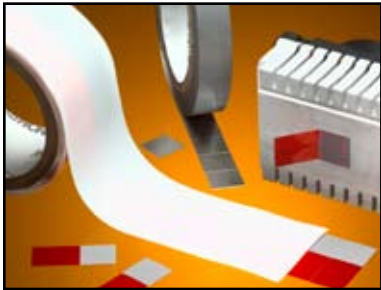
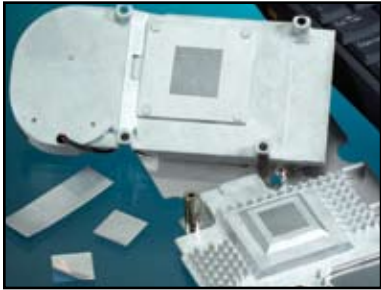


Thermal Management Materials

SELECTOR GUIDE



THERMFLOW®							
Phase Change Thermal Interface Materials							
Material	Color	Thickness mm (Inches)	Carrier mm (Inches)	Thermal Impedance (Modified ASTM D5470) °C-cm²/W (°C-in²/W)	Phase-change Temperature °C (ASTM D3418)	RoHS Compliant	Comments
T557*	Gray	0.13 (0.005)	Free Film	0.065 (0.01)	43 / 62	Yes	Lowest thermal impedance. Inherently tacky, easy to use
T558**	Gray/Silver	0.13 (0.005)	0.025 (0.001) Metal Foil	0.065 (0.01)	43 / 62	Yes	Lowest thermal impedance. Inherently tacky. Top foil for clean-break
T725***	Pink	0.13 (0.005)	Free Film	0.19 (.03)	55	Yes	Inherently tacky and Easy to Use in Assembly. UL 94 V-0 Rated (see UL file #E140244)
T766****	Light Gray/Metallic	0.09 (0.0035) 0.15 (0.006)	0.025 (0.001) Metal Foil	0.26 (0.04)	55	Yes	Foil provides clean break between heat sink and Package
T710 w/PSA****	Light Gray	0.17 (0.0065)	Fiberglass	1.6 (0.25)	43	Yes	BGA, Microprocessors and power semiconductors. PSA attachment

*US PATENT No. 6,054,198
 **US PATENT No. 6,054,198
 *** US PATENT 6,956,739 B2
 ****US PATENT No. 6,835,453

THERMATTACH®							
Thermally Conductive Double-Sided Adhesive Tapes							
Material	Thickness mm (Inches)	Carrier	Lap Shear Adhesion (ASTM D1002 Al-Al), MPa (psi)	Thermal Impedance (ASTM D5470), °C-cm²/W (°C-in²/W)	Flammability Rating (UL94), See UL File E140244 for Details	RoHS Compliant	Comments
T405	0.15 (0.006)	Aluminum	0.93 (135)	3.2 (0.50)	V-0	Yes*	High strength acrylic adhesive
T405-R	0.15 (0.006)	Aluminum	0.93 (135)	3.2 (0.50)	Not Tested	Yes	T405 without brominated flame retardant
T404	0.13 (0.005)	Kapton* MT	0.86 (125)	3.9 (0.60)	V-0	Yes*	Electrically insulating acrylic adhesive
T414	0.13 (0.005)	Kapton* MT	0.69 (100)	3.9 (0.60)	Not Tested	Yes	Low ionic content T404 without brominated flame retardant
T413	0.18 (0.007)	Fiberglass	0.69 (100)	4.2 (0.65)	Not Tested	Yes	Ionically clean, conformable acrylic adhesive
T412	0.23 (0.009)	Expanded Aluminum Mesh	0.48 (70)	1.6 (0.25)	Not Tested	Yes	Highest thermal performance acrylic adhesive
T418	0.25 (0.010)	Fiberglass	1.4 (200)	7.7 (1.2)	V-0	Yes	Superior mechanical attachment strength acrylic
T411	0.28 (0.011)	Expanded Aluminum Mesh	0.27 (40)	6.5 (1.0)	Not Tested	Yes	Silicone adhesive recommended for plastic components

*RoHS compliant per exemption October 13, 2005. EU document # C(2005) 3754. Contains an EU acceptable brominated flame retardant.



