Thermally Conductive Adhesive Transfer Tapes

8805 • 8810 • 8815 • 8820

Technical Data **September, 2002**

Product Description

3M™ Thermally Conductive Adhesive Transfer Tapes 8805, 8810, 8815 and 8820 are designed to provide a preferential heat-transfer path between heat-generating components and heat sinks or other cooling devices (e.g., fans, heat spreaders or heat pipes).

- These tapes are tacky pressure sensitive adhesives loaded with thermally conductive ceramic fillers that do not require a heat cure cycle to form an excellent bond to many substrates. Only pressure is needed to form an excellent bond and thermal interface.
- The specialized chemistry of tapes 8805, 8810, 8815 and 8820 renders them modestly soft and able to wet to many surfaces, allowing them to conform well to non-flat substrates, provide high adhesion, and act as a good thermal interface.
- The specialized acrylic chemistry of tapes 8805, 8810, 8815 and 8820 provides for excellent thermal stability of the base polymer.
- The thermally conductive tapes are provided on a silicone treated polyester release liner for ease of handling and die cutting.
- The tapes offer excellent adhesive performance with good wetting and flow onto many substrate surfaces. These tapes offer both good thermal conductivity and good electrical insulation properties.

Product Constructions

	Tape 8805	Tape 8810	Tape 8815	Tape 8820
Color	White			
Tape Type	Filled Acrylic Polymer			
Tape Thickness	5 mils (0.125 mm)	10 mils (0.25 mm)	15 mils (.375 mm)	20 mils (0.50 mm)
Filler Type	Ceramic			
Liner Type	Dual liner using silicone-treated polyester			
Liner Thickness	1.5-2 mil (37.5-50 µm) thickness for inside or outside wound liner			

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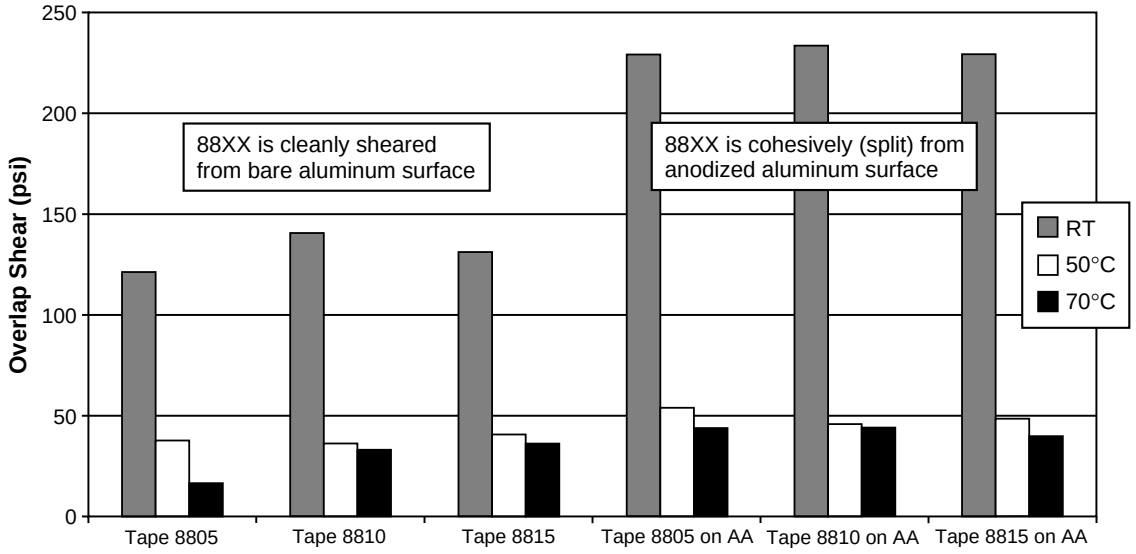
Typical Properties and Performance Characteristics

Note: The following technical information for 3M™ Thermally Conductive Adhesive Transfer Tapes 8805, 8810, 8815 and 8820 should be considered representative or typical only and should not be used for specification purposes.

