASTM D412
UL Flammability Rating	94 HB	94 HB	94 HB	UL
Shelf Life	Indefinite	Indefinite	Indefinite	-
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	ASTM D5470 (modified)
Thermal Impedance @ 10 psi	1.93°C-in^2/W	2.05°C-in^2/W	2.16°C-in^2/W	ASTM D5470 (modified)
Thermal Impedance @ 69 KPa	12.45°C-cm^2/W	13.23°C-cm^2/W	13.94°C-cm^2/W	ASTM D5470 (modified)
Coefficient of Thermal Expansion	430 ppm/°C	430 ppm/°C	430 ppm/°C	IPC-TM-650 2,4,24
Volume Resistivity	2x10^{13} ohm-cm	2x10^{13} ohm-cm	2x10^{13} ohm-cm	ASTM D257
Dielectric Constant @ 1 MHz	3.31	3.31	3.31	ASTM D150
Dissipation Factor @ 1 MHz	<0.001	<0.001	<0.001	ASTM D150

T-flex™ 600 Product Options

Standard	0.130" (3.30 mm)
0.020" (0.51 mm)	0.140" (3.56 mm)
0.030" (0.76 mm)	0.150" (3.81 mm)
0.040" (1.02 mm)	0.160" (4.06 mm)
0.050" (1.27 mm)	0.170" (4.32 mm)
0.060" (1.52 mm)	0.180" (4.57 mm)
0.070" (1.78 mm)	0.190" (4.83 mm)
0.080" (2.03 mm)	0.200" (5.08 mm)
0.090" (2.29 mm)	Contact Customer Service for alternative thicknesses
0.100" (2.54 mm)	
0.110" (2.79 mm)	
0.120" (3.05 mm)	

Standard Sheets Sizes

9" x 9" (229 mm x 229 mm) and 18" x 18" (457 mm x 457 mm)
9" x 9" only over 0.100" thickness
T-flex™ 600 is available in individual die-cut shapes

Pressure Sensitive Adhesive

Pressure sensitive adhesive is not applicable for T-flex™ products

Tacky One Side Only

T-flex™ 600 is naturally tacky on both sides but can be provided tacky on one side only. This is indicated by the suffix "DC1". This option offers good separation properties allowing the tacky side to stick to the heat sink/chassis/cold plate/etc. and the other "dry" side to release easily from the component

Reinforcement

Fiberglass is required in 0.020"(0.51 mm) and 0.030" (0.76 mm)
Fiberglass is not an option in material thicknesses of 0.040"(1.02 mm) and above

T-putty™ 502 Series

Ultra Compliant Thermal Gap Filler with 3.0 W/mK

T-putty™ 502 Series is the best material for applications where large tolerance differences create the need for compression of interface material beyond 50% of its original thickness.

T-putty™ 502 flows to ensure low pressures on the components being cooled. In conjunction with outstanding compliance characteristics, T-putty™ 502 has a high thermal conductivity that results in very low thermal resistance.

T-putty™ 502 is naturally tacky and requires no further adhesive coating, which would inhibit thermal performance. T-putty™ 502 has a hardness of 5 (Shore OO), is electrically insulating and is stable from -45°C to 200°C.

Features and Benefits

- Soft and ultra high compliancy for low stress applications
- 3.0 W/mK thermal conductivity
- Available in sheets (from 0.020" to 0.200" thick) and in bulk
- Naturally tacky needing no further adhesive coating

Applications:

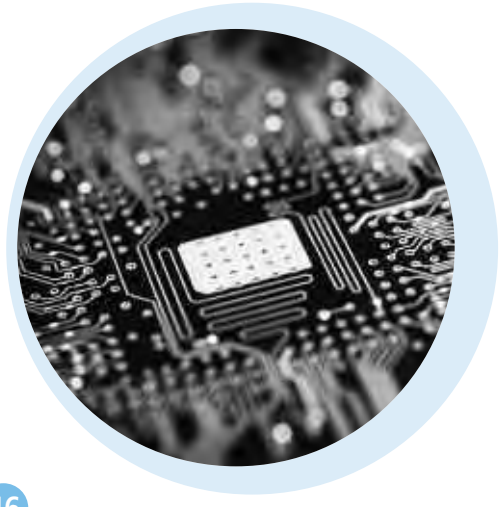
- Cooling multiple components to the chassis or frame
- Entire large panel printed circuit board cooling
- Semiconductor automated test equipment
- Any high compression low stress application

T-putty™ 502 Series .02 - .05

Property	T-putty™ 502 0.020	T-putty™ 502 0.030	T-putty™ 502 0.040	T-putty™ 502 0.050
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced
Color	White	White	White	White
Thickness	0.02" (0.508 mm)	0.03" (0.762 mm)	0.04" (1.016 mm)	0.05" (1.270 mm)
Thickness Tolerance	+/- 0.002" (0.05 mm)	+/- 0.002" (0.05 mm)	+/- 0.003" (0.075 mm)	+/- 0.003" (0.075 mm)
Density	1.39 g/cc	1.38 g/cc	1.38 g/cc	1.37 g/cc
Hardness (without fiberglass)	05 Shore OO	05 Shore OO	05 Shore OO	05 Shore OO
UL Flammability Rating	94V0	94V0	94V0	94V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	0.44°C-in^2/W	0.46°C-in^2/W	0.49°C-in^2/W	0.51°C-in^2/W
Thermal Impedance @ 69 KPa	2.84°C-cm^2/W	2.97°C-cm^2/W	3.16°C-cm^2/W	3.29°C-cm^2/W
Coefficient of Thermal Expansion	92 ppm/°C	92 ppm/°C	92 ppm/°C	92 ppm/°C
Volume Resistivity	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm
Dielectric Constant	3.20	3.20	3.20	3.20
Dissipation Factor	<0.001	<0.001	<0.001	<0.001

T-putty™ 502 Series .06 - .09

Property	T-putty™ 502 0.060	T-putty™ 502 0.070	T-putty™ 502 0.080	T-putty™ 502 0.090
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced
Color	White	White	White	White
Thickness	0.06" (1.524 mm)	0.07" (1.778 mm)	0.08" (2.032 mm)	0.09" (2.286 mm)
Thickness Tolerance	+/- 0.004" (0.10 mm)	+/- 0.004" (0.10 mm)	+/- 0.004" (0.10 mm)	+/- 0.005" (0.13 mm)
Density	1.37 g/cc	1.37 g/cc	1.37 g/cc	1.37 g/cc
Hardness (without fiberglass)	05 Shore OO	05 Shore OO	05 Shore OO	05 Shore OO
UL Flammability Rating	94V0	94V0	94V0	94V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	0.53°C-in^2/W	0.55°C-in^2/W	0.58°C-in^2/W	0.60°C-in^2/W
Thermal Impedance @ 69 KPa	3.42°C-cm^2/W	3.55°C-cm^2/W	3.74°C-cm^2/W	3.87°C-cm^2/W
Coefficient of Thermal Expansion	92 ppm/°C	92 ppm/°C	92 ppm/°C	92 ppm/°C
Volume Resistivity	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm	5x10^{13} ohm-cm
Dielectric Constant	3.20	3.20	3.20	3.20
Dissipation Factor	<0.001	<0.001	<0.001	<0.001



T-putty™ 502 Series .10 - .13

Property	T-putty™ 502 0.100	T-putty™ 502 0.110	T-putty™ 502 0.120	T-putty™ 502 0.130
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced
Color	White	White	White	White
Thickness	0.10"(2.54 mm)	0.11"(2.794 mm)	0.12"(3.048 mm)	0.13"(3.302 mm)
Thickness Tolerance	+/- 0.005"(0.13 mm)	+/- 0.005"(0.13 mm)	+/- 0.006"(0.15 mm)	+/- 0.006"(0.15 mm)
Density	1.36 g/cc	1.36 g/cc	1.36 g/cc	1.36 g/cc
Hardness (without fiberglass)	05 Shore OO	05 Shore OO	05 Shore OO	05 Shore OO
UL Flammability Rating	94V0	94V0	94V0	94V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	0.62°C-in^2/W	NA	NA	NA
Thermal Impedance @ 69 KPa	4.00°C-cm^2/W	NA	NA	NA
Coefficient of Thermal Expansion	92 ppm/°C	92 ppm/°C	92 ppm/°C	92 ppm/°C
Volume Resistivity	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm
Dielectric Constant	3.20	3.20	3.20	3.20
Dissipation Factor	<0.001	<0.001	<0.001	<0.001

T-putty™ 502 Series .13 - .17

Property	T-putty™ 502 0.140	T-putty™ 502 0.150	T-putty™ 502 0.160	T-putty™ 502 0.170
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced
Color	White	White	White	White
Thickness	0.14" (3.556 mm)	0.15" (3.81 mm)	0.16" (4.064 mm)	0.17" (4.318 mm)
Thickness Tolerance	+/- 0.006" (0.15 mm)	+/- 0.007" (0.18 mm)	+/- 0.007" (0.18 mm)	+/- 0.007" (0.18 mm)
Density	1.36 g/cc	1.36 g/cc	1.36 g/cc	1.36 g/cc
Hardness (without fiberglass)	05 Shore OO	05 Shore OO	05 Shore OO	05 Shore OO
UL Flammability Rating	94V0	94V0	94V0	94V0
Shelf Life	Indefinite	Indefinite	Indefinite	Indefinite
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-45 to 200°C
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	3.0 W/mK
Thermal Impedance @ 10 psi	NA	NA	NA	NA
Thermal Impedance @ 69 KPa	NA	NA	NA	NA
Coefficient of Thermal Expansion	92 ppm/°C	92 ppm/°C	92 ppm/°C	92 ppm/°C
Volume Resistivity	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm
Dielectric Constant	3.20	3.20	3.20	3.20
Dissipation Factor	<0.001	<0.001	<0.001	<0.001

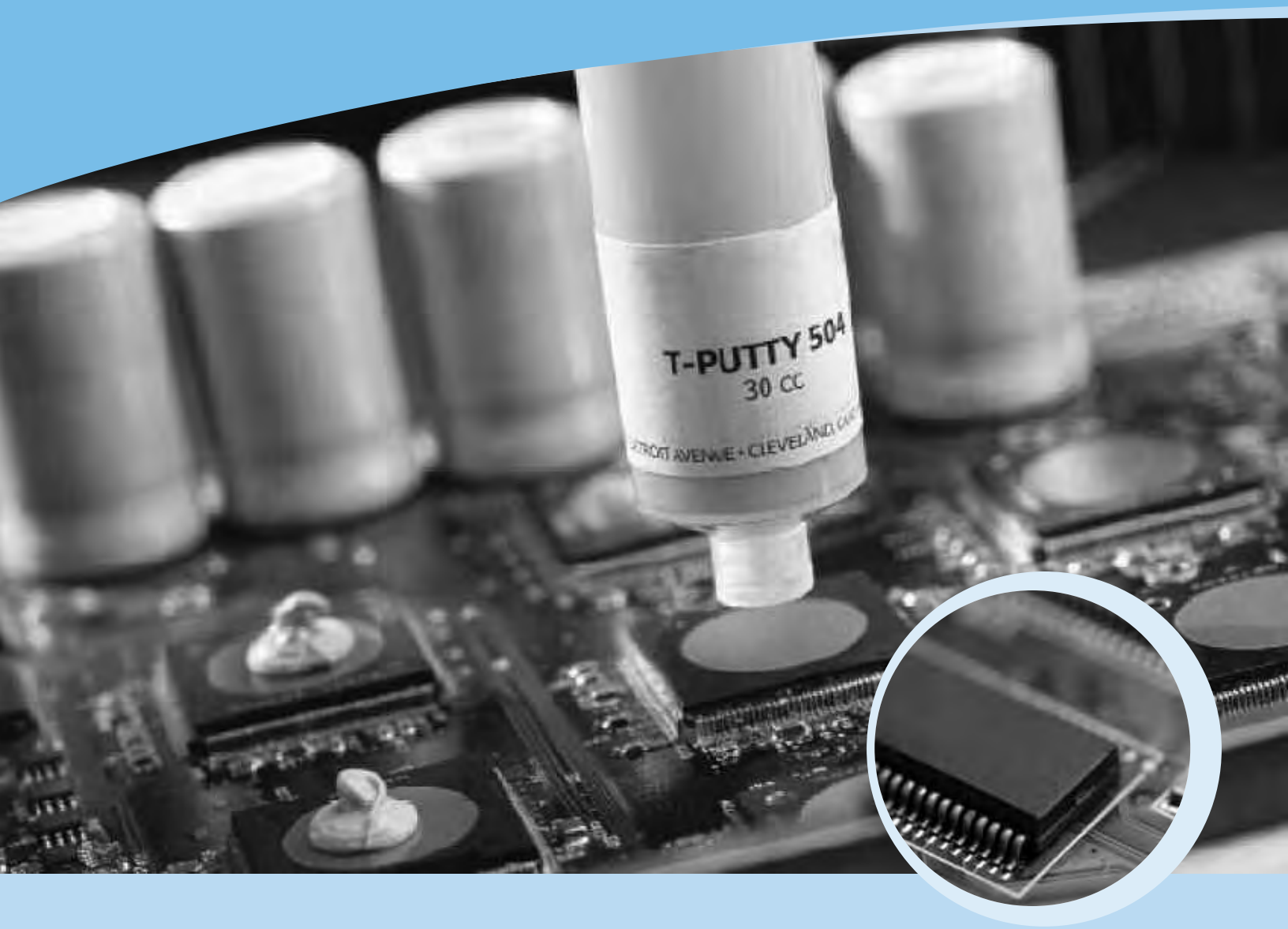
T-putty™ 502 Series .18 - .20 and Test Methods

Property	T-putty™ 502 0.180	T-putty™ 502 0.190	T-putty™ 502 0.200	Test Method
Construction and Composition	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	Boron nitride filled, silicone elastomer, fiberglass reinforced	-
Color	White	White	White	Visual
Thickness	0.18" (4.572 mm)	0.19" (4.826 mm)	0.20" (5.08 mm)	-
Thickness Tolerance	+/- 0.008" (0.20 mm)	+/- 0.008" (0.20 mm)	+/- 0.010" (0.25 mm)	-
Density	1.36 g/cc	1.36 g/cc	1.36 g/cc	Helium Pycnometer
Hardness (without fiberglass)	05 Shore OO	05 Shore OO	05 Shore OO	ASTM D2240
UL Flammability Rating	94V0	94V0	94V0	UL
Shelf Life	Indefinite	Indefinite	Indefinite	-
Temperature Range	-45 to 200°C	-45 to 200°C	-45 to 200°C	-
Thermal Conductivity	3.0 W/mK	3.0 W/mK	3.0 W/mK	ASTM D5470 (modified)
Thermal Impedance @ 10 psi	NA	NA	NA	ASTM D5470 (modified)
Thermal Impedance @ 69 KPa	NA	NA	NA	ASTM D5470 (modified)
Coefficient of Thermal Expansion	92 ppm/°C	92 ppm/°C	92 ppm/°C	IPC-TM-650 2,4,24
Volume Resistivity	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	$5x10^{13}$ ohm-cm	ASTM D257
Dielectric Constant	3.20	3.20	3.20	ASTM D150
Dissipation Factor	<0.001	<0.001	<0.001	ASTM D150

T-putty™ 502 Product Options

Standard Thicknesses		Bulk Putty
0.020" (0.51 mm)	0.140" (3.56 mm)	T-putty™ 502 is available in bulk form in the following sizes: 100cc Jar 500cc Jar 1000cc Jar Consult the factory for alternate bulk sizes
0.030" (0.76 mm)	0.150" (3.81 mm)	
0.040" (1.02 mm)	0.160" (4.06 mm)	
0.050" (1.27 mm)	0.170" (4.32 mm)	
0.060" (1.52 mm)	0.180" (4.57 mm)	
0.070" (1.78 mm)	0.190" (4.83 mm)	
0.080" (2.03 mm)	0.200" (5.08 mm)	
0.090" (2.29 mm)	Contact Customer Service for alternative thicknesses	**Standard Sheets Sizes**
0.100" (2.54 mm)		9" x 9" (229 mm x 229 mm) and 18" x 18" (457 mm x 457 mm) 9" x 9" only over 0.100" thickness Individual die-cut shapes can also be supplied
0.110" (2.79 mm)		**Pressure Sensitive Adhesive**
0.120" (3.05 mm)		Pressure sensitive adhesive is not applicable for T-putty™ products
0.130" (3.30 mm)		**Reinforcement**
		T-putty™ 502 sheets are reinforced on both sides

GAP FILLERS



T-putty™ 504 Series

Soft, silicone gel

T-putty™ 504 is a soft silicone gel thermal gap filler ideal for applications where large gap tolerances are present.