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THERM-A-GAP™								
THERMALLY CONDUCTIVE GAP FILLERS								
Material	Color	Standard Thickness Range* mm (inches)	Carrier	Apparent Thermal Conductivity (ASTM D5470), W/m-K	Conformability Rating (1= Softest/5 = Least Soft)	Flammability Rating (UL 94), See UL File E140244 for Details	RoHS Compliant	Comments
A569 / G569	Grey	1.0 - 5.1 (0.020 - 0.200)	A = Aluminum w/PSA G = Clean-break fiberglass no PSA	1.2	1	V-0	Yes	Superior conformability, most economical
A579 / G579	Pink	1.0 - 5.1 (0.020 - 0.200)	A = Aluminum w/PSA G = Clean-break fiberglass	2.5	1	V-0	Yes	Superior conformability & thermal performance
A580 / G580	Yellow	1.0 - 5.1 (0.020 - 0.200)	A = aluminum w/PSA G = Clean-break fiberglass no PSA	2.5	3	V-0	Yes	Improved moldability. Higher mechanical shock resistance.
A570 / G570	Blue	1.0 - 5.1 (0.020 - 0.200)	A = Aluminum w/PSA G = Clean-break fiberglass no PSA	1.2	2	V-0	Yes	Improved moldability. Higher mechanical shock resistance.
A174 / T174	Purple	1.0 - 5.1 (0.020 - 0.200)	A = Aluminum w/PSA T = CHO-THERM insulator w/PSA	1.0	3	T174 = V-1 / A174 = V-0	Yes	Most suitable for complex molded shapes.
G974	Blue	0.25-1.5 (0.010 - 0.060)	Fiberglass with PSA	1.5 - 3.0	4	V-0	Yes	Highest thermal conductivity with fiberglass
974	Blue	0.50 - 1.5 (0.020 - 0.060)	Unsupported	2.0 - 4.0	4	Not Tested		Highest thermal conductivity

***Other thicknesses (up to ~25.4mm thick) and custom-molded shapes are available. Contact applications engineering for details.**

THERM-A-GAP™ Fully Cured, Dispensable Gap-Fillers

Dispensable, Very Low Compression Force, Thermal Gap Fillers (No Cure Required) for Automated Dispensing

Material	Apparent Thermal Conductivity (ASTM D5470), W/m-K	Percent deflection at various pressures (ASTM C165 Modified), %			RoHS Compliant	Comments
		14 Kpa (2 psi)	69 Kpa (10 psi)	172 Kpa (25 psi)		
T630	0.7	70	70+	70+	Yes	Fully-cured, dispensable, extremely conformable
T630G	0.7	70	70+	70+	Yes	T630 w/0.25mm glass beads as dielectric compression stops
T635	1.7	10	45	55	Yes	Improved thermal performance, very conformable
T636	2.4	10	45	55	Yes	Highest thermal performance, very conformable

Available in large containers (1 and 5 gallons) for High Volume Manufacturers. Large formats require customized dispensing equipment

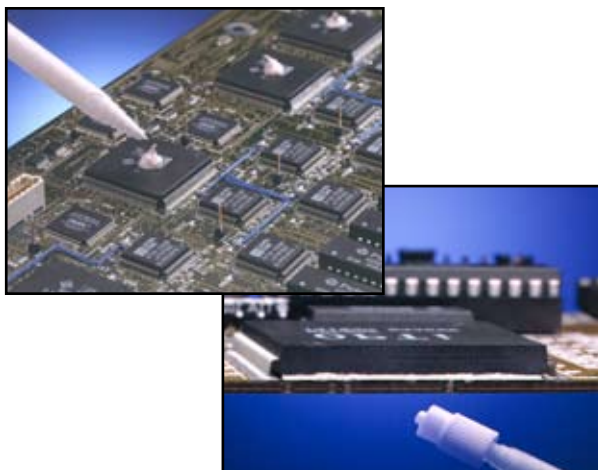


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THERM-A-FORM™ COMPOUNDS							
Thermally Conductive Silicone Compounds							
Compound	Color	Apparent Thermal Conductivity (ASTM D5470), W/m-K	Hardness (Shore A) ASTM D2240	RoHS Compliant	Components	Approximate Cure Time	Comments
1641	White	0.90	78	Yes	1-part	25° C for 48 Hours 75° C for 30 Minutes 150° C for 3 Minutes	Moisture cure, encapsulant, potting compound
T646*	Tan	0.90	50	Yes	2-part		1:1 ratio. Often used in high-volme, automated dispensing
1642	Blue	0.95	85	Yes	2-part		100:3 ratio potting compound
T642	Blue	1.20	70	Yes	2-part		10:1 low extractable silicone compound. Good thermal conductivity.
T644*	Pink	1.20	15	Yes	2-part		1:1 ratio. Good thermal conductivity.
T647*	Grey	2.50	50	Yes	2-part		1:1 ratio. Highest thermal performance