Property	Value				Method
Product Number	**Tape 8805**	**Tape 8810**	**Tape 8815**	**Tape 8820**	
Thermal Impedance (C-in.^{2}/W)	0.5	0.9	1.20	1.50	3M TM
Thermal Conductivity (W/m-K)	0.60				ASTM C-177
Specific Gravity	1.07 g/cc				
Surface Resistivity (Ω-cm)	1.6 x 10^{11}	1.6 x 10^{11}	1.5 x 10^{11}	**1.5 x 10^{11}	ASTM D-257
Volume Resistivity (Ω-cm)	5.2 x 10^{11}	3.9 x 10^{11}	3.8 x 10^{11}	**3.8 x 10^{11}	ASTM D-257
Dielectric Strength (Volts/mil)	668 Volts / mil (UL-746A*)			**	ASTM D-149
Dielectric Properties (frequency)	*3 MHz*	*100 MHz*	*1 GHz*	**	ASTM D-150
Dielectric Constant (8815)	3.5	3.2	3.0		
90 Degree Peel Test (oz/in) Untreated aluminum substrate	**8805**	**8810**	**8815**	**8820**	3M TM 1 mil PET Backing
Room Temp Dwell @ 15 min	35	46	53	60	
65°C Dwell @ 15 min	51	72	86	98	
Room Temp Dwell @ 72 hrs	53	75	89	108	
65°C Temp Dwell @ 72 hrs	56	88	141	181	
Static Shear test of holding 1000g @ Room Temp using 1 in^2	PASS	PASS	PASS	PASS	3M TM: SS & PET Hold weight 1 week
Static Shear test of holding 500g @ 70°C using 1 in^2	PASS	PASS	PASS	PASS	3M TM: SS & PET Hold weight 1 week
Heat Aging and Environmental Cycling Performance	Products pass UL-746C Heat Aging testing and Environmental Cycling testing. See pg. 6 for details.			TBD	UL-746C

*UL-746A file number E213134 **Estimated value based on 8815 test data

Overlap Shear at Specific Temperatures Properties: (Test conditions: Test substrates are bare untreated aluminum or anodized aluminum, 1 in.^{2} test sample size, shear speed = 0.5 inch/minute. Samples heated to temperature noted below in 5 minutes and then OLS tested. Before testing, samples are dwelled for 3 days at RT to build adhesive bond to substrate).