The silicone gel is filled with a complex matrix of ceramic fillers to yield superior thermal performance.

T-putty™ 504 is soft and compliant transferring little to no pressure between interfaces. Because T-putty™ 504 has a higher viscosity than grease, it eliminates the bleed, separation and pump-out usually associated with grease. Bond line variances can also be more easily controlled with T-putty™ 504 than with traditional thermal pads. T-putty™ 504 can be applied like grease and is easily dispensable from a wide range of commercially available equipment including screen print, syringe and automated equipment.

Features and Benefits:

- Soft and compliant transferring little to no pressure between interfaces
- 1.8 W/mK thermal conductivity
- Available in 10 and 30 cc syringes and cartridges
- Can be applied like grease and is easily dispensable from a wide range of commercially available equipment including screen print, syringe and automated equipment

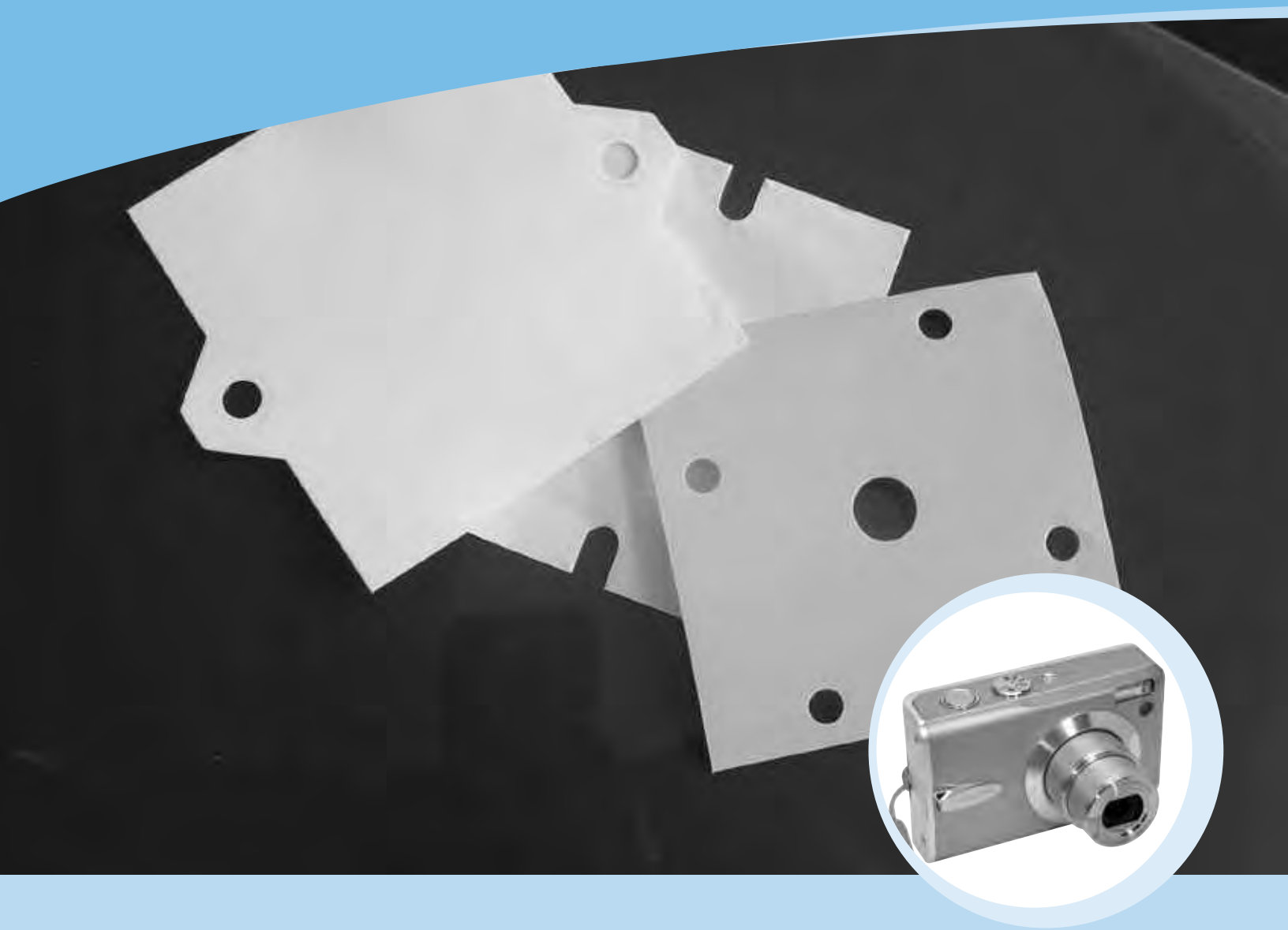
Applications:

- Flip chip microprocessors
- PPGA's, micro BGA's, BGA's
- DSP chips, graphic accelerator chips
- Other high wattage electronic components

T-putty™ 504 Product Data Table

Property	T-putty™ 504	Test Method
Construction and Composition	Ceramic-filled dispensable silicone gel	-
Color	Light Gray	-
Viscosity @°C, mPa.s (cP) Brookfield RV, TC spindle, Helipath @ 0.05 rpm	4.000.000	-
Temperature Range	-45 to 200 °C	-
Outgassing TML	0.34%	ASTM E595
Outgassing CVCM	0.09%	ASTM E595
Thermal Conductivity	1.8 W/mK	ASTM D5470 (modified)
Thermal Impedance Final Thickness @ 0.010	0.15 °C-in²/W (0.97 °C-cm²/W)	ASTM D5470 (modified)
Thermal Impedance Final Thickness @ 0.020	0.27 °C-in²/W (1.74 °C-cm²/W)	ASTM D5470 (modified)
Dielectric Strength	500 VAC/mil	ASTM D149
Volume Resistivity	>1014 ohm-cm	ASTM D257
MSDS	Details	-
Shelf Life	Indefinite	-

PHASE CHANGE
THERMAL INTERFACE MATERIALS



Thermal Phase Change Materials

Thermal phase change materials are solid pads at room temperature that melt at operating temperatures from intimate contact on the mating surfaces to produce low thermal resistance.

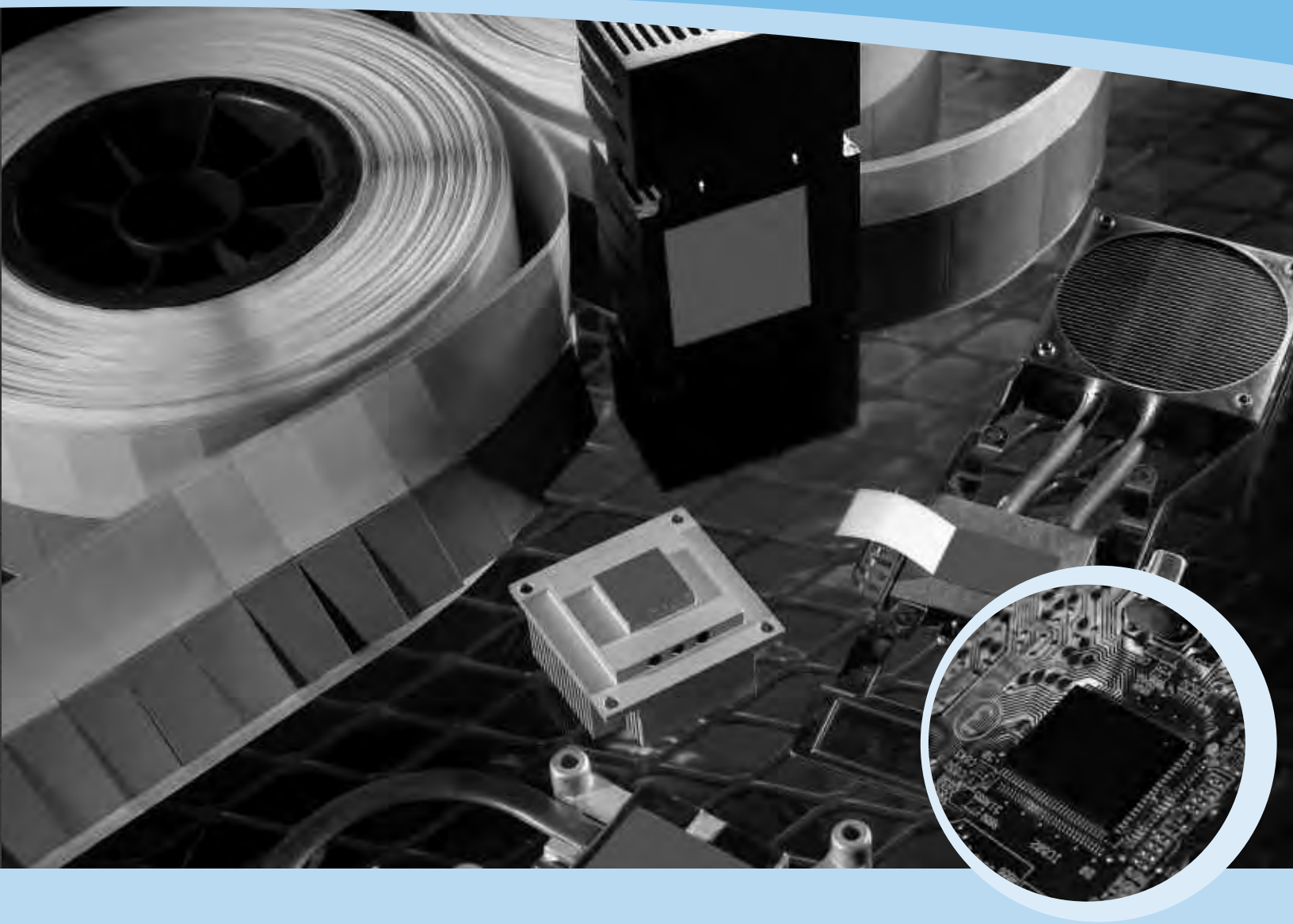
Laird Technologies offers a broad range of phase change materials (PCM) for a variety of applications.

Features and Benefits:

- Supplied on rolls with top tabbed liners for easy application; clearly superior to thermal grease application
- Provides superior surface wetting, minimum bondlines thickness and actively expels entrapped air, all leading to maximum thermal performance of any available phase change material
- Designed to provide stable and reliable performance

Applications:

- Microprocessors
- Chipsets
- Graphics processing units
- Custom ASICS
- Power components and modules



T-pcm™ 580 Series

High-Performance Thermal Phase Change Materials

T-pcm™ 580 Series are high performance thermal phase change materials designed to meet the thermal, reliability, and price requirements of high end thermal applications. T-pcm™ 580 Series is inherently tacky, flexible and exceptionally easy to use.

T-pcm™ 580 is available in four thicknesses 0.003" (T-pcm™ 583), 0.005"(T-pcm™ 585), 0.008" (T-pcm™ 588) and 0.010" (T-pcm™ 5810).

At temperatures above its transition temperature of 50oC (122oF), T-pcm™ 580 Series begins to soften and flow, filling the microscopic irregularities of the components it contacts. The result is an interface with minimal thermal contact resistance. Due to the gradual change in viscosity (softening), T-pcmTM 580 Series minimizes migration (pump out).

T-pcm™ 580 Series can be supplied as cut parts in strips and rolls with top tabbed liners for easy application. The top tabbed liner can be removed immediately or provide a protective cover during shipping and removed at assembly. T-pcm™ 580 Series can also be supplied in sheets and custom die cut configurations. T-pcmT™ 580 Series meets all environmental requirements including RoHS.

Features and Benefits

- Low total thermal resistance (0.013°C-in^2/W at 50 psi)
- Inherently tacky and easy to use - No adhesive required
- High reliability
- Meets all environmental requirements including RoHS
- Provides high value price / performance point

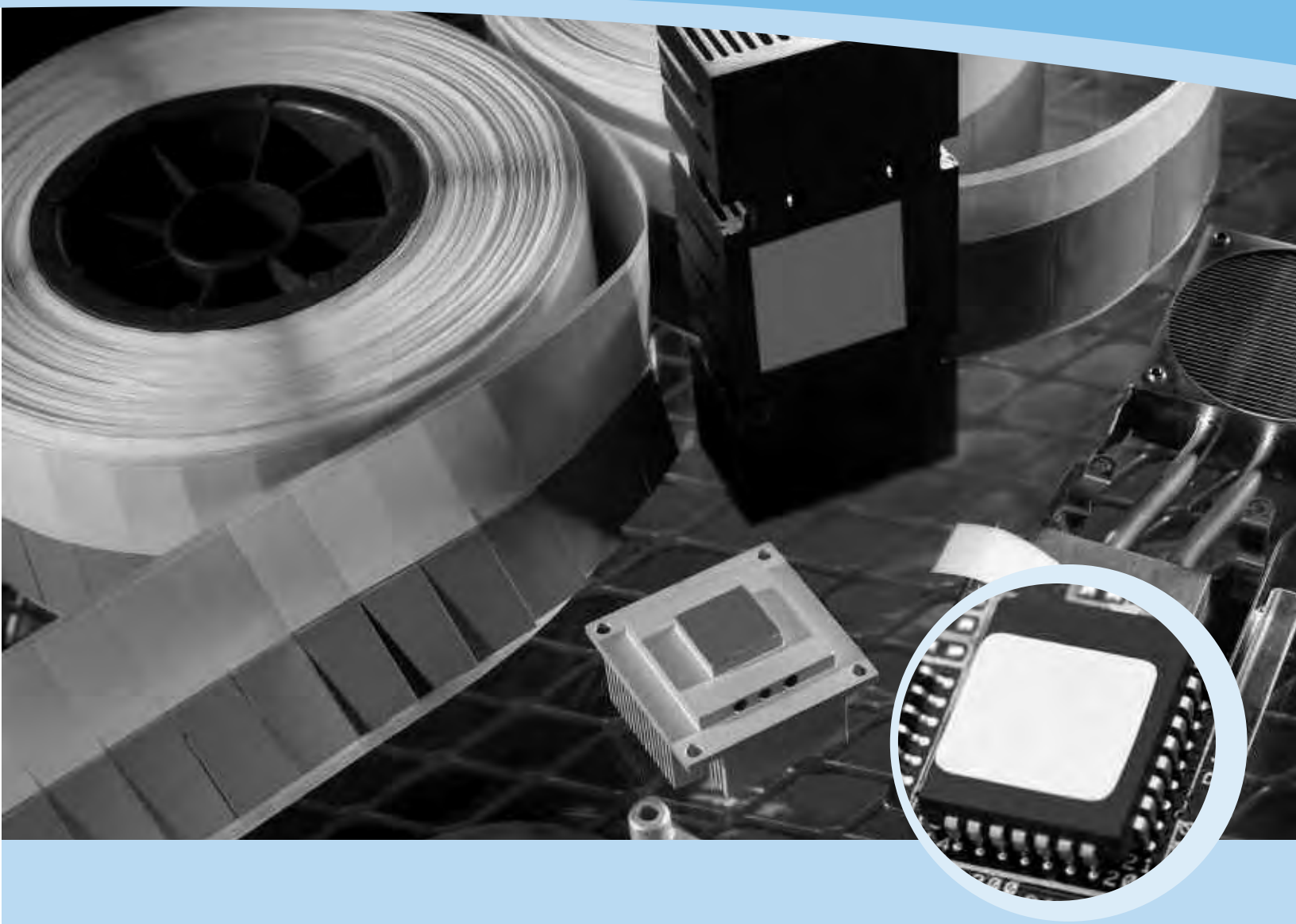
Applications:

- Microprocessors
- Chipsets
- Graphic processing chips
- Custom ASICS

PHASE CHANGE
THERMAL INTERFACE MATERIALS

T-pcm™ 580 Product Data Table

Properties	T-pcm 583	T-pcm 585	T-pcm 588	T-pcm 5810
Construction and Composition	Non-reinforced film	Non-reinforced film	Non-reinforced film	Non-reinforced film
Color	Gray	Gray	Gray	Gray
Thickness	0.003" (0.076mm)	0.005" (0.127mm)	0.008" (0.2mm)	0.010" (0.25mm)
Density	2.87 g/cc	2.87g/cc	2.87 g/cc	2.87 g/cc
Operating Temperature Range	-40 to 125°C (-40 to 257°F)	-40 to 125°C (-40 to 257°F)	-40 to 125°C (-40 to 257°F)	-40 to 125°C (-40 to 257°F)
Phase Change Softening Point	50°C (122°F)	50°C (122°F)	50°C (122°F)	50°C (122°F)
Thermal Resistance Modified ASTM D5470 10 psi	0.019°C-in²/W (0.12°C-cm²/W)	0.020°C-in²/W (0.13°C-cm²/W)	0.020°C-in²/W (0.13°C-cm²/W)	0.020°C-in²/W (0.13°C-cm²/W)
20 psi	0.016°C-in²/W 0.10°C-cm²/W)	0.016°C-in²/W (0.10°C-cm²/W)	0.016°C-in2/W (0.10°C-cm2/W)	0.016°C-in²/W (0.10°C-cm²/W)
50 psi	0.013°C-in2/W (0.08°C-cm2/W)	0.013°C-in²/W (0.08°C-cm²/W)	0.013°C-in²/W (0.08°C-cm²/W)	0.013°C-in²/W (0.08°C-cm²/W)
Thermal Conductivity	3.8 W/mK	3.8 W/mK	3.8 W/mK	3.8 W/mK
Volume Resistivity	3.0 x 10^{12} ohm-cm	3.0 x 10^{12} ohm-cm	3.0 x 10^{12} ohm-cm	3.0 x 10^{12} ohm-cm



T-pcm™ 580S

High Performance Phase Change Material

T-pcm™ 580S are high performance thermal phase change materials designed to meet the thermal, reliability, and price requirements of high end thermal applications. T-pcm™ 580S is inherently tacky, flexible and exceptionally easy to use. T-pcm™ 580S is available in different thicknesses 0.008" (T-pcm™ 588S) and 0.010" (T-pcm™ 5810S).

