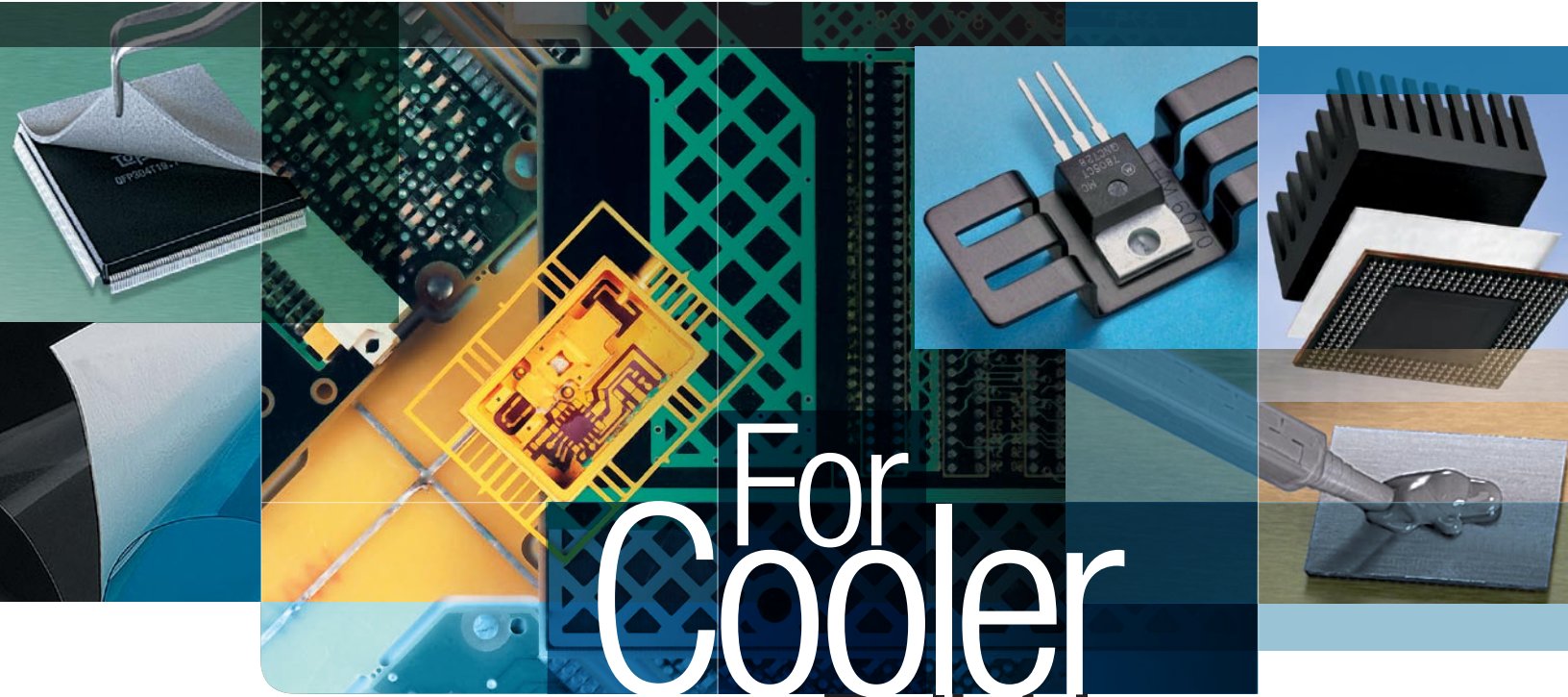


Thermal Management Solutions
For Electronics



For
Cooler
More Reliable
Devices



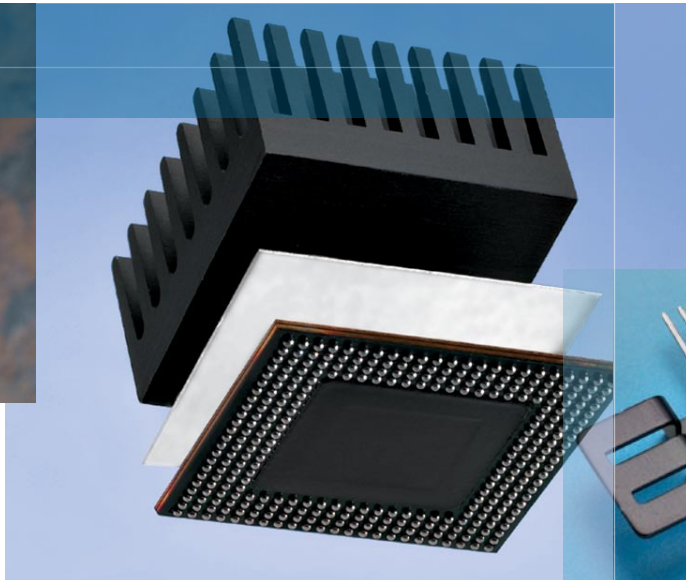
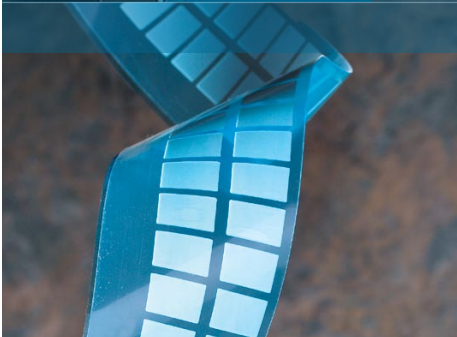
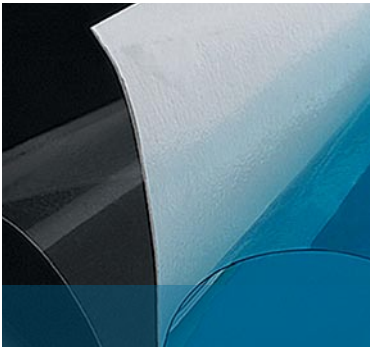
3M™ Thermal Management Solutions for Electronics

3M™ Thermally Conductive Adhesive Transfer Tapes

This range of high adhesion thin tapes offers you efficient thermal transfer for a wide range of applications requiring a thermal solution: bonding heat sinks, heat spreaders and other cooling devices to IC packages, power transistors, and other heat generating components.

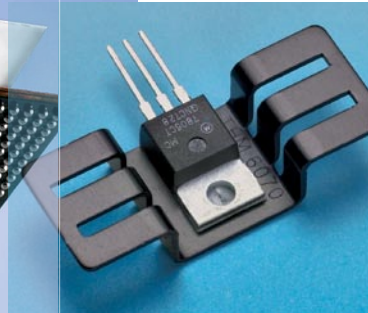