Typical Properties and Performance Characteristics *(continued)*

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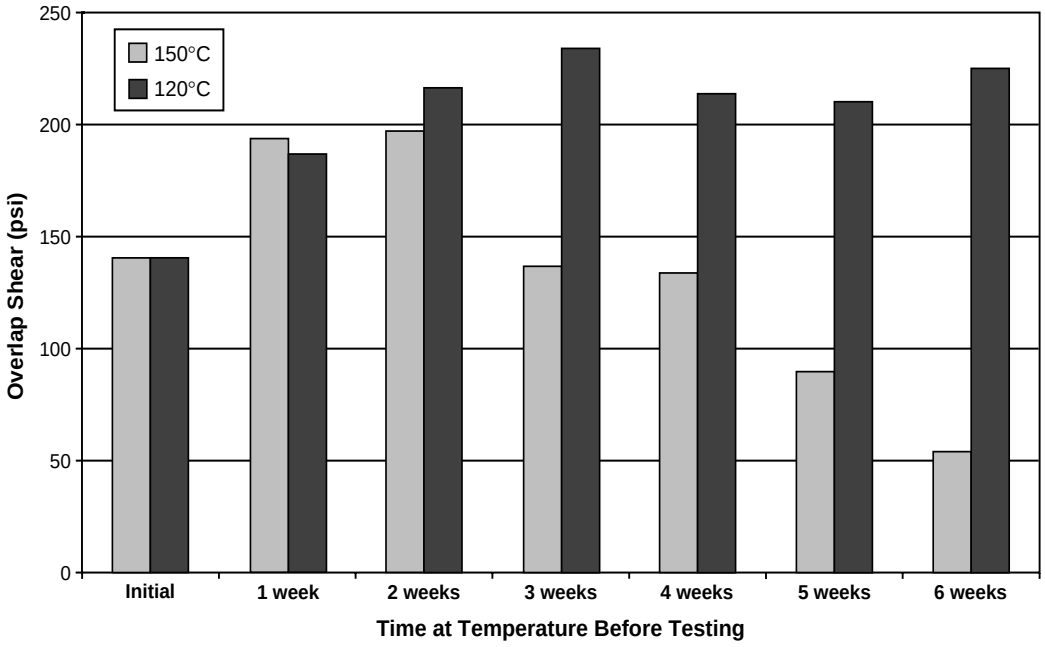
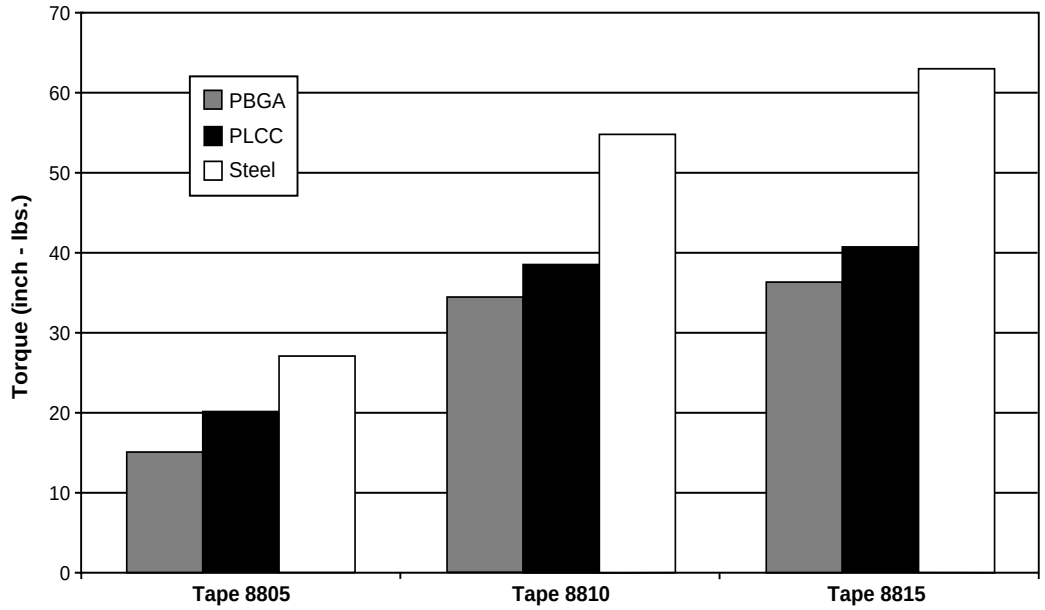
Overlap Shear Heat Aged Properties: (Test conditions: Test substrates are bare untreated aluminum, OLS speed is 0.5 in./min., adhesive cleanly removes from substrate surface during OLS test, 1 $in.^2$ test sample size, test at RT conditions after aging cycle complete, 3M 8810).



Torque Resistance: (Test conditions: This test indicates the resistance to twisting shear forces, heat sink attachment to different chip package material types, 1.0 hour room temperature dwell after attachment to the package surface before torque testing is completed).



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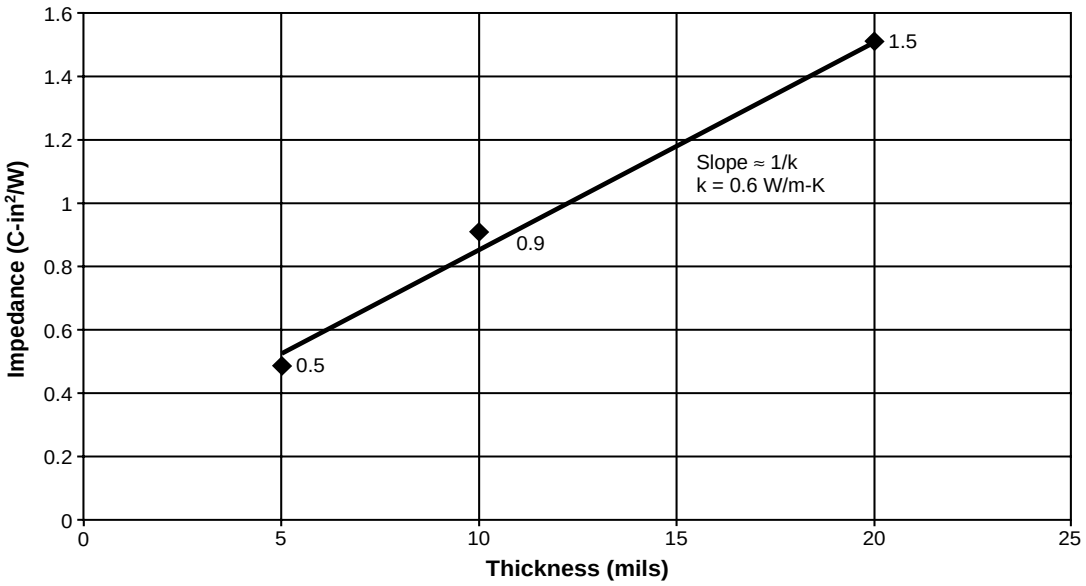
Typical Properties and Performance Characteristics ***(continued)***