At temperatures above its transition temperature of 50°C (122°F), T-pcm™ 580S begins to soften and flow, filling the microscopic irregularities of the components it contacts. The result is an interface with minimal thermal contact resistance. Due to the gradual change in viscosity (softening), T-pcm™ 580S minimizes migration (pump out). T-pcm™ 580S is exceptionally soft to absorb shock and vibrations during extreme conditions and for easy separation of mated components.

T-pcm™ 580S can be supplied as cut parts in strips and rolls with top tabbed liners for easy application. The top tabbed liner can be removed immediately or provide a protective cover during shipping and removed at assembly. T-pcm™ 580S can also be supplied in sheets and custom die cut configurations. T-pcm™ 580S meets all environmental requirements including RoHS.

Features and Benefits

- Low total thermal resistance (0.010°C-in²/W at 50 psi)
- Inherently tacky and easy to use - No adhesive required
- High reliability
- Meets all environmental requirements including RoHS
- Provides high value price / performance point
- Formulated for easy release and rework

Applications:

- Microprocessors
- Memory chipsets
- Graphic processing chips
- Custom ASICS

T-pcm™ 580S Product Data Table

Properties	T-pcm 588S	T-pcm 5810S
Construction and Composition	Non-reinforced film	Non-reinforced film
Color	Gray	Gray
Thickness	0.008" (0.2mm)	0.010" (0.25mm)
Density	2.87 g/cc	2.87 g/cc
Operating Temperature Range	-40 to 125°C (-40 to 257°F)	-40 to 125°C (-40 to 257°F)
Transition Temperature	50°C (122°F)	50°C (122°F)
Thermal Resistance Modified ASTM D5470		
10 psi	0.015°C-in²/W (0.097°C-cm²/W)	0.015°C-in²/W (0.13°C-cm²/W)
20 psi	0.011°C-in²/W (0.071°C-cm²/W)	0.011°C-in²/W (0.10°C-cm²/W)
50 psi	0.010°C-in²/W (0.064°C-cm²/W)	0.010°C-in²/W (0.08°C-cm²/W)
Thermal Conductivity	4.0 W/mK	4.0 W/mK
Volume Resistivity	1.4 x 10^{12}ohm-cm	1.4 x 10^{12}ohm-cm
Hardness	50 (Shore 00)	50 (Shore 00)
Approximate Bondline Thickness	@ 10 psi = 0.0015in @ 50 psi = 0.001in	@ 10 psi = 0.0015in @ 50 psi = 0.001in

T-pcm™ 900 Series

Easy to Use, Low Thermal Resistance, Naturally Tacky Phase Change Material

T-pcm™ 900 Series is a high-performance, non-electrically conductive phase change material. T-pcm™ 900 is a flexible solid at room temperature and freestanding without a reinforcing layer that could reduce thermal performance. T-pcm™ 900 is naturally tacky providing easy application. Since no additional adhesive is required, a reduction in thermal performance is less likely to occur. At 50°C, T-pcm™ 900 begins to soften and flow filling the microscopic irregularities of both the thermal solution and the components surfaces, thereby reducing thermal interface resistance.

T-pcm™ 900 shows no thermal performance degradation after 1,000 hours @ 130°C, nor after 500 cycles, from -25°C to 125°C. T-pcm™ 900 uses a non-wax matrix whereby the material softens and does not fully change state, resulting in minimal migration (pump out).

T-pcm™ 900 is supplied in rolls with top tabbed liners for easy manual or large volume automatic application.

Individual die-cut parts can also be supplied.

Features and Benefits

- 0.03°C-in^2/W thermal resistance
- Naturally tacky; extremely easy to use
- Stable and reliable
- Available in three thicknesses; 0.005", 0.010" & 0.020" (0.125 mm, 0.25 mm, & 0.50 mm)

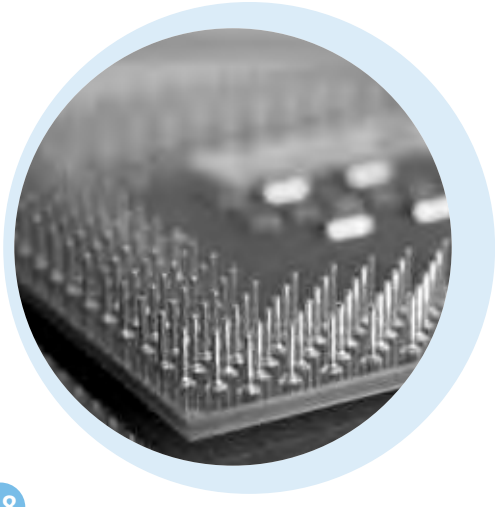
Applications:

- Microprocessors
- Chipsets
- Graphics processing units
- Custom ASICS
- Power components and modules

PHASE CHANGE
THERMAL INTERFACE MATERIALS

T-pcm™ 900 Product Data Table

Property	T-pcm™ 905C	T-pcm™ 910	T-pcm™ 920	Test Method
Construction and Composition	Non-reinforced boron nitride filled film	Non-reinforced boron nitride filled film	Non-reinforced boron nitride filled film	-
Color	Yellow	Yellow	Yellow	-
Thickness	0.005" (0.127 mm)	0.010" (0.254 mm)	0.020" (0.508 mm)	-
Thickness Tolerance	+/- 0.001" (0.025 mm)	+/- 0.001" (0.025 mm)	+/- 0.002" (0.050 mm)	-
Density	1.31 g/cc	1.39 g/cc	1.39 g/cc	-
Shelf Life	1 year	1 year	1 year	-
Temperature Range	-25 - 125°C	-25 - 125°C	-25 - 125°C	-
Phase Change Softening Range	50 - 70°C	50 - 70°C	50 - 70°C	-
Thermal Conductivity	0.7 W/mK	2.23 W/mK	2.23 W/mK	ASTM D5470 (modified)
Thermal Resistance @ 10 psi	0.05°C-in²/W 0.32°C-cm²/W	0.14<°C-in²/W 0.90°C-cm²/W	0.18°C-in²/W 1.16°C-cm²/W	ASTM D5470 (modified)
Thermal Resistance @ 50 psi	0.03°C-in²/W 0.19°C-cm²/W	0.08°C-in²/W 0.52°C-cm²/W	0.09°C-in²/W 0.58°C-cm²/W	ASTM D5470 (modified)
Volume Resistivity	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm	$2x10^{13}$ ohm-cm	ASTM D257
Dielectric Constant @ 1 MHz and 25C	3.1	3.1	3.1	ASTM D150



PHASE CHANGE
THERMAL INTERFACE MATERIALS

T-pcm™ Al-52

T-pcm™ Al-52 is a thermally conductive phase change material coated on both sides of aluminum foil. At temperatures greater than 52°C, T-pcm™ Al-52 changes into a molten state and, under low compression force, wets the heat sink and component surfaces to create a very thin, low thermal resistance interface.

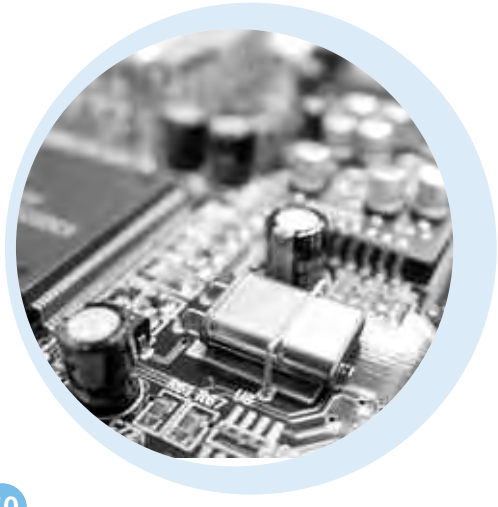
T-pcm™ Al-52 has great heat spreading characteristics and won't flow from the interface. T-pcm™ Al-52 has superior thermal performance comparable to the highest performing grease and phase change products available. T-pcm™ Al-52 is easy to handle and is a great replacement for messy grease.

T-pcm™ Al-52 is available as individual die-cut parts, kiss-cut parts on rolls or sheets, and uncut rolls. T-pcm™ Al-52 is available with or without adhesive.

PHASE CHANGE
THERMAL INTERFACE MATERIALS

T-pcm™ Al-52 Product Data Table

Typical Properties	T-pcm™ AL-52
Color	Gray
Thickness	0.003" (0.076mm)
Standard Coating Thickness per side	0.0005" (0.013mm)
Density	2.1 g/cc
Shelf Life	Indefinite
UL Flammability Rating	94V0
Maximum Use Temperature	200°C
Phase Change Softening Temperature	52°C
Thermal Impedance @ 5 psi @ 34.5 Kpa	 0.03°C-in²/W 0.193°C-cm²/W



T-pcm™ FSF-52

Thixotropic, Low Thermal Resistance, Wax Based Phase Change Material

T-pcm™ FSF-52, formerly known as Thermaphase®, is a wax-based self supporting film. It contains no substrate. At temperatures greater than 52°C, T-pcm™ FSF-52 changes into a molten state, wets the heat sink and component surfaces to create a very thin, low thermal resistance interface.

T-pcm™ FSF-52 is thixotropic and doesn't flow from the interface.

T-pcm™ FSF-52 is available as individual die-cut parts, kiss-cut parts on rolls or sheets and uncut rolls. T-pcm™ FSF-52 has a thickness of 0.005" (0.125 mm) and available with or without adhesive.

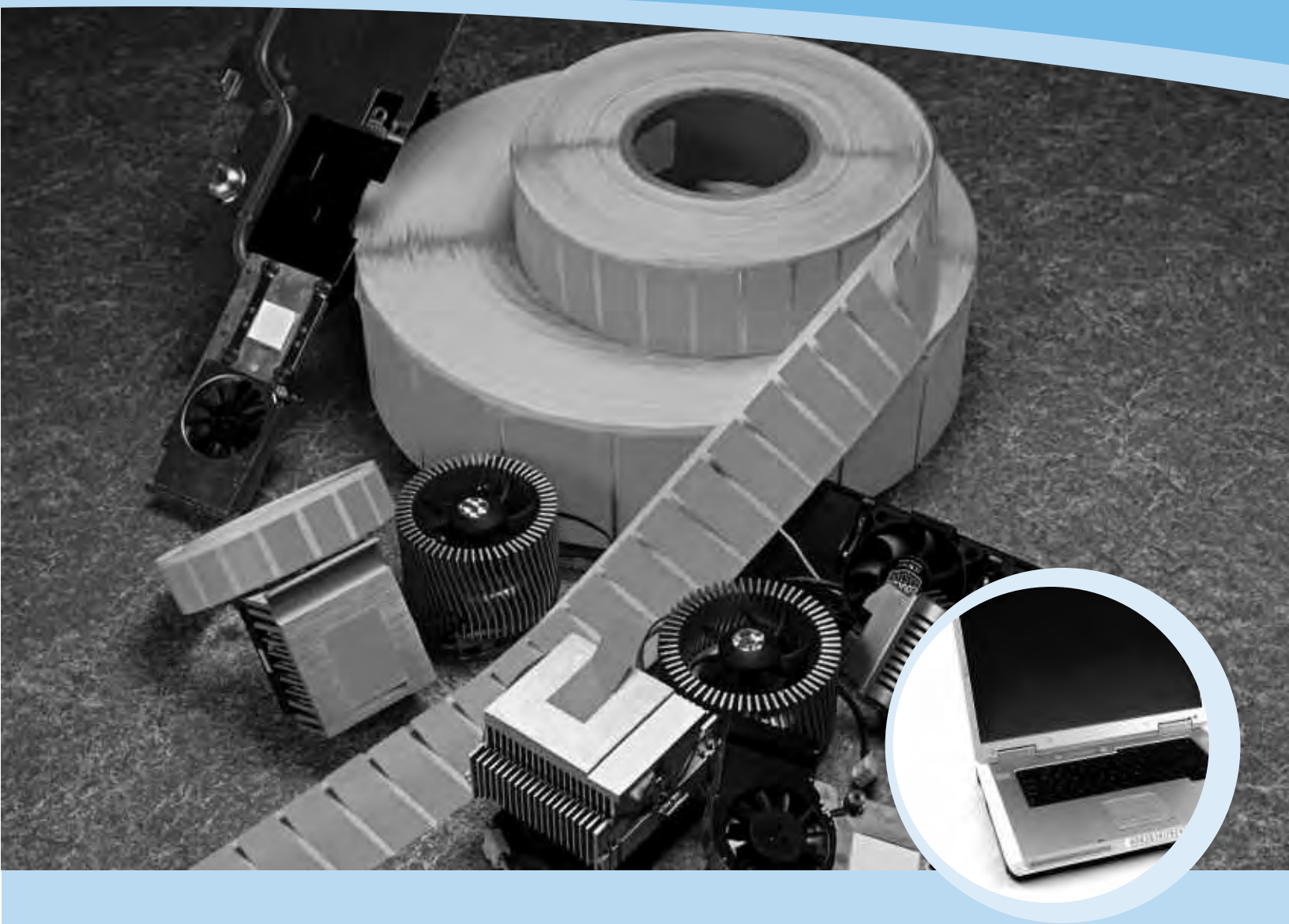
Applications:

- Microprocessors
- Chipsets
- Graphics processing units
- Custom ASICS
- Power components and modules

PHASE CHANGE
THERMAL INTERFACE MATERIALS

T-pcm™ FSF-52 Technical Specifications

Property	T-pcm™ FSF-52
Color	White
Thickness	0.005" (0.125 mm)
Thickness Tolerance	+/- 0.001" (0.025 mm)
Density	2.0 g/cc
Shelf Life	Indefinite
Maximum Temperature	200°C
Phase Change Temperature	52°C
Thermal Resistance @ 20 psi	0.03°C-in^2/W (0.193°C-cm^2/W)



T-pcm™ HP105

High-Performance, Naturally Tacky Phase Change Material

T-pcm™ HP105 is a high-performance phase change product with an exceptionally low thermal resistance. T-pcm™ HP105 is a flexible solid at room temperature and freestanding without a reinforcing layer that could reduce thermal performance. T-pcm™ HP105 is naturally tacky providing for easy application. Since no additional adhesive is required, a reduction in thermal performance is less likely to occur.