Each tape combines 3M high performance acrylic adhesive with highly conductive ceramic particles for an extremely reliable and user-friendly thermal interface. Highly conformable construction provides excellent wet-out on surfaces.

Select 5, 10, 15 and 20 mil thicknesses to meet application requirements. The unique 40 mil 9889FR is a highly conformable pressure-sensitive film that offers a combination of high thermal conductivity, good dielectric properties, high bond strength, and ease of use.



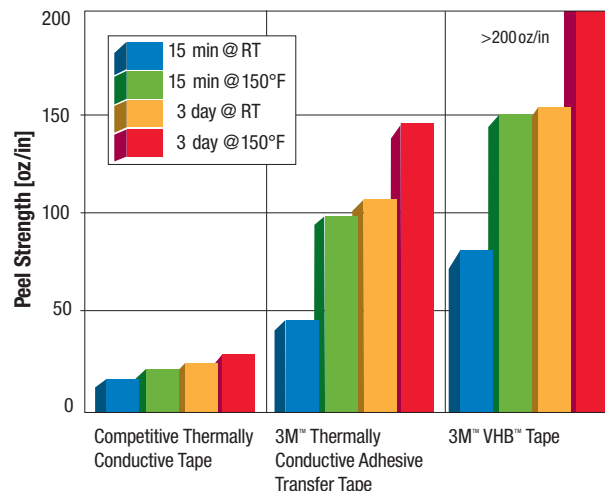
Heat Sink. Thermally Conductive Adhesive Transfer Tape bonds a heat sink to a component and provides a thermal path for component cooling.