Note: The following technical information for 3M™ Thermally Conductive Adhesive Transfer Tapes 8805, 8810, 8815 and 8820 should be considered representative or typical only and should not be used for specification purposes.

Thermal Impedance (C-in²/W) vs. Thickness: (Test Conditions: 3M test method).



Available Sizes

Width: Maximum width 14 inches.

Length: Standard 36 yards.

Custom Sizes: Contact your local 3M sales representative for information and availability of custom sizes (width and length) or die cut parts of tapes 8805, 8810, 8815 and 8820.

Application Guidelines

1.) Substrate surfaces should be clean and dry prior to tape application. Isopropyl alcohol (isopropanol) applied with a lint-free wipe or swab should be adequate for removing surface contamination such as dust or finger prints. Do not use “denatured alcohol” or glass cleaners which often contain oily components. Allow the surface to dry for several minutes before applying the tape. More aggressive solvents (such as acetone, methyl ethyl ketone (MEK) or toluene) may be required to remove heavier contamination (grease, machine oils, solder flux, etc.) but should be followed by a final isopropanol wipe as described above.

Note: Be sure to read and follow the manufacturers’ precautions and directions when using primers and solvents.

2) Apply the tape to one substrate at a modest angle with the use of a squeegee, rubber roller or finger pressure to help reduce the potential for air entrapment under the tape during its application. The liner can be removed after positioning the tape onto the first substrate.

3) Assemble the part by applying compression to the substrates to ensure a good wetting of the substrate surfaces with the tape. Proper application of pressure (amount of pressure, time applied, temperature applied) will depend upon design of the parts. Rigid substrates are more difficult to bond without air entrapment as most rigid parts are not flat. Use of a thicker tape may result in increased wetting of rigid substrates. Flexible substrates can be bonded to rigid or flexible parts with much less concern about air entrapment because one of the flexible substrates can conform to the other substrate.

Application Guidelines *(continued)*

4.) Application pressure guideline table for 3M™ Thermally Conductive Adhesive Transfer Tapes 8805, 8810, 8815 and 8820.

Substrate	Application Conditions	Time
Rigid to rigid	Minimum: 15 psi at room temperature Preferred: 50 psi at room temperature More pressure equals better wetting	2 sec 5 sec
Flexible to rigid	Minimum: 5 psi at room temperature Preferred: 15 psi at room temperature	1 sec 5 sec
Flexible to flexible	Minimum: 5 psi at room temperature Preferred: 15 psi at room temperature	1 sec 5 sec

5.) Application Tips:

- For rigid to rigid bonding, a twisting motion during assembly of the substrates will improve wetting. This should be a back and forth twisting motion during the application of compression.
- For flexible to rigid or flexible to flexible bonding, a roll lamination system may be employed to apply the flexible substrate down to the rigid (or other flexible) substrate. Rubber nip rollers, heated steel rollers, and other methods can be employed to bond in a continuous manner.
- Heat can be employed to increase wetting percentage and wetting rate of the substrates and to build room temperature bond strength.
- Primers may be employed to increase adhesion to low surface energy substrates (eg. plastic packages). Contact your 3M Technical Service Representative for more information about primers.
- For best product performance, it is important to use pressure and time conditions to achieve as much wetting as possible.