At 50°C, T-pcm™ HP105 begins to soften and flow filling the microscopic irregularities of both the thermal solution and the components surfaces, thereby reducing thermal interface resistance.

T-pcm™ HP105 shows no thermal performance degradation after thermal cycling at -20°C to 80°C for over 2500 cycles. T-pcm™ HP105 uses a non-wax matrix whereby the material softens and does not fully change state, resulting in minimal migration (pump out).

T-pcm™ HP105 is supplied in rolls with top tabbed liners for easy 0manual or large volume automatic application. Individual die-cut parts can also be supplied.

Features and Benefits

- 0.02°C-in^2/W thermal resistance
- Naturally tacky; extremely easy to use
- Stable and reliable

Applications:

- Microprocessors
- Chipsets
- Graphics processing units
- Custom ASICS
- Power components and modules

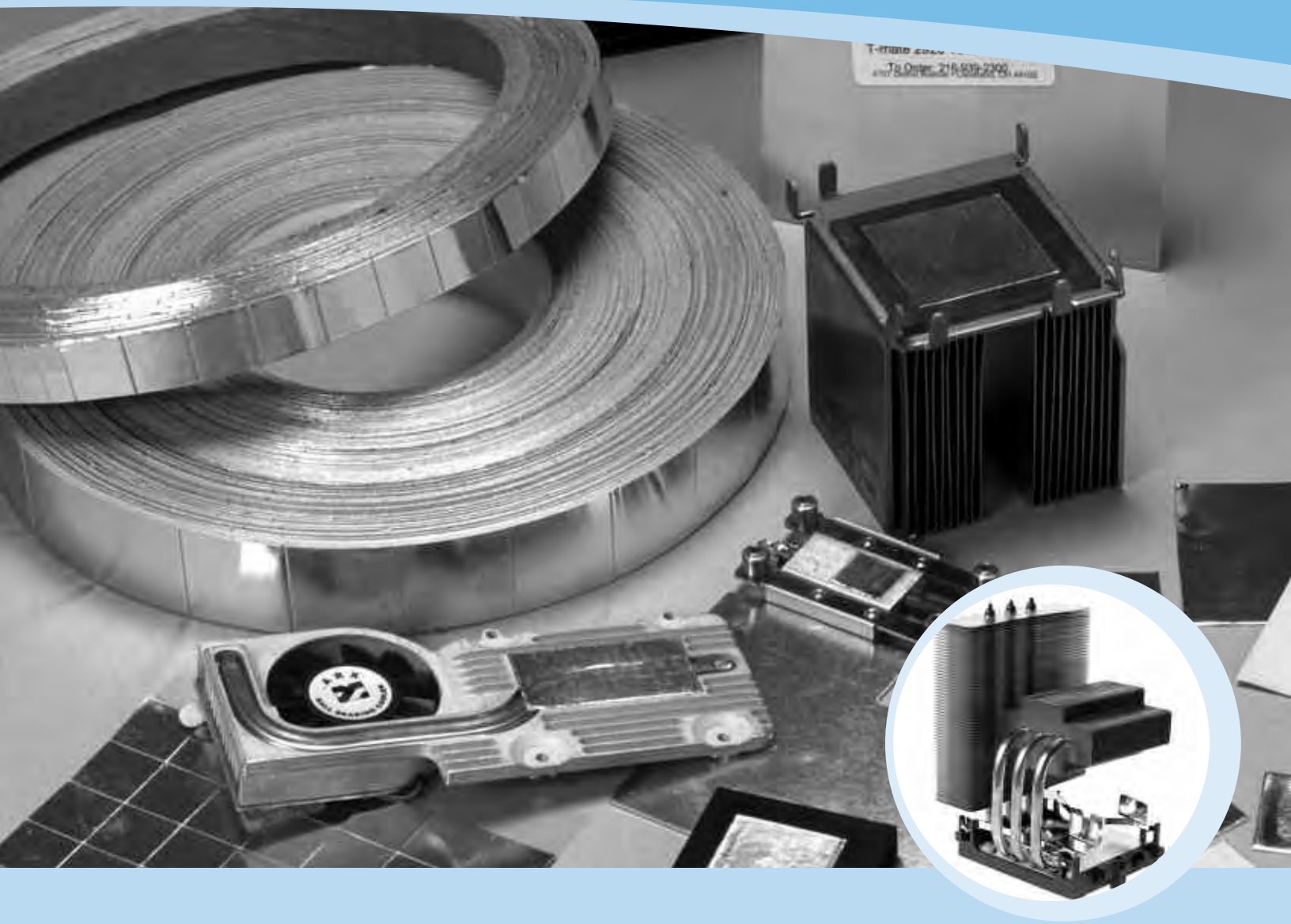
T-pcm™ HP105 Product Data Table

Property	T-pcm™ HP105	Test Method
Construction and Composition	Non-reinforced boron nitride filled film	-
Color	Off White	-
Thickness	0.005" (0.125 mm)	-
Thickness Tolerance	+/- 0.001" (0.025 mm)	-
Specific Gravity	1.30 g/cc	-
Shelf Life	1 year	-
Temperature Range	-25 – 125°C	-
Phase Change Softening Range	50°C +	-
Thermal Conductivity	0.73 W/mK	ASTM D5470 (modified)
Thermal Resistance @ 10 psi	0.024°C-in²/W (0.15°C-cm²/W)	ASTM D5470 (modified)
Thermal Resistance @ 50 psi	0.017°C-in²/W (0.11°C-cm²/W)	ASTM D5470 (modified)
Thermal Resistance @ 100 psi	0.015°C-in²/W (0.10°C-cm²/W)	ASTM D5470 (modified)
Volume Resistivity	$3x10^{14}$ ohm-cm	ASTM D257

T-pcm™ HP105 Product Options

Standard Thicknesses	Standard Sheets Sizes
0.005" (0.13 mm)	9" x 9" (229 mm x 229 mm) T-pcm™ HP105 sheets are supplied with white release paper top and bottom liner T-pcm™ HP105 is available in rolls with an extended tab liner Individual die-cut shapes can also be supplied
	Pressure Sensitive Adhesive
	Pressure sensitive adhesive is not applicable for T-pcm products
	Reinforcement
	No reinforcement is necessary

PHASE CHANGE THERMAL INTERFACE MATERIALS



T-mate™ 2900 Series

Reusable Thermal Phase Change Material

T-mate™ 2900 Series is a reusable phase change material designed for easy re-workability. The T-mate™ 2900 Series is comprised of a unique malleable metal foil and a high performance phase change material. At 50°C, the T-mate™ 2900 Series begins to soften and flow, filling the microscopic irregularities of the thermal solution, thus reducing thermal resistance. Due to the foil, the interface can be separated many times without needing to replace the pad. This is a benefit when multiple tests are required with the same thermal solution.

T-mate™ 2900 Series shows no thermal performance degradation after 1,000 hours @ 130°C nor after 500 cycles (-25°C to 125°C). The phase change material softens and does not fully change state resulting in minimal migration (pump out) at operating temperatures.

T-mate™ 2900 Series is available in thicknesses of 0.005", 0.010" and 0.020" (0.125 mm, 0.25 mm and 0.50 mm).

Features and Benefits

- Reusable; break and make interface connection many times
- Low thermal resistance at low pressures
- Naturally tacky at room temperature, no adhesive required

Applications:

- Microprocessors
- Chipsets
- Graphics processing units
- Custom ASICS
- Power components and modules
- Testing systems

PHASE CHANGE
THERMAL INTERFACE MATERIALS

T-mate™ 2900 Series 2905C - 2910 Product Data Table

Property	T-mate™ 2905C	T-mate™ 2905	T-mate™ 2910C	T-mate™ 2910
Construction and Composition	Foil coated on one side with phase change material	Foil coated on one side with phase change material	Foil coated on one side with phase change material	Foil coated on one side with phase change material
Color	Silver/Yellow	Silver/Yellow	Silver/Yellow	Silver/Yellow
Thickness	0.005" (0.127 mm)	0.005" (0.127 mm)	0.010" (0.254 mm)	0.010" (0.254 mm)
Thickness Tolerance	+/- 0.001" (0.025 mm)	+/- 0.001" (0.025 mm)	+/- 0.001" (0.025 mm)	+/- 0.001" (0.025 mm)
Density	1.86 g/cc	1.86 g/cc	1.58 g/cc	1.64 g/cc
Shelf Life	1 year	6 months	1 year	1 year
Temperature Range	-25 - 125°C	-25 - 125°C	-25 - 125°C	-25 - 125°C
Phase Change Softening Range	50°C +	50°C +	50°C +	50°C +
Thermal Resistance @ 20 psi	0.07°C-in^2/W 0.45°C-cm^2/W	0.11°C-in^2/W 0.71°C-cm^2/W	0.09°C-in^2/W 0.61°C-cm^2/W	0.18°C-in^2/W 1.16°C-cm^2/W
Volume Resistivity	5x10^{12} ohm-cm	5x10^{12} ohm-cm	5x10^{12} ohm-cm	5x10^{12} ohm-cm
Dielectric Constant @ 1 MHz and 25C	4.2	4.2	4.2	4.2

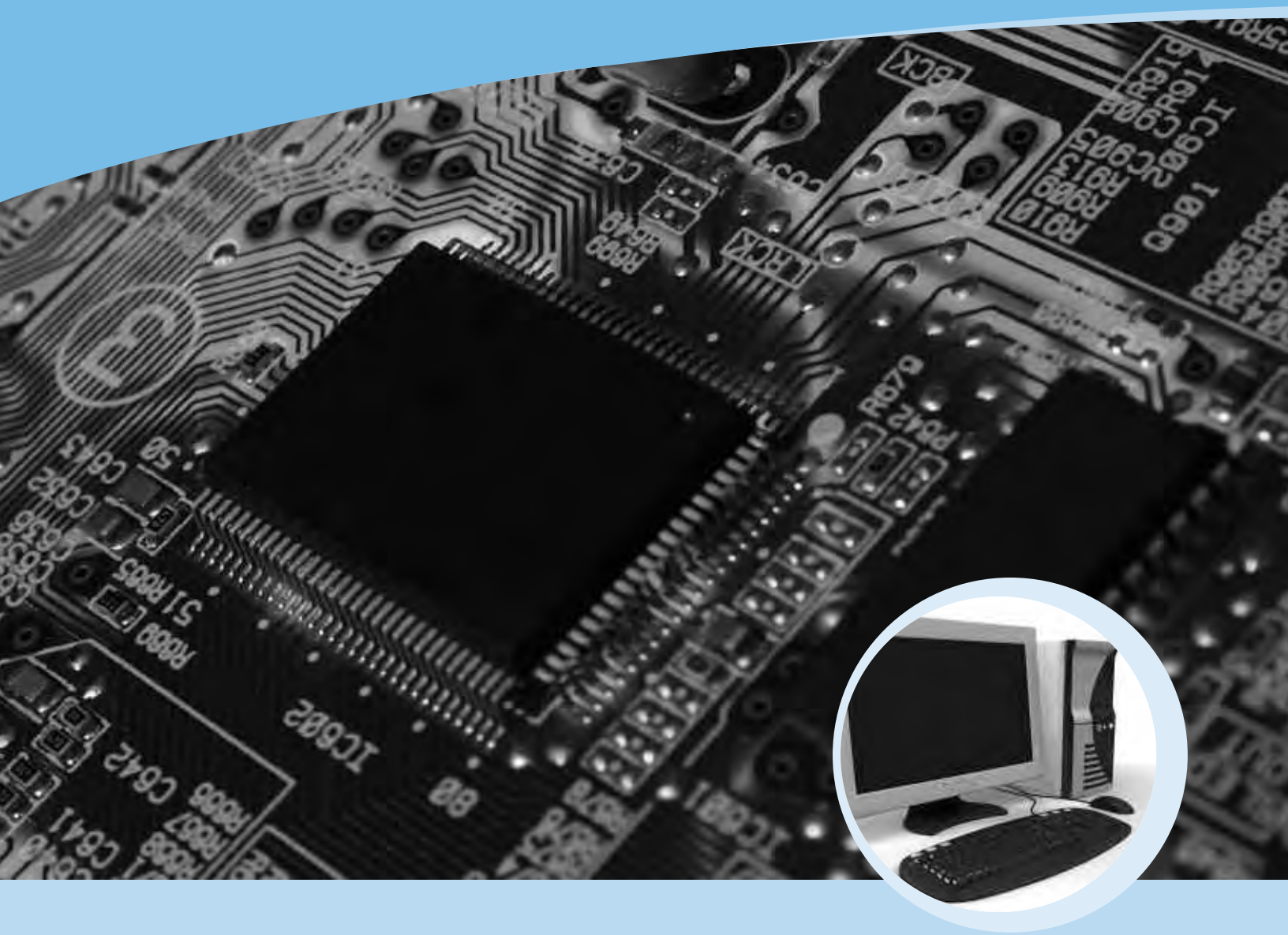
T-mate™ 2900 Series

Property	T-mate™ 2920	Test Method
Construction and Composition	Foil reinforced boron nitride filled film	-
Color	Silver/Yellow	Visual
Thickness	0.020" (0.51 mm)	-
Thickness Tolerance	+/- 0.002" (0.05 mm)	-
Density	1.52 g/cc	-
Shelf Life	1 year	-
Temperature Range	-25 – 125°C	-
Phase Change Softening Range	50°C +	-
Thermal Resistance @ 20 psi	0.27°C-in^2/W (1.74°C-cm^2/W)	ASTM D5470 (modified)
Volume Resistivity	5 x 10^{12}ohm-cm	ASTM D257
Dielectric Constant @ 1 MHz and 25C	4.2	ASTM D150

T-mate™ 2900 Series Product Options

Standard Thicknesses	Standard Sheets Sizes
0.005" (0.13 mm) 0.010" (0.25 mm) 0.020" (0.51 mm)	9" x 9" (229 mm x 229 mm) T-mate sheets are supplied with clear polyester top liner and aluminum foil bottom liner T-mate is available in rolls and individual die-cut shapes
	Pressure Sensitive Adhesive
	Pressure sensitive adhesive is not applicable for T-mate products
	Fiberglass Reinforcement
	T-mate is not fiberglass reinforced

THERMAL GREASES



T-grease™

High-Performance Thermal Grease

Laird Technologies' high-performance thermal greases help cool today's most demanding electronics applications. Laird Technologies thermal grease technology provides high thermal conductivities, minimum bond-line thicknesses and superior surface wetting.
This combination creates industry leading low thermal resistances.

The company's thermal greases are designed to provide outstanding reliability. The thermal greases do not dry out or pump-out and remain stable through all industry standard reliability testing.

They are further designed for easy application, with viscosities designed to ensure screen printing and stencil processing are optimized.

Laird Technologies thermal greases are environmentally friendly meeting all regulatory provisions including RoHS.

Applications:

- CPUs for desktop and notebook computers and servers
- GPUs
- Chipsets and power components that do not require electrical isolation

T-grease™ 880

Ultra Low Thermal Resistance Thermal Grease

T-grease™ 880 is a silicone based, high-performance thermal grease designed to meet the thermal, reliability and price requirements of high end CPUs, GPUs and custom ASICs chips.

With superior wetting properties to comparable grease, T-grease™ 880 fills the microscopic irregularities of the components it contacts, resulting in very low thermal resistance.

Providing outstanding reliability and stability, T-grease™ 880 does not dry out, settle, harden or pump out. In addition, it meets all environmental standards including RoHS.

T-grease™ 880 is easy to use, affording an enhanced viscosity for screen printing and stencilling.

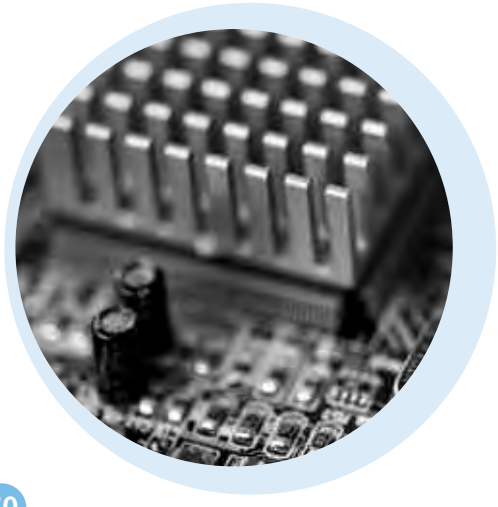
Supplied in 1/2 kg, 1 kg and 3 kg containers, and syringes are available upon request.