3M™ Thermally Conductive Adhesive Transfer Tapes 8805, 8810, 8815, 8820. High temperature adhesion with good dielectric strength. Applies quickly and easily using die-cut shapes.



Power Transistor Attachment. 3M™ Thermally Conductive Adhesive Transfer Tape 8810 replaces silicone grease and screws for attaching transistors to heat sink.

90° Peel Adhesion to Bare Untreated Aluminum

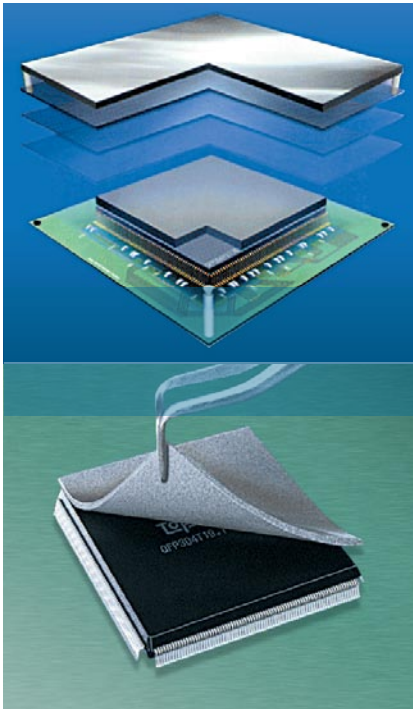


90° Peel Adhesion to Bare Untreated Aluminum. The chart compares the peel strength of three tapes under four different conditions. The 3M™ VHB™ Tape consistently shows the highest peel strength, exceeding 200 oz/in.

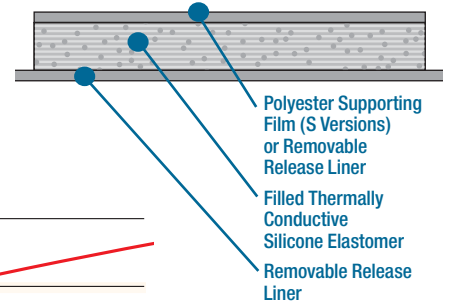
3M™ Thermally Conductive Interface Pads

Through innovative 3M technology, these soft and conformable pads provide high levels of conductivity for the more demanding applications in the electronics industry.

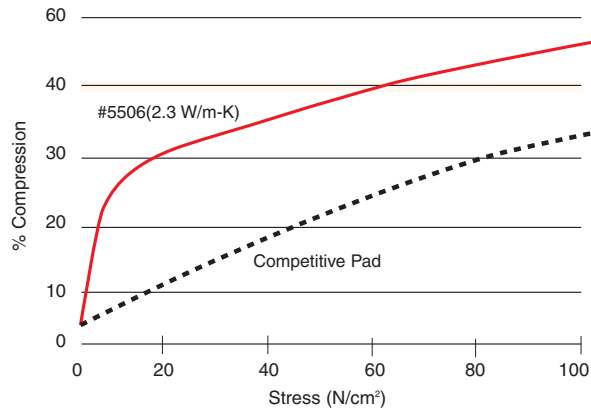
In addition, the pads provide excellent handling and can be die cut to fit most applications. Available in silicone and non-silicone elastomers.