* These compounds are available in large formats for High Volume Manufacturers. Large formats require customized dispensing equipment

CHO-THERM®							
Thermally Conductive Insulators available with and without Pressure Sensitive Adhesive (PSA)							
Material	Color	Standard Thickness mm (inches)	Dielectric Strength (VAC)	Thermal Impedance** (ASTM D5470), °C-cm²/W (°C-in²/W)	Flammability Rating (UL 94), See UL File E140244 for Details	RoHS Compliant	Comments
T500	Green	0.25 (0.010)	5,000	1.2 (0.19)	V-0	Yes	Best thermal performance
1678	Pink	0.25 (0.010)	2,500	1.3 (0.20)	V-0	Yes	Value-priced with good thermal and electrical performance
1671*	White	0.38 (0.015)	4,000	1.5 (0.23)	V-1	Yes	High thermal performance and proven reliability in aerospace applications
T609	Light Green	0.25 (0.010)	4,000	2.1 (0.33)	V-0	Yes	Best value for moderate to high performance pad
T444	Beige	0.08 (0.003)	5,000	2.4 (0.37)	Not Tested	Yes	Non-silicone, Kapton® Film
1674	Blue	0.25 (0.010)	2,500	2.6 (0.4)	V-0	Yes	General Purpose commercial grade insulator
T441-08	Pink	0.20 (0.008)	8,500	2.6 (0.41)	V-0	Yes	Excellent dielectric strength at high humidity. Commercial grade insulator
T441-13	Pink	0.33 (0.013)	11,500	3.6 (0.56)	V-0	Yes	
T441-18	Pink	0.46 (0.018)	13,500	4.1 (0.64)	V-0	Yes	

*1671 available in custom thicknesses

**Tested without PSA. PSA typically adds 0.30 °C-cm²/W (0.05 °C-in²/W)

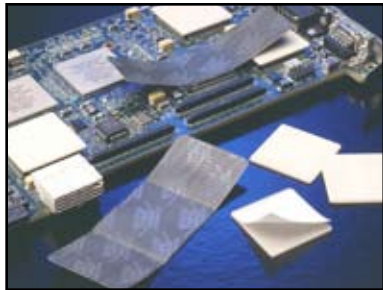


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HEAT SPREADERS (T-WING® & C-WING™)								
Material	Thickness mm (inch)	Thermal Conductor	Sizes (Width X Height) mm (inches)		Component Temp Reduction (° C)	Flammability Rating (UL94), See UL File E140244 for Details	RoHS Compliant	Comments
T-WING T-WING	0.33 (0.013) 0.63 (0.025)	Copper	50.8 (2.0) X 50.8 (0.5)	76.2 (3.0) X 12.7 (0.5)	16	V-0	Yes	Flexible, low profile heat spreaders laminated with dielectric material on both sides. PSA in center for attachment. Custom shapes available Silicone PSA for plastic components.
			76.2 (3.0) X 19.1 (0.75)	76.2 (3.0) X 25.4 (1.0)				
			101.6 (4.0) X 25.4 (1.0)	101.6 (4.0) X 38.1 (1.5)				
C-WING	0.060 (1.53)	Aluminum Oxide or Aluminum Nitride	Custom Sizes		12	Not Tested	Yes	For EMI-sensitive applications. Low profile heat spreaders with PSA attachment. Silicone PSA for plastic components.

High Performance Thermal Grease							
Material	Color	Thermal Impedance above 50°C (Modified ASTM D5470), °C-cm²/W (°C-in²/W)	Thermal Impedance above 65°C (Modified ASTM D5470), °C-cm²/W (°C-in²/W)	Apparent Thermal Conductivity (ASTM D5470), W/m-K	Viscosity cps	RoHS Compliant	Comments
T660	Lt. Gray	0.13 (0.02)	0.06 (0.009)	0.90	170,000	Yes	Phase Change Technology Requires heating above 62 °C for enhanced performance
T650	Blue	0.13 (0.02)	0.13 (0.02)	0.80	190,000	Yes	General Purpose Thermal Grease



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