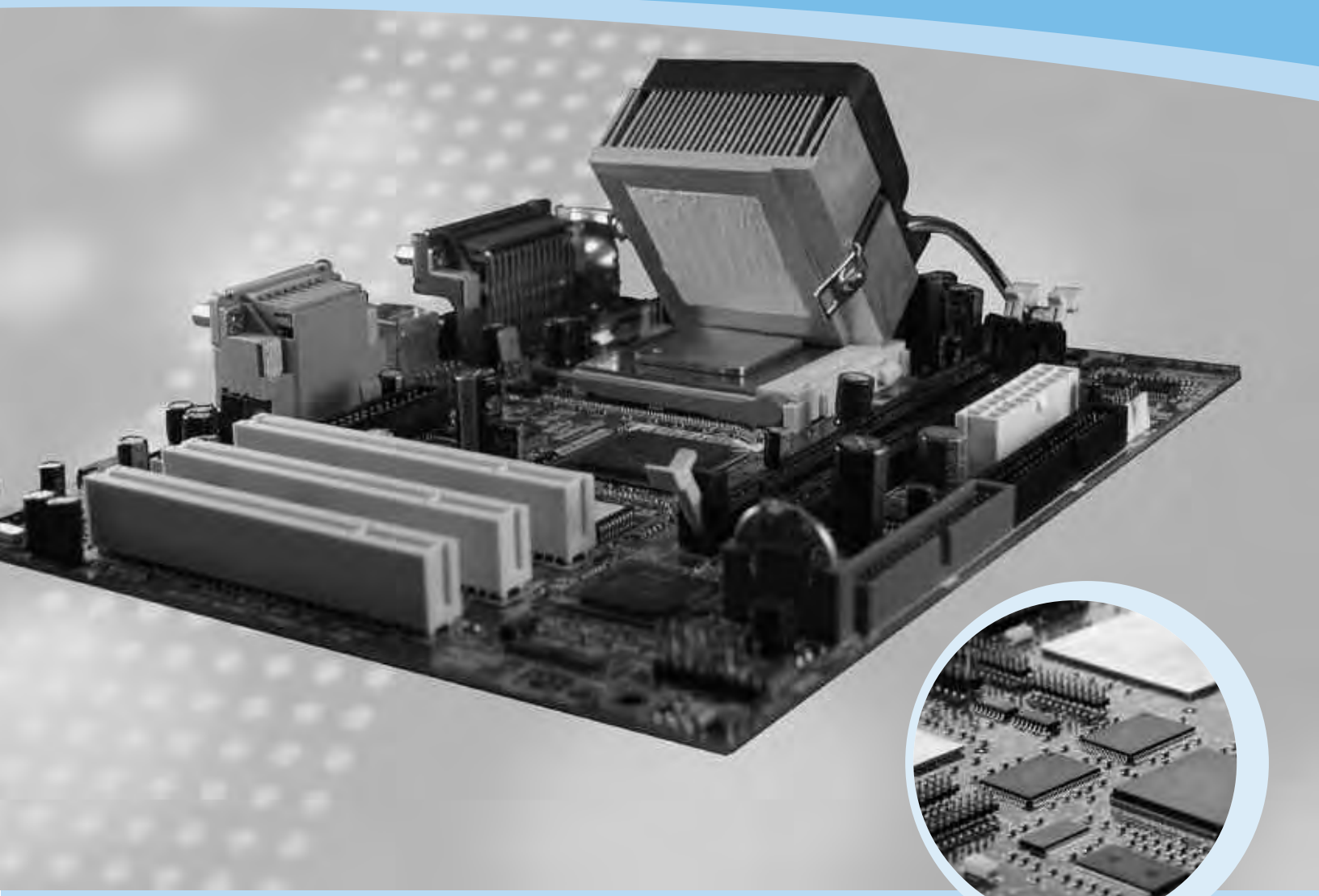
Applications:

- CPUs for servers, notebook and desktop computers
- GPUs (graphics chips)
- Northbridge chipsets
- Custom ASICS chips

Technical Specifications

Property	T-grease™ 880	Test Method
Color	Gray	Visual
Density	2.73 g/cc	-
Viscosity	< 1.500.000 cps TF spindle at 2 rpm helipath and 23°C	Brookfield Viscometer
Temperature Range	-40 – 150°C (-40 – 302°F)	-
UL Rating	94V0	UL
Thermal Conductivity	3.1 W/mK	ASTM D5470 (modified)
Thermal Resistance at 10 psi	0.014°C-in²/W (0.099°C-cm²/W)	ASTM D5470 (modified)
Thermal Resistance at 20 psi	0.010°C-in²/W (0.065°C-cm²/W)	ASTM D5470 (modified)
Thermal Resistance at 50 psi	0.009°C-in²/W (0.058°C-cm²/W)	ASTM D5470 (modified)
Volume Resistivity	$9x10^{13}$ ohm-cm	ASTM D257
Dielectric Constant	14.1@1KHz/13.9@MHz	ASTM D257
TML (Total Mass Lost)	0.38%	-
CVCM (Collected Volatile Condensable Material)	0.16% (clear)	-
WVR (Water Vapour Recovered)	0.01% (detection capability is only 0.01%)	-





T-grease™ 1500

Silicone Based Thermal Grease

T-grease™ 1500 is low cost, low bleed silicone-based thermal grease designed to increase heat flow from processors to heat sinks, leading to better performance and longer life. T-grease™ 1500 provides low thermal resistance over a wide range of pressures.

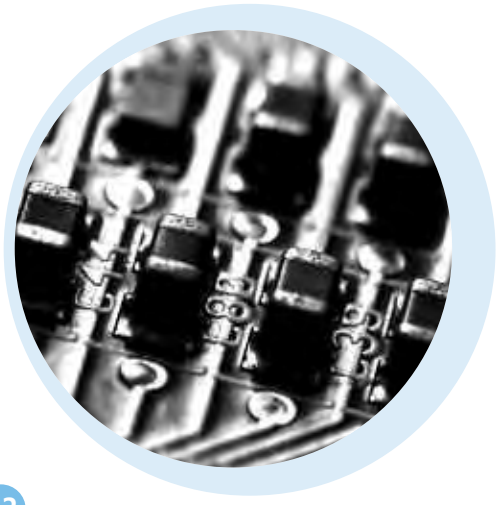
Applications for T-grease™ 1500 include interfacing between: semiconductor cases and heat sinks, power resistors and chassis, thermostats and mating surfaces, and thermoelectric cooling devices.

Applications:

- Semiconductor cases and heats sinks
- Power resistors and chassis
- Thermostats and mating surfaces
- Thermoelectric cooling devices

Technical Specifications

Typical Properties	T-grease 1500
Color	White
Density	2.6 g/cm^3
Viscosity	Screen Printable and Easily Stencilled
Operating Temperature Range	-40°C to 140°C
Thermal Conductivity	1.2 W/mK
Thermal Impedance @ 50 psi @ 20 psi @ 10 psi	 0.026°C-in^2/W 0.028°C-cm^2 0.040°C-cm^2/W



T-grease™ 2500

Silicone Free Thermal Grease for High-Performance Applications

When environmental restrictions limit the use of silicone, T-grease™ 2500 provides the answer. This non-silicone based grease provides comparable low thermal resistance to silicone-based thermal greases.

With a high thermal conductivity of 3.8 W/mK, T-grease™ 2500 thoroughly wets thermal surfaces to create a very low thermal resistance.

T-grease™ 2500 eliminates migration issues of silicone-based grease to create superior reliability.

T-grease™ 2500 is ideal for situations where automatic dispensing and screen printing are required. T-grease™ 2500 is non-toxic and environmentally safe.

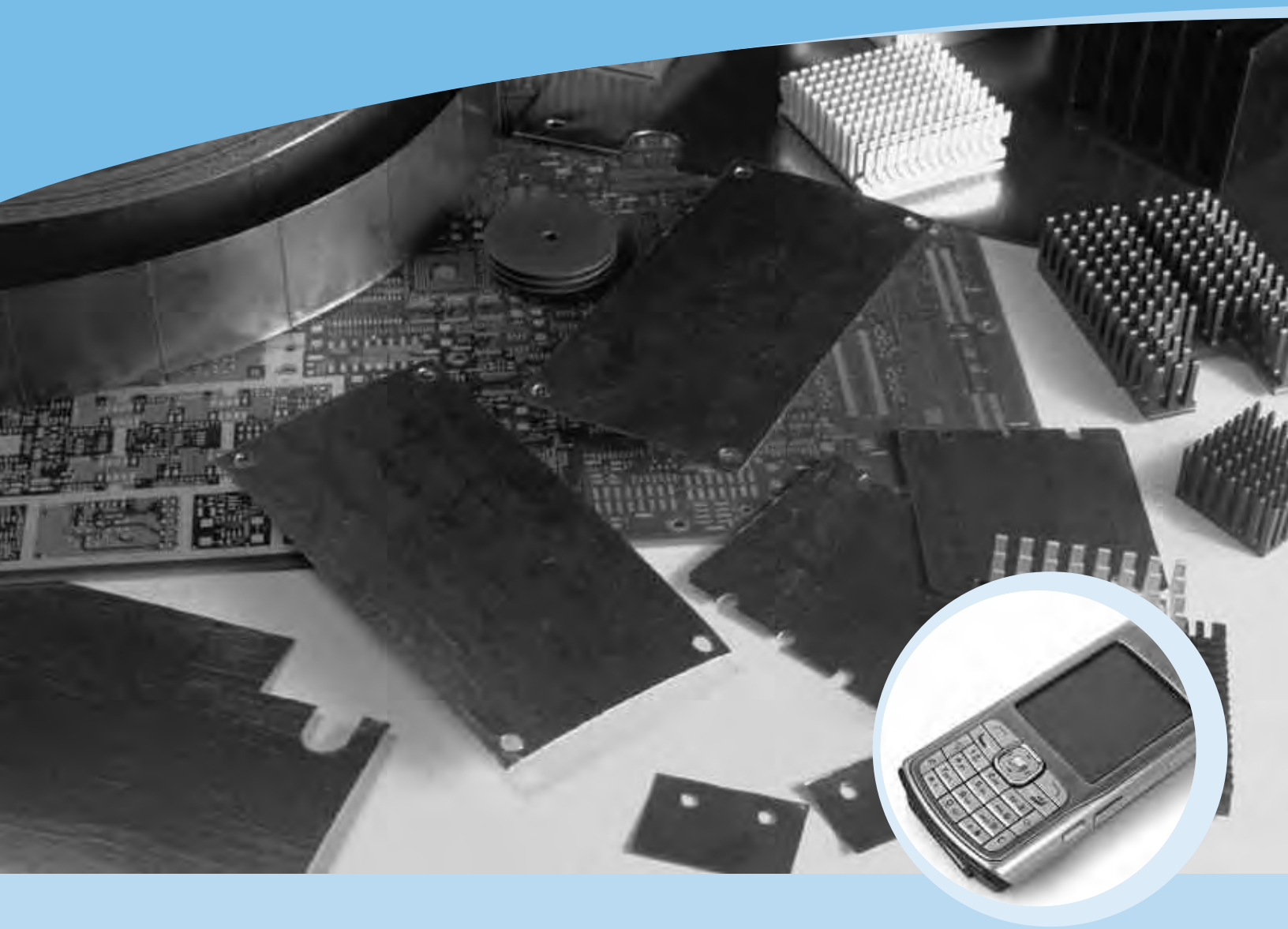
Applications:

- CPUs for servers, notebook and desktop computers
- GPUs (graphics chips)
- Northbridge chipsets
- Custom ASICS chips
- Power components

Technical Specifications

Property	T-grease™ 2500	Test Method
Color	White	Visual
Density	3.42 g/cc	-
Viscosity	Dispensable/Screen-printable	-
Maximum Operating Temperature	150°C (302°F)	-
Outgassing TML	0.91%	ASTM E595
Outgassing (CVCM)	0.15%	ASTM E595
UL Flammability Rating	94V0	-
Thermal Conductivity	3.8 W/mK	ASTM D5470 (modified)
Thermal Resistance @ 50 psi	0.017°C-in²/W (0.110°C-cm²/W)	ASTM D5470 (modified)
Volume Resistivity	3.5 x 10^{12} Ohm-cm	ASTM D257
Dielectric Constant @ 1KHz/1MHz	5.7/5.6	ASTM D150

ELECTRICALLY AND THERMALLY CONDUCTIVE INTERFACE MATERIAL



T-gon™ 800 Series

Electrically and Thermally Conductive Interface Pad

T-gon™ 800 Series is a high-performance, cost effective thermal interface material. T-gon™ 800 is used where electrical isolation is not required. Its unique grain-oriented, plate-like structure allows it to conform exactly to surfaces, thus maximizing heat transfer.

T-gon™ 800 can be supplied in 12" x 18" (305 mm x 457 mm) or 18" x 24" (457 mm x 914 mm) sheets, in rolls, or die-cut to specific configurations. T-gon™ 800 is available with proprietary pressure sensitive adhesive on one side. This adhesive coating is the thinnest available, thereby minimizing any impact on thermal performance.

Features and Benefits:

- High thermal conductivity of 6 W/mK in Z axis and 240 W/mK in the X-Y axis
- Greater than 98% graphite
- Low thermal resistance
- Thicknesses of 0.005", 0.010" and 0.020" (0.127 mm, 0.125 mm, 0.25 mm, and 0.50 mm)

ELECTRICALLY AND THERMALLY CONDUCTIVE INTERFACE MATERIAL

Property	T-gon™ 805	T-gon™ 810	T-gon™ 820
Construction and Composition	Graphite composite	Graphite composite	Graphite composite
Color	Pewter	Pewter	Pewter
Thickness	0.005" (0.127 mm)	0.010" (0.254 mm)	0.02" (0.508 mm)
Thickness Tolerance	+/- 0.001" (0.025 mm)	+/- 0.001" (0.025 mm)	+/- 0.002" (0.05 mm)
Density	1.18 g/cc	1.10 g/cc	1.07 g/cc
Hardness	85 Shore A	85 Shore A	85 Shore A
Tensile Strength	650 psi	650 psi	650 psi
Outgassing TML	0.15%	0.15%	0.15%
Outgassing CVCM	0.01%	0.01%	0.01%
UL Flammability Rating	94 V0	94 V0	94 V0
Shelf Life	Indefinite	Indefinite	Indefinite
Temperature Range	-240 to 300°C	-240 to 300°C	-240 to 300°C
Z Plane Thermal Conductivity	6 W/mK	6 W/mK	6 W/mK
XY Thermal Conductivity	240 W/mk	240 W/mk	240 W/mk
* Thermal Resistance @ 100 psi	0.07°C-in^2/W	0.10°C-in^2/W	0.17°C-in^2/W
* Thermal Resistance @ 681 KPa	0.42°C-cm^2/W	0.66°C-cm^2/W	1.07°C-cm^2/W
Volume Resistivity	11x10^{-4} ohm-cm	11x10^{-4} ohm-cm	11x10^{-4} ohm-cm
Dissipation Factor @ 1MHz	<0.001	<0.001	<0.001