- Thermal Conductivity: 1.0-5.0 W/m-k
- Available in silicone and acrylic elastomers



Compressibility



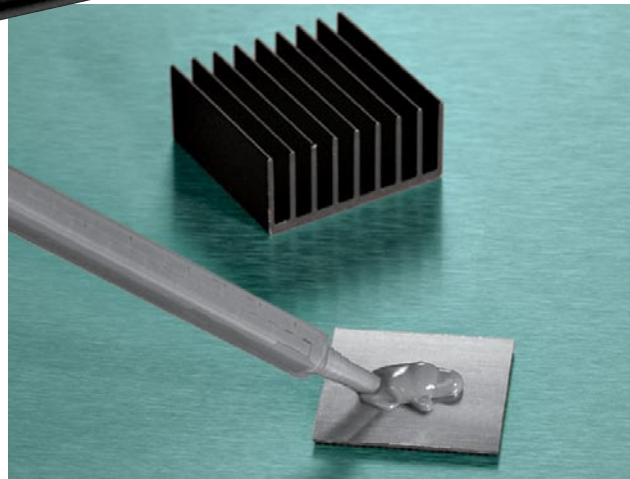
3M™ Thermally Conductive Epoxies

This range of liquid adhesives has minimal odor and superior structural strength adhesion. Dispensing is easy for high output in-line automated manufacturing and manual application.

Adhesive flows and fills micro-spaces on surfaces. Ultra-thin bond line helps achieve low thermal impedance.



3M™ EPX applicator and nozzle simultaneously and accurately mixes, meters, and applies adhesive with a squeeze of the trigger



Note: The technical information and data on this page should be considered representative or typical only and should not be used for specification purposes.

3M™ Thermally Conductive Interface Materials Selection Guide

Product	Description				Adhesion Peel Strength @ 72 hr. Dwell at RT N/cm	Thermal Performance			Dielectric Properties			UL Flammability Rating	Continuous Operating Temperature Range °F (°C)
	Base Material Type	Product Thickness mil (mm)	Filler Type	Liner Type		Conductivity W/m-K	Impedance Thickness mil (mm)	°C-in ² /W (°C-cm ² /W)	Dielectric Strength KV/mm	Dielectric Constant 1KHz	Volume Resistivity ohm/cm		
3M™ High Adhesion Thermally Conductive Adhesive Transfer Tape													
8805	Filled Acrylic Polymer	5 (0.13)	Ceramic	Silicone- Treated Polyester; Dual Liner	5.8	0.6	5 (0.13)	0.48 (3.1)	38	3.5 @ 35 MHz	5.2 X 10 ¹¹	N/A	212 (100) per UL746C or 3M test method
8810		10 (0.25)			8.3		10 (0.25)	0.88 (5.7)			3.9 X 10 ¹¹		
8815		15 (0.38)			9.8		15 (0.38)	1.17 (7.6)			3.8 X 10 ¹¹		
8820		20 (0.51)			11.9		20 (0.51)	1.50 (9.7)			3.8 X 10 ¹¹		
3M™ Thermally Conductive Acrylic Soft Tape (TCAST)													
9889FR	Filled Acrylic Polymer	40 (1.02)	Ceramic	Paper	3.7 on Al	0.5	40 (1.0)	—	—	—	—	UL 94 V-2	Up to 176 (80)
3M™ Thermally Conductive Interface Pads													
5506 ^{1,2}	Filled Silicone Elastomer, Gray	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	Ceramic	Poly- Coated Polyester	No adhesive layer, highly conformable, slightly tacky	2.3	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	0.49 (3.2) 0.71 (4.6) 0.94 (6.1) 1.1 (7.1)	0.12	18.6	1.15 X 10 ¹¹	UL 94 V-1	212-302 (100-150), depending on the application
5591S ^{1,2,3,4}	Silicone	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	Ceramic	PET	No adhesive layer, highly conformable, slightly tacky	1.0	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	—	13.8 ⁵	—	2 X 10 ¹²	3M V0	212-302 (100-150), depending on the application
5592 ^{1,2,4}	Silicone	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	Ceramic	PET	No adhesive layer, highly conformable, slightly tacky	1.1	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	—	14.7 ⁵	—	3 X 10 ¹²	3M V0	212-302 (100-150), depending on the application
5595 ^{1,2}	Silicone	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	Ceramic	PET	No adhesive layer, highly conformable, slightly tacky	1.6	20 (0.5) ² 40 (1.0) 60 (1.5) 80 (2.0)	—	15.7 ⁵	—	5 X 10 ¹²	3M V0	212-302 (100-150), depending on the application
3M™ Thermally Conductive Interface Pads (Acrylic)													
5590H ³	Acrylic	20 (0.5) 40 (1.0) 60 (1.5)	Ceramic	PET	No adhesive layer, highly conformable, slightly tacky	3.0	20 (0.5) 40 (1.0) 60 (1.5)	—	33	—	2.7 X 10 ¹²	3M V0	176-212 (80-100), depending on the application
3M™ Thermally Conductive Epoxies													
DP-190 Gray	Two-part epoxy	—	Aluminum Silicate/ Carbon Black	—	—	0.38	—	—	32.7	—	5.0 X 10 ¹¹	N/A	Up to 212 (100), depending on the application
TC 2707		1 (0.03)	Aluminum Metal	—	—	0.72	1 (0.03)	0.05 (0.32)	2.1	14.6	2.4 X 10 ¹¹		
		5 (0.13)					5 (0.13)	0.27 (1.74)					
		10 (0.25)					10 (0.25)	0.54 (3.48)					
TC 2810	15 (0.38)	Ceramic	—	—	1.0	15 (0.38)	0.82 (5.29)	3.0	4.6	7.6 X 10 ¹¹			
	20 (0.51)					20 (0.51)	1.09 (7.03)						