6.) Rework Tips:

- Rework requires separation of the two substrates. Separation can be accomplished by any practical means: prying, torquing or peeling. The tape will be destroyed upon separation and must be replaced. The surfaces should be re-cleaned according to the recommendations in this data page.
- Heating up the substrates can reduce the adhesion level and make removal easier.
- Part separation can be aided by immersion in warm water. This should eventually reduce the adhesion and make prying, torquing or peeling apart the substrates easier.

General Information

Product	Thickness (mm)	Bulk Thermal Conductivity (W/m-K)	Typical Applications
3M™ Thermally Conductive Adhesive Transfer Tapes			
8805	0.127	0.6	Applications requiring thin bonding with good thermal transfer; CPU, flex circuit and power transformer bonding to heat sinks and other cooling devices. Superior tack and wetting properties.
8810	0.25		
8815	0.375		
8820	0.50		
9894FR	1.0	0.6	Applications requiring gap filling and bonding with good thermal transfer; plasma display, IC packages, and PCB bonding to heat sinks, metal cases, and other cooling devices.
3M™ Thermally Conductive Pads			
5506/5507	0.5 to 2.5	2.3/2.5	Applications requiring gap filling and superior thermal performance without bonding, IC package and PCB thermal interfacing with heat sinks or other cooling devices and metal cases.
5509	0.5 to 2.5	5.0	

Product selection table for 3M Thermally Conductive Materials.

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Application Ideas

3M™ Thermally Conductive Adhesive Transfer Tapes 8805, 8810, 8815 and 8820 are designed to provide a preferential heat-transfer path between heat-generating devices and cooling devices (e.g., fans, heat pipes and heat sinks).

Shelf Life

Product shelf life is 2 years from date of manufacture when stored at room temperature conditions (72°F [22°C] and 50% RH) in the products original packaging.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550. Address correspondence to: 3M Engineered Adhesives Division, 3M Center, Building 220-7E-01, St. Paul, MN 55144-1000. Our fax number is 651-733-9175. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.

Certification/ Recognition

MSDS: 3M has not prepared a MSDS for these products which are not subject to the MSDS requirements of the Occupational Safety and Health Administration's Hazard Communication Standard, 29 C.F.R. 1910.1200(b)(6)(v). When used under reasonable conditions or in accordance with the 3M directions for use, these products should not present a health and safety hazard. However, use or processing of the product in a manner not in accordance with the directions for use may affect their performance and present potential health and safety hazards.

TSCA: These products are defined as articles under the Toxic Substances Control Act and therefore, are exempt from inventory listing requirements.

UL: The 8805, 8810 and 8815 products have been recognized by Underwriters Laboratories Inc. per UL-746C and UL-746A.

Per UL-746C testing, the maximum temperature rating for the 8805, 8810 or 8815 is 100°C when tested on glass epoxy or an anodized aluminum substrate. The products meet the UL-746C test requirement of maintaining at least 50% of their initially tested Overlap Shear strength after heat aging for 1000 hours at 150°C. (See UL file #MH17478 for details):

Additional testing completed and passed per UL-746C test methods include:

- Effect of Humidity: 7 days @ 95% Relative Humidity (RH) @ 60°C.
- Effect of Environmental Cycling (3 cycles): 1 cycle = 24h immersed in 25°C water / 24h @ 100°C / 96h @ 35°C @ 90% RH / 8 h @ -35°C.

Note: 8820 has not been tested per UL-746C or UL-746A test procedures.

Important Notice

3M MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's method of application. Please remember that many factors can affect the use and performance of a 3M product in a particular application. The materials to be bonded with the product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a 3M product. Given the variety of factors that can affect the use and performance of a 3M product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.

Limitation of Remedies and Liability

If the 3M product is proved to be defective, THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M PRODUCT. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including, but not limited to, contract, negligence, warranty, or strict liability.

ISO 9002

This Engineered Adhesives Division product was manufactured under a 3M quality system registered to ISO 9002 standards.

Electronic Adhesives and Specialties Department
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