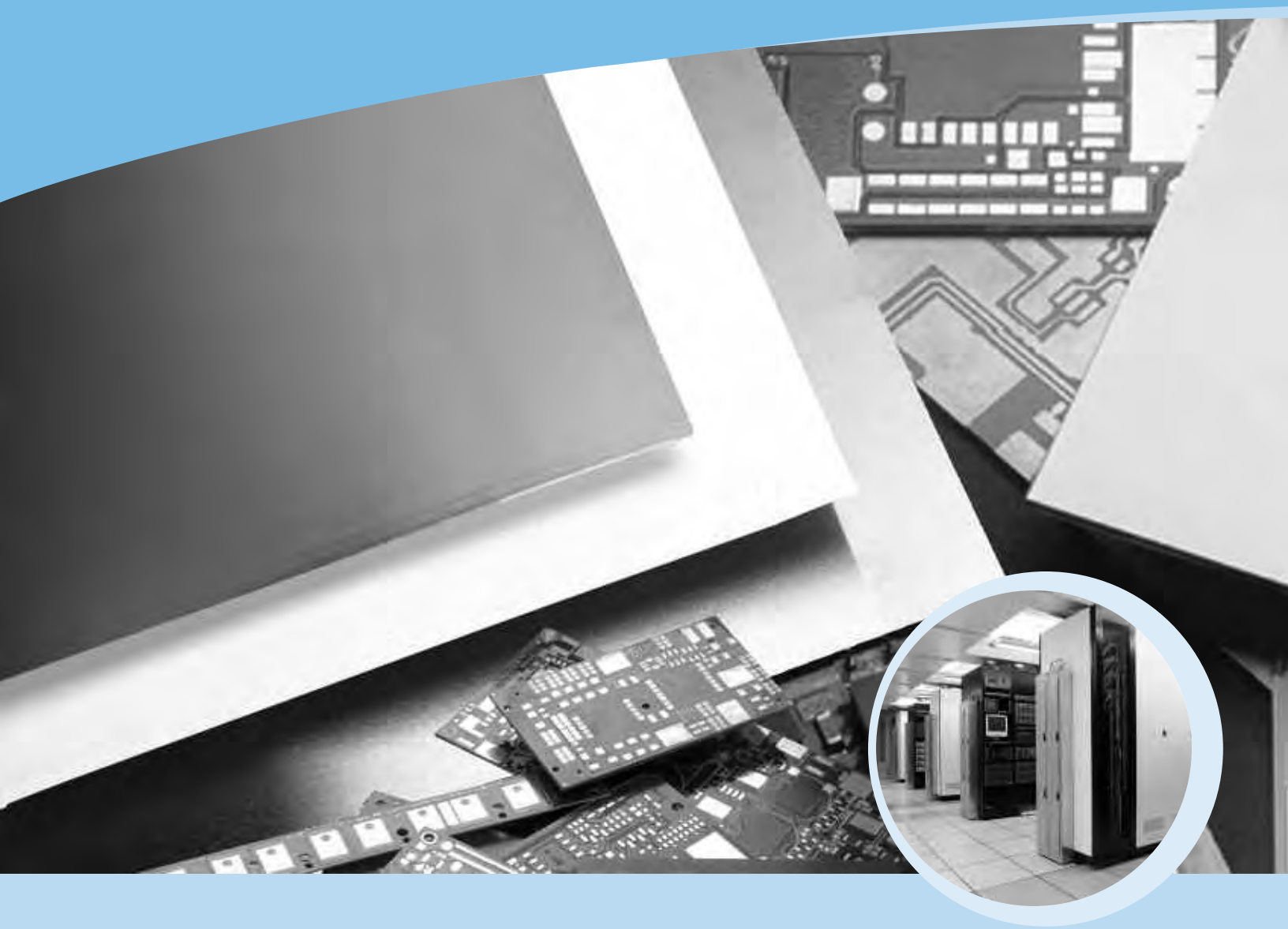
* The thermal resistance data includes interfacial thermal resistance which more closely represents the thermal performance of the T-gon™ 800 in application

Product Options

T-gon™ 800 Series is a high-performance, cost effective thermal interface material. T-gon™ 800 is used where electrical isolation is not required. Its unique grain-oriented, plate-like structure allows it to conform exactly to surfaces, thus maximizing heat transfer.

Standard Thicknesses	Standard Sheets Sizes
0.005" (0.125 mm) 0.010" (0.25 mm) 0.020" (0.51 mm)	18" x 24" (457 mm x 610 mm) T-gon™ 800 sheets are supplied with no liners when ordered without adhesive. With adhesive they are supplied with no top liner and a white release liner on the bottom T-gon™ 800 is available on rolls and individual die-cut shapes
	Pressure Sensitive Adhesive
	Request no adhesive with "A0" suffix Request adhesive one side with "A1" suffix Double sided adhesive is not available

THERMALLY CONDUCTIVE CIRCUIT BOARDS



T-lam SS HTD

Metal Core Printed Circuit Board Material

T-lam SS HTD is a copper circuit layer and aluminum or copper base plate bonded together with 150°C rated T-lam HTD dielectric. T-lam SS HTD laminate are processed through standard FR4 print and etch operations.

T-lam SS HTD products have 6-8 times better thermal conductivity than FR4 and this is the key to keeping components cool. The T-lam SS HTD boards are run through standard pick and place SMT and manual wire bond processes.

T-lam SS HTD is designed for applications with high temperature and/or high voltage applications typically found in industrial motor drives and automotive motor controls.

Standard constructions are made with 1 and 2 ounce copper and 1mm and 1.5mm thick aluminum. Custom constructions of heavier weight circuit copper and thicker aluminum and copper base plates are also available.

Features and Benefits:

- UL 746 B Electrical RTI of 150°C
- High withstand voltage > 5000 volt DC
- RoHS compliant
- Environmentally green material
- Lead free solder compatible

Applications:

- Automotive - under hood motor control modules
- 240/480 VAC industrial motor drives
- 120/240 volt LED substrate
- Lighting ballasts

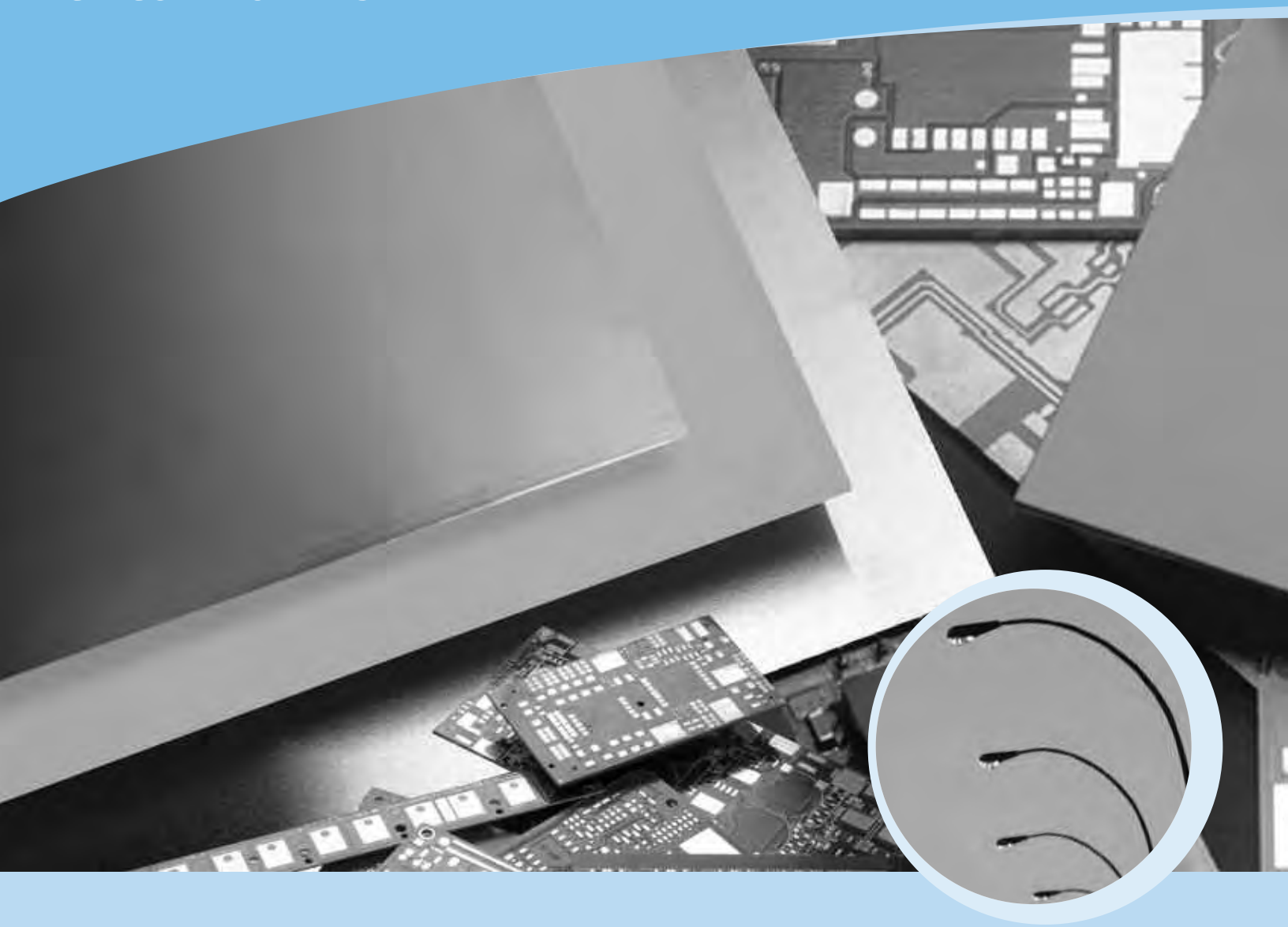
T-lam SS HTD

Operating Voltage	UNITS	T-lam SS HTD04	T-lam SS HTD06
Continuous AC, Max	VAC	240	480
Continuous DC, Max	VDC	450	950
Peak Recurring, Max	Vp	600	1200
Thermal Properties	**UNITS**	**T-lam SS HTD04**	**T-lam SS HTD06**
Thermal Conductivity	watt/m°K	2.2	2.2
Thermal Resistance	°C-in²/watt (°C-cm²/watt)	0.072 (0.464)	0.107 (0.690)
Glass Transition Temperature	°C	168	168
Operating Temperature, Maximum	°C	150	150
Soldering Temperature, Maximum	°C	288	288
Heat Capacity	J/g°C	1.12	1.12
Electrical Properties	**UNITS**	**T-lam SS HTD04**	**T-lam SS HTD06**
Dielectric Constant @ 1KHz/1MHz		5.1/4.8	5.1/4.8
Dissipation Factor @ 1KHz		0.007	
Capacitance @ 1KHz	pF/in²(pF/cm²)	287(44.5)	191(29.6)
Volume Resistivity @25°C	ohm-cm	1.4E+15	1.0E+15
Volume Resistivity @150°C	ohm-cm	2.0E+11	2.0E+11
Surface Resistivity	ohm	1.5E+12	1.5E+12
Dielectric Strength	V/mil (kV/mm)	1500 (38.1)	1500 (38.1)
Hi-pot Withstand (DC)	VDC, 1sec.	>4000	>6000
Hi-pot Withstand (AC)	VAC, 1sec.	>2,500	>3,500
Mechanical Properties	**UNITS**	**T-lam SS HTD04**	**T-lam SS HTD06**
Dielectric Thickness	inch (mm)	0.004 (0.102)	0.006 (0.152)
Peel Strength	lbs/in (Kg/cm)	6.5 (1.16)	7.0 (1.25)
CTE > Tg XY/Z axis	ppm/°C	16/36	16/36
CTE > Tg XY/Z axis	ppm/°C	18/155	18/155
Young's Modulus @ 25/150°C	MPa	13180/6810	13180/6810
Poisson's Ratio 25/150°C		0.277/0.263	0.277/0.263
Flexural Strength 25°C	MPa	142	142
Agency Ratings & Durability	**UNITS**	**T-lam SS HTD04**	**T-lam SS HTD06**
UL Continuous Operating Temp	°C	150	150
UL Flammability	E165095	94V0	94V0
Comparative Tracking Index		600	600
Solder Float (4 min. @ 288°C)		Pass	Pass

Notes:

1. All properties are typical @ 25°C, unless otherwise specified. 2. See www.lairdtech.com for ASTM and IPC tests and conditions. 3. This is a preliminary data sheet, and subject to change. 4. All properties are based on nominal thicknesses. The layout and process may require thicker starting T-preg to meet nominal laminated thickness.

THERMALLY CONDUCTIVE CIRCUIT BOARDS



T-lam SS 1KA

Metal Core Printed Circuit Board Material

T-lam SS 1KA is a copper circuit layer and aluminum or copper base plate bonded together with Laird Technologies' 3 watt/m-K T-lam 1KA dielectric. T-lam SS 1KA materials are processed through standard FR4 print and etch operations.

T-lam SS 1KA has 8-10 times better thermal conductivity compared to FR4 and this is the key to keeping components cool. The T-lam SS 1KA boards run through standard pick and place SMT and manual wire bond processes.

T-lam SS 1KA is designed for applications that require the best thermal performance and resistance to thermal cycling. Customers have found that T-lam SS 1KA reduces the stress on solder bonds with ceramic devices.

Standard constructions are made with 1 and 2 ounce copper and 0.040 (1 mm) and 0.062 (1.6 mm) inch thick aluminum. Custom constructions of heavier weight circuit copper and thicker aluminum and copper base plates are also available.

Features and Benefits:

- UL®746 B Electrical/Mechanical RTI as high as 130°C
- RoHS compliant
- Environmentally green
- Lead free solder compatible
- Compliant for low bond stress

Applications:

- Multi-layer network power converters
- Multi-layer LED for LCD Monitor BLU
- Ultra-bright LED substrate

T-lam SS 1KA

Operating Voltage	Units	T-lam SS 1KA04	T-lam SS 1KA06	T-lam SS 1KA08
Continuous AC	VAC	50	120	240
Continuous DC	VDC	95	225	450
Peak Recurring	Vp	140	300	600
Thermal Properties	Units	T-lam SS 1KA04	T-lam SS 1KA06	T-lam SS 1KA08
Thermal Conductivity*	Watt/m °K	3.0	3.0	3.0
Thermal Resistance	°C-in2/watt (°C-cm2/watt)	0.05 (0.35)	0.081 (0.552)	0.109 (0.703)
Glass Transition Temperature	°C	105	105	105
Operating Temperature, Maximum	°C	110	120	130
Soldering Temperature, Maximum	°C	288	288	288
Heat Capacity	J/g°	1.53	153	1.53
Electrical Properties	Units	T-lam SS 1KA04	T-lam SS 1KA06	T-lam SS 1KA08
Dielectric Constant @ 1KHz/1MHz		4.3/4.1	4.3/4.1	4.3/4.1
Dissipation Factor @ 1KHz/1MHz		0.008/0.035	0.008/0.035	0.008/0.035
Capacitance @ 1KHz	pF/in2 (pF/cm2)	121 (18.8)	121 (18.8)	121 (18.8)
Volume Resistivity	ohm-cm	1.2E+14	1.2E+14	1.2E+14
Surface Resistivity	ohm	1.0E+10	1.0E+10	1.0E+10
Dielectric Strength	V/mil (kV/mm)	800 (20.3)	800 (20.3)	800 (20.3)
Hi-Pot Withstand, 5 sec.	VDC	1200	2500	3500
Mechanical Properties	Units	T-lam SS 1KA04	T-lam SS 1KA06	T-lam SS 1KA08
Dielectric Thickness	inches (mm)	0.004 (0.102)	0.006 (0.152)	0.008 (0.203)
Peel Strength	lbs/in (Kg/cm)	4.5 (0.8)	4.5 (0.8)	5.0 (1.0)
CTE in XY/Z axis < Tg	ppm	32/43	32/43	32/43
CTE in XY/Z axis > Tg	ppm	81/171	81/171	81/171
Young's Modulus @ 25/150°C	MPa	9700/2700	9700/2700	9700/2700
Poisson's Ratio @ 25/150°C		0.26/0.16	0.26/0.16	0.26/0.16
Flexural Strength	MPa	49.7	49.7	49.7
Chemical Properties	Units	T-lam SS 1KA04	T-lam SS 1KA06	T-lam SS 1KA08
Water Absorption after 168 hours	% wt.	0.1	0.1	0.1
Out-Gassing-Total Mass Loss	% wt.	0.57	0.57	0.57
Collect Volatile Condensable Material	% wt.	0.06	0.06	0.06
Agency Ratings & Durability	Units	T-lam SS 1KA04	T-lam SS 1KA06	T-lam SS 1KA08
UL Continuous Operating Temperature	°C	110	120	130
UL Flammability	E165095	94V0	94V0	94V0
Comparative Tracking Index		600	600	600
Solder Float (3 min. @ 288°C)		Pass	Pass	Pass

THERMALLY CONDUCTIVE ELECTRICAL INSULATORS

T-gard™ Products for Consumer Electronics

Consumer Electronics

Laird Technologies utilizes proprietary technology, as well as engineering and manufacturing expertise, to deliver solutions that help OEMs meet the high power requirements of the consumer electronics market

The company's engineers are available to answer questions or discuss applications for:

- Home audio systems including tuners, amplifiers and surround sound systems
- Consumer appliances such as washing machines, dishwashers, and refrigerators
- Desktop computers
- Cable and DVR units

T-gard Products

The T-gard K52 and T-gard 20 are ideal products for consumer electronics. They feature the best balance of thermal, dielectric, and cut-through performance, while solving over-heating issues that are critical to the success of all consumer electronic products.