¹ 5506, 5592 and 5595 are also available with a polyester (PET) film on one side to provide a non-tacky surface. Product numbers are 5506S, 5591S, 5592S and 5595S.

² Only "S" version is available in 0.5 mm thickness.

³ "S" designation signifies a polyester film on one side to provide a non-tacky surface.

"H" designation signifies a product with one non-tacky surface without the use of a PET film.

⁴ 5591S and 5592S have similar bulk thermal conductivity, but the 5591S has ultra-soft firmness. The 5592S is considered to have soft firmness.

⁵ 5591S, 5592S and 5595S versions tested.

Note: The technical information and data on this page should be considered representative or typical only and should not be used for specification purposes.

Calculate Chip Temperature for use with Tapes, Pads, and Epoxies

Input Values

A (in²), size of thermal interface material

%WO, % wet-out of interface material (estimate of actual contact area)

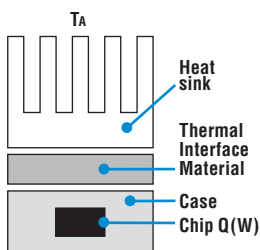
Q (W), power rating of chip

R_{chip-case} (°C/W) (0.55 ref.), thermal resistance of chip to case

R_{sink-air} (0.80 ref.), thermal resistance of heat sink to ambient

T_A (°C) (35°C ref.), ambient temperature

Z (°C-in²/W), thermal impedance of 3M interface material



Calculations

Thermal Resistance of 3M Interface Material

$$R \text{ (°C/W)} = \frac{Z/A}{\%WO/100}$$

Total resistance, R_{total} (°C/W) = R_{chip-case} + R + R_{sink-air},
For temperature of Chip, T_{chip} = T_A + (Q x R_{total})

Obtain Maximum Operating Temperature of Chip from vendor.
Calculated T_{chip} should not exceed temperature specified.

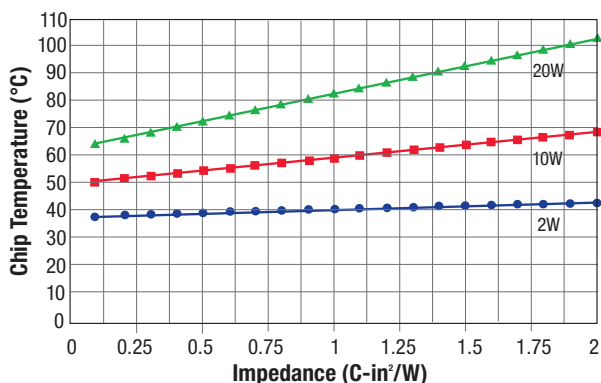
3M™ Thermally Conductive Interface Materials Typical Applications