T-gard 20 Series Designed for High-Volume Computer Power Supplies

Laird Technologies' T-gard 20 is designed to solve over-heating issues such as lower component efficiency, premature component failures, size limitations, and other performance problems for today's computer power supplies.

A film-based product designed to resist cut-through in screw-mounting applications, the T-gard 20 provides a more consistent breakdown of voltage over other insulator constructions. The phase-change coating on the film core provides an excellent mating surface for low-pressure, clip-mounting applications.

T-gard K52 Series High-Thermal and Dielectric Performance Insulator Pads

T-gard K52 series of high-thermal and dielectric performance insulator pads consist of a ceramic-filled phase-change compound coated on MT Kapton film.

Its phase-change coating all but eliminates contact thermal resistance and melts at 52°C, while replacing all the contact areas that contain air. The T-gard K52 is ideal for applications requiring the best thermal performing insulator material available.

With the best balance of thermal, dielectric, and cut-through performance, the T-gard K52-3 is a high-performance, three mil MT Kapton film that provides the best crush, cut, and tear resistance available

.

Technical Specifications
Electrical Properties

Specification	Units	T-gard K52	T-gard 50	T-gard 20
Dielectric Withstand Voltage 50 mm probe, 30 sec	Volts, AC	4,500	4,000	4,500
Dielectric Breakdown Voltage 50 mm probe	Volts, AC	7,800	7,500	>9,000
Volume Resistivity	Ohm-cm	$>10^{12}$	$>10^{12}$	$>10^{12}$
Dielectric Constant @ 1 MHz		1.8	1.8	1.8

Mechanical Properties

Specification	Units	T-gard K52	T-gard 50	T-gard 20
Thickness*	mm	0.076	0.076	0.076
Substrate Film Thickness	mm	0.051	0.051	0.051
Tensile Strength	Ohm-cm	124 mPa	150 mPa	138 mPa
Elongation		80%	130%	130%
Operating Temperature Range		-60 – 150°C	-40 – 150°C	-40 – 150°C
Color		Light Amber	Amber	White
UL Flammability Rating		V0	V0	V0

* These products are also available in 25, 38 and 75 micron thick films.

Total Thermal Impedance °C-in²/watt (°C cm²/watt)

Specification	Units	T-gard K52	T-gard 50	T-gard 20
Thermal Resistance[1] @ 345 kPa (50 psi)	°C-in²/watt °C-cm²/watt	0.23 1.48	0.28 1.80	0.60 3.87
TO-220 Thermals[1] @ 345 kPa (50 psi)	°C/watt	1.5	1.8	3.4

T-gard 20 Series

Features and Benefits:

- Reinforced with moderate temperature-resistant film
- High voltage-resistant film
- Total thermal impedance of 3.4°C/watt on TO-220
- Non-blocking for ease of use
- Designed for computer power supplies

Product Capabilities:

- High dielectric breakdown of 9,000 volts
- Film-based resistance cut-through
- Thermal impedance of 0.60°C-in² /watt @ 25 psi pressure

Applications:

- Switching mode power supplies for:
  - Computers
  - Consumer electronics
  - Set Top Boxes
- UPS units

T-gard K52 Series

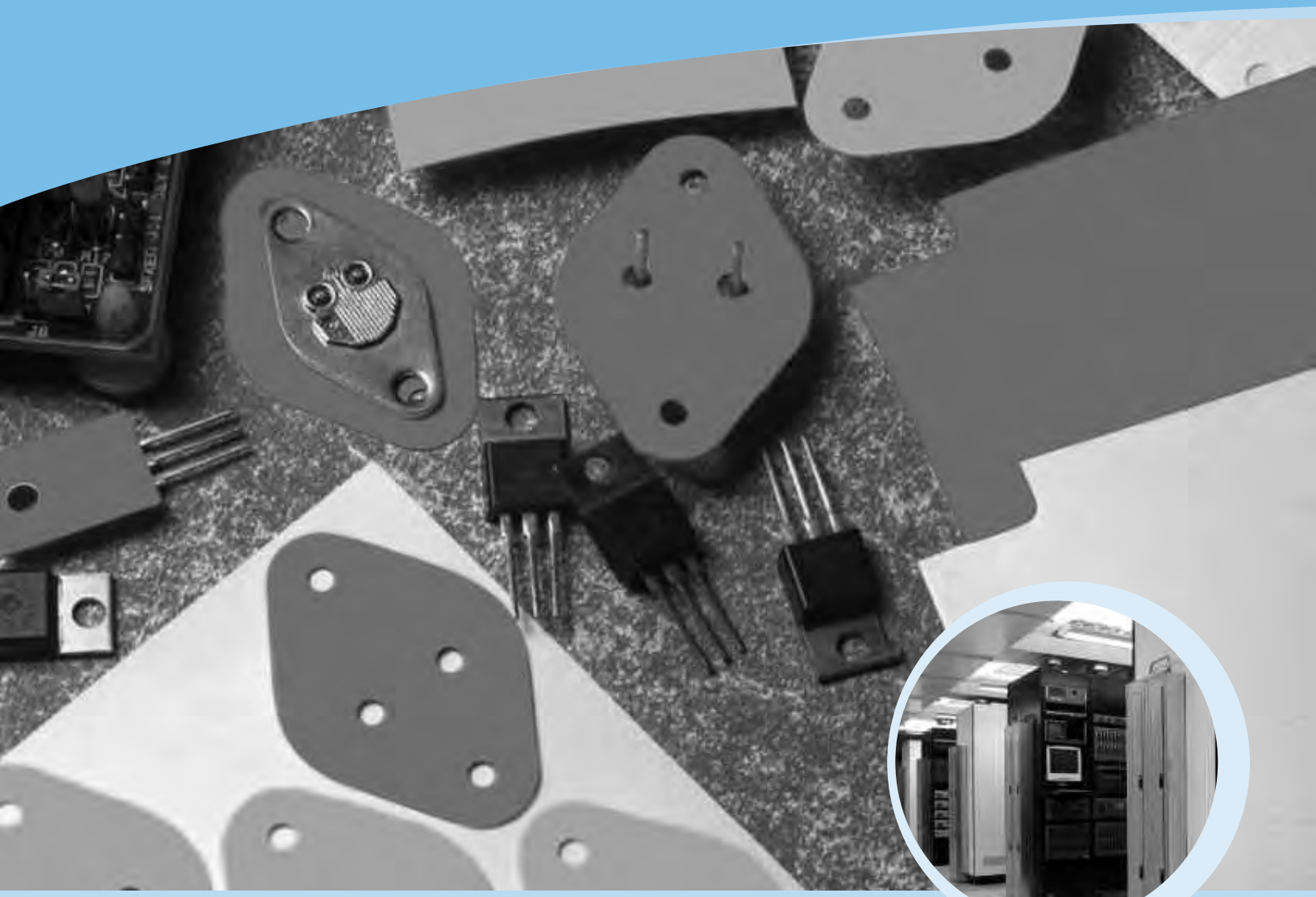
Features and Benefits:

- High dielectric strength of 4,000 – 9,000 range VAC
- Resistant to tears and cut-through
- Thermal impedance of 0.13 range °C-in²/watt at 20 psi clip force

Applications:

- Flat panel TV power modules
- UPS units
- Switching mode power supplies

THERMALLY CONDUCTIVE ELECTRICAL INSULATORS



T-gard™ Products for Network Infrastructure

Network Infrastructure

More than ever leading information technology and network infrastructure companies rely on the engineering expertise of Laird Technologies for the design and manufacture of the power supply components necessary to drive computer servers, datacommunications, and storage area network systems.

Laird Technologies' technical professionals work with companies through all project phases to determine the most efficient, cost-effective method of designing optimal solutions.

T-gard Products

Ideal for telecommunications markets, Laird Technologies' T-gard 3000 and 5000 Series of film-based products are designed for over-heating issues – particularly due to the continuing reduced size of electronic components. Both product series feature a high dielectric breakdown of 6,000 volts and high voltage-resistant film.

T-gard Series 3000 and Series 5000

Film-based, thermally conductive electrical insulators offer very high reliability. Electrical isolation comes from T-gard 3000 and T-gard 5000's three independent layers of insulators. With the two layers of silicone compound and one layer of dielectric film, it is difficult to have a single defect on one layer that will significantly affect the overall electrical isolation.

T-gard 3000 Series High-Performance Thermal Interface Products

Laird Technologies' T-gard 3000 series is designed to solve over-heating issues such as lower component efficiency, premature component failures, size limitations, and other performance problems for today's power component assemblies. The need to remove unwanted heat to ambient temperatures becomes more critical as electronic systems pack more power into smaller spaces.

A film-based product designed to resist cut-through in screw-mounting applications, The T-gard 3000 provides a more consistent breakdown of voltage over other insulator constructions. The soft conformal coating on the film core provides an excellent mating surface for low-pressure clip-mounting applications.

T-gard 5000 is an excellent dielectric material with good thermal performance consisting of a polyimide film coated with a ceramic-filled, high-temperature silicone rubber.

Ideal for applications that require a delta temperature across the interface of 2.0°C/watt or higher on a TO-220 clip mounted at 50 psi pressure, the T-gard 5000 is and exceptionally tough, cut-through resistant material.

Technical Specifications
Electrical Properties

Specification	Units	T-gard 3000	T-gard 5000
Dielectric with Standard Voltage	Volts, AC	4,500	4,500
Dielectric Breakdown Voltage	Volts, AC	6,000	6,000
Volume Resistivity	Ohm-cm	$>10^{12}$	$>10^{12}$
Dielectric Constant @ 1 MHz		3.3	3.4

Mechanical Properties

Specification	Units	T-gard 3000	T-gard 5000
Thickness	mm	0.13 mm	0.13 mm
Cure Silicone Hardness		85 Shore A	65 Shore A
Tensile Strength	Ohm-cm	52.4 mPa	40 mPa
Elongation		85%	45%
Operating Temperature Range		-60 – 180°C	-76 – 180°C
Color		Brown	Tan
UL Flammability Rating		V0	V0

Total Thermal Impedance °C-in²/watt (°C cm²/watt)

Specification	Units	T-gard 3000	T-gard 5000
Thermal Resistance [1] @ 345 kPa (50 psi)	°C-in²/watt °C-cm²/watt	0.45 2.90	0.35 1.26
TO-220 Thermals[1] @ 345 kPa (50 psi)	°C/watt	2.4	2.0

T-gard 3000 Series

Features and Benefits:

- Designed for switch mode power supply applications
- Reinforced with high temperature-resistant film
- High voltage-resistant film
- Total thermal impedance of 2.2°C/watt on TO-220
- Non-blocking for ease of use

Applications:

- Network Primary Power Supplies
- Electrical power generators
- UPS units

T-gard 5000 Series

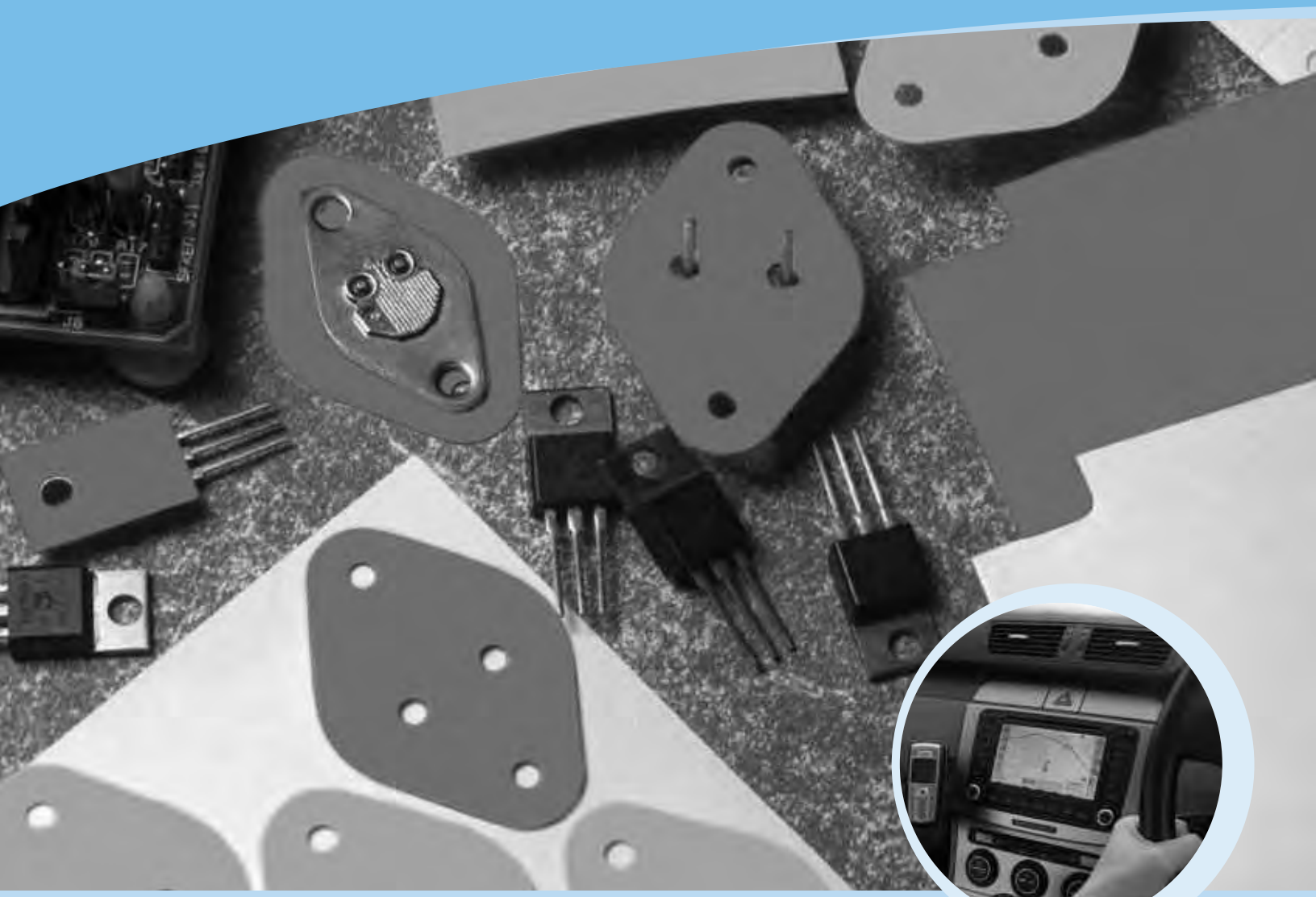
Features and Benefits:

- High dielectric breakdown voltage of 6,000 volts
- Film-based resistance cut-through
- Thermal impedance of 0.35°C-in2/watt at 50 psi clip pressure
- Thermal impedance of 0.28°C-in2/watt at 400 psi screw pressure
- Standard and custom configurations available

Applications:

- Switching mode power supplies
  - Telecom Network Server
  - Computer Network Server
  - Storage Area Network Server
- UPS units
- Electrical power generators

THERMALLY CONDUCTIVE ELECTRICAL INSULATORS



T-gard™ Products for Automotive/Industrial Applications

Automotive

The use of sophisticated electronics in the automotive industry continues to grow and companies turn to Laird Technologies' experienced engineers for comprehensive automotive solutions. By partnering with Laird Technologies, customers take advantage of the company's superior thermal interface products that are designed for optimal efficiency.

Industrial

Reliable components are paramount in industrial applications and Laird Technologies is committed to developing superior products that industrial equipment OEMs can rely upon.

T-gard Products

Laird Technologies' T-gard 200 SERIES and T-gard 500 SERIES are ideal for the automotive and industrial markets because they are designed to withstand the harsh manufacturing conditions of these markets.

Both products are tough and have high dielectric strength to withstand burrs of stamped heat sinks.

T-gard 200 Series High-Performance Thermal Interface Products

Laird Technologies' T-gard 200 is a high-performance interface pad that consists of a silicone/boron nitride composite.

These interface pads are ideal for the harsh conditions found in the automotive and industrial markets that require the lowest thermal resistance and the highest dielectric strength.

T-gard 200 insulating pads are manufactured from a fiberglass-reinforced material that results in a tough, strong, high-tear, cut-through, and puncture-resistant product. The pads do not dry out, crack or fail when pressed between mating parts, eliminating burrs as a problem.

T-gard 200 products are available in 0.010-inch (0.25 mm), 0.020-inch (0.51 mm), and 0.030-inch (0.75 mm) thicknesses.

T-gard 500 Series Thick Thermal Insulator Pads Prevent Electrical Shorts in Automotive Electronics Applications

The T-gard 500 is a medium thermal performance insulator pad consisting of ceramic-filled, high-temperature silicone rubber coated on electrical grade fiberglass.

Designed for applications that require additional thickness to prevent electrical shorts from stamped aluminum heat sinks, T-gard 500 products are used in switching-mode power supplies (SMPS) and debris from aluminum castings used in automotive motor controls. The T-gard 500 series is ideal for applications requiring an interface of 2.5°C/watt or higher on a TO-220 mounted at 50 psi pressure.

Technical Specifications
Electrical Properties

Specification	Units	T-gard 200	T-gard 500
Dielectric with Withstand Voltage	Volts, AC	4,500	4,500
Dielectric Breakdown Voltage	Volts, AC	6,000	6,000
Volume Resistivity	Ohm-cm	$>10^{12}$	$>10^{12}$
Dielectric Constant @ 1 MHz		3.3	3.3
Electrical RTI Temperature Rating	°C	150°C	150°C

Mechanical Properties

Specification	Units	T-gard 200	T-gard 500
Thickness	mm	0.254	0.23
Hardness	Shore A	85	85
Tensile Strength	mPa	5	9
Elongation @ 45° to Warp/Fill	%	5	5
Mechanical RTI Temperature Rating	°C	150°C	150°C
Color		White	Brown
UL Flammability Rating		94V0	94V0

Total Thermal Impedance °C-in²/watt (°C cm²/watt)

Specification	Units	T-gard 200	T-gard 500
Thermal Resistance [1] @ 345 kPa (50 psi)	°C-in²/watt °C-cm²/watt	0.20 1.31	0.45 2.9
TO-220 Thermals[1] @ 345 kPa (50 psi)	°C/watt	1.6	2.4

T-gard 200 Series

Features and Benefits:

- High thermal conductivity of 5 W/mK
- High dielectric strength of >6.000 volts
- Resistant to tears, cuts, and punctures
- UL94 VO rated

Applications:

- Audio/Video components
- Automotive control units
- General high-pressure interfaces
- Motor controllers
- Power conversion equipment
- Power semiconductors – T0 packages, MOSFETs, IGBTs

T-gard 500 Series

Features and Benefits:

- High dielectric strength of >6,000 volts AC
- Thermal resistance of 0.45°C-in2/watt at 50 psi
- Thermal resistance of 0.35°C-in2/watt at 400 psi
- Thickness encapsulates burrs of stamped heat sinks

Applications:

- Automotive motor controls
- Switching mode power supplies
- Stamped aluminum heat sinks

PRESSURE SENSITIVE ADHESIVE MATERIAL

T-bond™ 150-A2

T-bond™ 150-A2 is a thermally conductive adhesive tape designed to provide an efficient method of mounting heat sinks onto devices such as microprocessors, small electronic packages and other components.

T-bond™ 150-A2 eliminates the need for clips, clamps, other forms of mechanical fixing and messy thermal compound.

T-bond™ 150-A2 consists of a highly conductive Aluminum foil coated on both sides with thermally conductive high strength adhesive.

T-bond™ 150-A2 is supplied with a back and front polypropylene interliner and is available in sheet sizes of 12" x 12" (30cm x 30cm) or die-cut to individual shapes. T-bond™ 150-A2 is 0.007" (0.16mm) thick.

PRESSURE SENSITIVE ADHESIVE MATERIAL

Typical Properties		Test Method
Color	Cream	Visual
Thickness	0.007" (0.16mm)	-
Thickness Tolerance	0.001" (±0.02mm)	-
Hardness	90 ±5	Shore A
Tensile Strength	22 MPa	ASTM D412
Elongation	8%	ASTM D412
Temperature Range	-20°C to 155°C	-
Thermal Resistance 50 psi assembly pressure	1.1°C-in^2/W 7.1°C-cm^2/W	-
Tear Resistance	48 kN/m	ASTM D624
Adhesive Strength	5.5 N/cm	-
Dielectric Constant @ 1000MHz	2.6	ASTM D150

MOUNTING HARDWARE

Insulating Bushes

Insulating bushes are used for insulating the fixing bolt from the transistor metal tab and body.

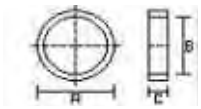
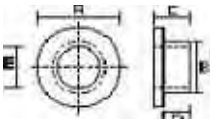
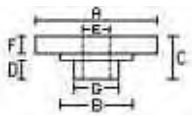
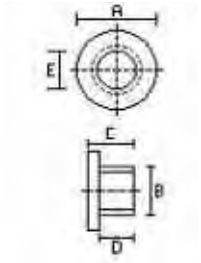
For optimum insulation the shank length (dimensions 'D') should be long enough to locate inside the heat sink bolt-hole.

The insulating pad fixing hole should be the same dimension as the insulating bush shank width (dimension 'B').

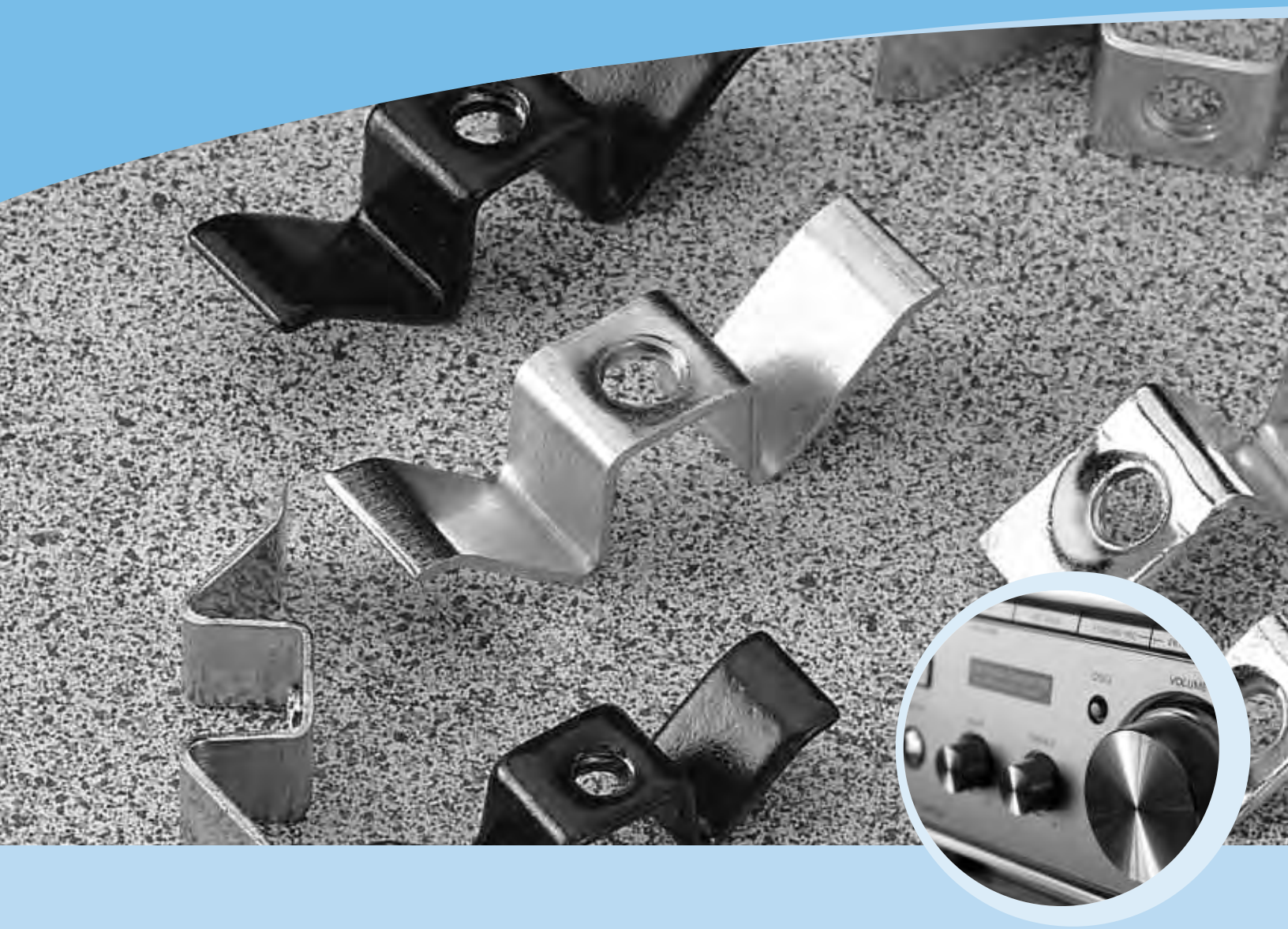
The maximum operating temperature is 125°C.

BQ	Material	Dielectric Strength	Maximum Temperature Range	Application
Property	GF Nylon 66 / PTFE	22KV/mm	+125°C	T0-220, T0-3, D04 & D05

Ordering Information

Diagram	Part No	A	B	C	D	E	F	G	Material	Component
	BQ041 BQ052	7.1 7.9	4.8 6.3	1.3 1.3	- -	- -	- -	- -	PTFE PTFE	D04 Diode D05 Diode
	BQ0440 BQ0550	10.2 12.6	6.3 7.9	3.0 3.3	2.2 2.3	4.8 6.3	- -	- -	Nylon Nylon	D04 Diode D05 Diode
	BQ2730	12.0	7.8	5.0	1.8	3.0	1.9	3.8	Nylon	T03
	BQ24	5.6	3.5	1.6	1.1	M3	-	-	GF Nylon	T0220
	BQ35	6.1	3.8	4.4	3.2	M3	-	-	GF Nylon	T03
	BQ46	6.1	3.8	6.3	5.2	M3	-	-	GF Nylon	T03
	BQ57	4.7	3.0	1.9	1.4	2.5	-	-	GF Nylon	T0220
	BQ68	6.1	3.8	2.4	1.3	M3	-	-	GF Nylon	T03
	BQ79	6.1	3.8	9.1	8.0	M3	-	-	GF Nylon	T03
	BQ810	6.1	3.8	1.8	0.6	M3	-	-	GF Nylon	T03
	BQ911	6.0	3.8	5.3	4.1	M3	-	-	GF Nylon	T03
	BQ1820	6.1	3.6	3.8	2.5	2.7	-	-	GF Nylon	T03
	BQ2123	6.1	3.7	3.7	2.5	2.8	-	-	GF Nylon	T03
	BQ2224	8.5	4.8	4.0	2.4	3.6	-	-	GF Nylon	T03
	BQ2840	6.1	3.6	3.8	2.5	M3	-	-	GF Nylon	T0220

MOUNTING HARDWARE



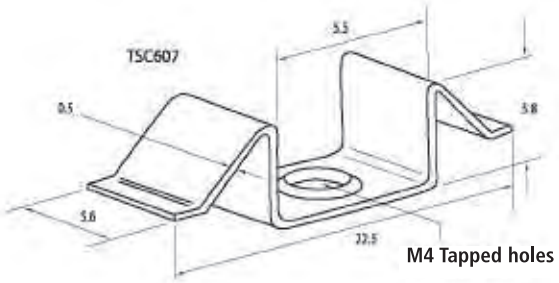
T-gon™ Clips

T-gon™ Clips offer an easy way of mounting one or two plastic case transistors in a small place.

T-gon™ Clips deliver a high mounting pressure to the center of the transistor case providing maximum heat transfer.

TSC	Material	Voltage Isolation	Plating / finish	Thread size
Property	CS70 Annealed Spring Steel	750V (NY Only)	NY = Nylon ZP = Delta Tone Zinc	M4
Test Method	-	ASTM D149 mod	-	-

TSC607-ZP & TSC607-NY

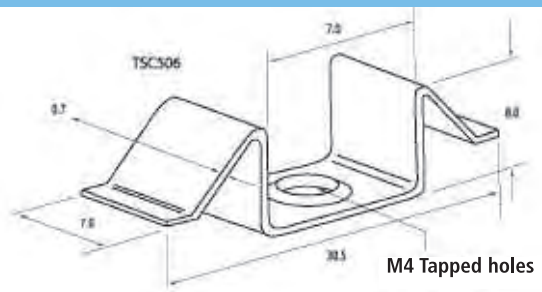


Suitable for use with any panel thickness.
Maximum force is 7.5Kg per transistor.
Zinc Delta tone coated finish as standard on ZP type.

Nylon coated breakdown voltage 750V

TO220 - Dual NY dimensions: ,2 to ,4mm

TSC506-ZP & TSC506-NY

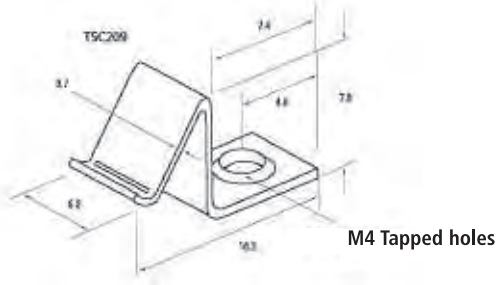


Suitable for use with any panel thickness.
Maximum force is 11Kg per transistor.
Zinc Delta tone coated finish as standard (ZP).

Nylon coating breakdown voltage 750V

TO3P double TO220 - Dual NY dimensions: ,2 to ,4mm

TSC209-ZP

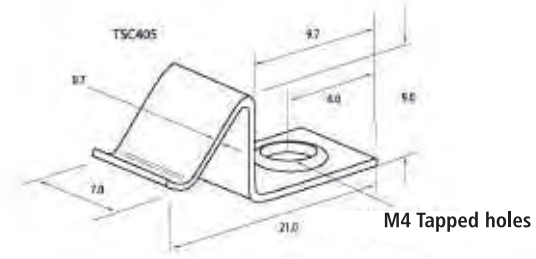


Suitable for use with any panel.
Maximum force 12Kg.

Use pad outline 819. Zinc Delta tone finish.

TO-220 single

TSC405



Suitable for use with any panel.
Maximum force 15Kg.

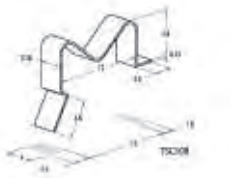
Use pad outline 706. Zinc Delta tone finish.

TO-3P single

MOUNTING HARDWARE

TSC	Material	Application	Plating / finish
Property	Steel / Delta Tone Coat	Single Component	Zinc Delta-Tone

TSC108



Suitable for use with panels up to 1.6 mm thick and pads up to 0.23 mm thick.

Maximum force of 4 Kg.

Zinc Delta-tone finish.

Suits TO-126

TSC802

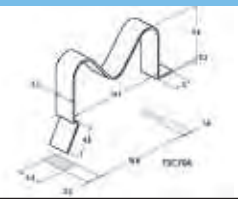
Suitable for use with panels up to 1.2 mm thick and pads up to 0.18 mm.

Maximum force of 5.5 Kg.

Zinc Delta-tone finish.

Suits TO-220

TSC704



Suitable for use with panels up to 2 mm thick and pads up to 0.2 mm thick.

Maximum force of 5.5 Kg.

Zinc Delta-tone finish.

Suits TO-220

TSC301

Suitable for use with panels up to 2 mm thick and pads up to 0.5 mm thick.

Also T-gon Tubes, with panels up to 1.6mm. Maximum force of 9 Kg.

Zinc Delta-tone finish.

Suits TO-3P. (TO-218,TO-247, SOT-93)

TSC394

Suitable for use with panels up to 3 mm thick and pads up to 0.5 mm thick.

Also T-gon Tubes, with panels up to 2.5 mm.

Maximum force of 9 Kg. Zinc Delta-tone finish.

Suits TO-3P, (TO-218, TO-247, SOT-93)

TSC903

Suitable for use with panels up to 2 mm thick and pads up to 0.2 mm thick.

Maximum force of 10 Kg.

Zinc Delta-tone finish. Suits TO-3P

(TO-217, TO-218, SOT-93)

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