Product	Typical Applications
8805 8810 8815 8820	Thermally conductive adhesive transfer tapes with high mechanical strength, improved surface wet-out, and excellent shock performance. Applications requiring thin bonding with good thermal transfer; components, flex circuit and power transformer bonding to heat sinks or other cooling devices.
9889FR	Flame retardant thermally conductive acrylic soft tape for applications requiring gap filling and bonding with good thermal transfer; plasma display, IC packages, PCB bonding to heat sinks, metal cases, and other cooling devices.
5506 ¹ 5591S ² 5592 ¹ 5595 ¹	Thermally conductive interface pads (silicone) for applications requiring gap filling and superior thermal performance without bonding. Provides IC package and PCB thermal interfacing with heat sinks or other cooling device, and metal cases.
TC-2707 TC-2810 DP 190 Gray	Thermally conductive epoxies for applications requiring high adhesive strength, good surface wet-out, gap filling and good thermal transfer. Provides IC package and PCB thermal interfacing with heat sinks or other cooling devices.
5590H ²	Thermally conductive interface pads use an acrylic elastomer for applications that require a non-silicone thermal pad. Provides IC package and PCB thermal interfacing with heat sinks or other cooling device, and metal cases.

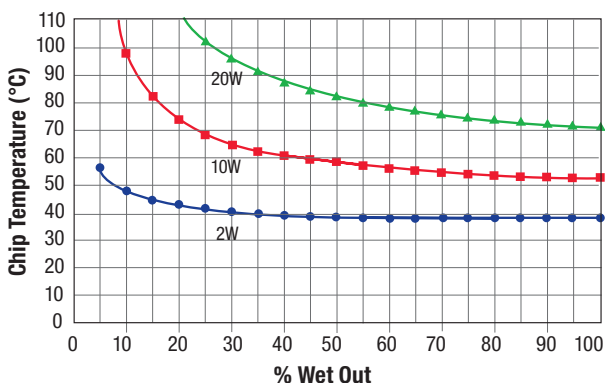
¹ 5506, 5592 and 5595 are also available with a polyester film on one side to provide a non-tacky surface.

² "S" designation signifies a polyester film on one side to provide a non-tacky surface.
"H" designation signifies a product with one non-tacky surface without the use of a PET film.

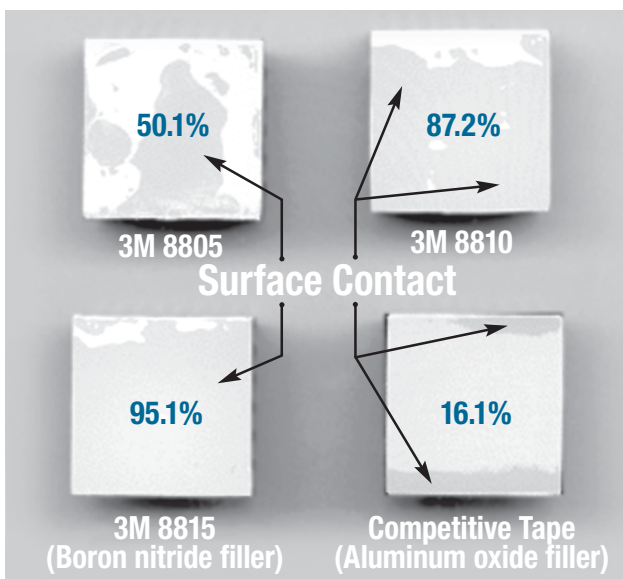
Effect of Thermal Interface Impedance and Device Power on Chip Temperature



Effect of Wet-Out (Interface Contact) and Device Power on Chip Temperature



% Wet-out of Heat Sink to Glass Slide



Dark areas show adhesive wet-out.

Increased wet-out improves both mechanical and thermal performance.

Relative darker color indicates surface contact has occurred. Boron nitride filler appears lighter in color versus aluminum oxide filler

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