3M™ Electrically Conductive Adhesive Transfer Tape 9703

Product Description

3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) 9703 is a pressure sensitive adhesive (PSA) transfer tape with anisotropic electrical conductivity. The PSA matrix is filled with conductive particles which allow interconnection between substrates through the adhesive thickness (the "Z-axis") but are spaced far enough apart for the product to be electrically insulating in the plane of the adhesive. The PSA tack properties and lack of any thermal curing make 3M ECATT 9703 easy to use in assembly operations.

3M ECATT 9703 electrically connects and mechanically bonds medium pitch flexible circuits with other flexible circuits (flex), rigid printed circuit boards (PCB) or LCD screens. 3M ECATT 9703 is electrically conductive and offers good adhesion to common PCB substrates such as copper, gold, FR-4 epoxy, DuPont™ Kapton™ polyimide and polyester films. Stable electrical performance in any flexible circuit interconnection application may require mechanical reinforcement (clamping).

3M ECATT 9703 also electrically connects and mechanically bonds EMI/RFI shield and gaskets to metal frames and enclosures. The low contact resistance and tape construction result in good EMI performance. 3M ECATT 9703 can be applied as die cut parts or in roll form and has good adhesion to common EMI/RFI substrates such as aluminum, stainless steel, and smooth gasket materials.

Product Construction

Property	Value
Adhesive Type	Filled Acrylic Pressure Sensitive
Release Liner	Silicone Treated Polycoated Kraft Paper
Approximate Thickness	
Adhesive	2 mil (50 µm)
Liner	4 mil (100 µm)

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Typical Physical Properties and Performance Characteristics

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

Adhesive Properties:

Peel Adhesion to Stainless Steel:
Tested in accordance with a modified ASTM D3330 test method, 12 ipm peel rate, 1 in. width, 2 mil PET backing, 180 degree)

Dwell Time @ Room Temperature	1 Hour	24 Hours
23°C	29 oz./in. (3.2 N/cm)	32 oz./in. (3.5 N/cm)

Note: Peel values will often be higher than noted above when using a non-PET backing. Different backing types effect the backing modulus, thickness and stiffness and these differences directly effect the peel test result value. As an example, a 2 mil aluminum backing will change the test value of the peel adhesion as the peel back angle at the interface will change due to the backing stiffness. A 2 mil aluminum backing would generally increase the peel values.

Temperature Performance[1]	Application Use Temperatures: -40 to +85°C in a properly designed end use application. See Note 1. Application Storage Temperatures: See "Shelf Life and Storage" comments. End user needs to qualify converted material for a broader storage environmental range. See also the Application section of this document

Outgassing:		
(NASA SP-R-0022 or ASTM E595)	125°C, 24 hrs, 2×10^{-6} Torr vacuum	
	Total Mass Loss (TML)	0.7%
	Collected Volatile Condensable Materials (CVCM)	0.01%

Electrical Properties:

Insulation Resistance[2,3]	3.4×10^{14} ohms/square (estimated based on 3M™ Electrically Conductive Adhesive Transfer Tape 9703)
Contact Resistance[1]	< 0.3 ohms (3M Test Method, Gold PI Flex onto Gold PCB, RT Initial R, 6 mm^2)
Minimum Gap[4]	15 mil (0.4 mm)
Minimum Overlap Area[5]	5000 mil^2 (3.2 mm^2)
Apparent Thermal Conductivity[6]	0.16-0.20 W/mK

1. The final assembly must be tested to verify that the 3M™ Electrically Conductive Adhesive Transfer Tape 9703 can achieve the desired performance in the assembly's end use application environmental conditions (temperature, humidity, temperature cycling, shock, application assembly design, assembly variation, etc.). 3M ECATT 9703 may achieve the -40 to +85°C temperature range (or broader temperature range excursions) in an end use application if the final assembly design is designed so that the conductive particles remain in sufficient mechanical contact between surfaces to achieve the desired contact resistance. Some type of mechanical bond line compression design as determined by the end use customer (clip, clamp, screw, compressed foam, etc.) that will apply a constant minimum pressure across the bond line may be required to meet the desired end use environmental ranges and contact resistance specification. The temperature use range is dictated by two primary items: Temperature performance of the acrylic adhesive (generally in the range of -40°C to about 95°C depending on other environmental conditions) as it supports the conductive particles in the adhesive/ particle matrix and the potential movement of the conductive fillers in the adhesive system in an end use application design. Items contributing to the performance of the Tape 9703 for resistance level performance include, but are not limited to: assembled bond line force (constant force present across the bond line after assembly and over the life of the product), types of substrates bonding, surface features in bonded area, environmental conditions, (temperature, humidity, CTE, shock, environmental cycling, etc.), assembly surfaces and 3M ECATT 9703 compatibility, 3M ECATT 9703 filler and assembly surfaces galvanic potential compatibility, etc. (See section on mechanical clamping for added information).
2. Tested in accordance with ASTM D-257 test method.
3. Estimate based on 3M™ Electrically Conductive Adhesive Transfer Tape 9703 test data.
4. Minimum free space between adjacent conductors suggested to ensure electrical isolation. Customers may qualify finer pitch performance in their applications.
5. Minimum recommended conductor overlap area (pad area) in the interconnection of individual circuit lines to ensure Z-Axis conductio.
6. Tested in accordance with a modified ASTM D5470 thermal test method.

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Available Sizes

Slit Tape Width	Standard Length	Maximum Length
0.25 to 0.5 inch (6.9 to 13 mm)	36 yds. (32.9 m)	36 yds. (32.9 m)
0.5 to 12 inch* (13 to 354 mm)	36 yds. (32.9 m)	108 yds. (98.8 m)
Normal Slitting Tolerance	0.03125 in. (0.8 mm)	

*Contact your 3M Technical Service Engineer for rolls wider than 12 inches.

Application Techniques

Bonding

- To obtain maximum adhesion, the bonding surfaces must be clean and dry.
- Pressure must be applied to the bond line after assembly to wet the substrates with 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) 9703 and to engage the conductive particles with the substrates to make electrical connection. Mechanical pressure (roller, metal bar) or finger pressure at 15 psi (0.10 Mpa) or greater is suggested. Heat may be applied simultaneously to improve wetting and final bond strength.
- 3M ECATT 9703 should be applied between 60°F - 158°F (15°C - 70°C). Tape application below 50°F (10°C) is not recommended because the adhesive will be too firm to wet the surface of the substrate, resulting in low adhesion.
- Adhesion builds with time, up to 24 hours may be required to reach final adhesion values.

Mechanical Clamping

To assure electrical resistance stability of 3M ECATT 9703 in any flexible circuit interconnection application, a mechanical clamp or other compressive force (i.e. foam strip held in compression over bond area.) should be considered in the design of the application. Any stress inherent in the assembly design (i.e. tensile, shear, cleavage) or temperature excursions (encountered through normal product use) applied to the bond area could result in an electrical open in the bonded circuit over time when no clamp or mechanism for maintaining a constant compressive forces is used. A well designed mechanical clamp will reduce the environmental stress on the bond line and improve the electrical reliability of the bond. In addition, the temperature operating range for the adhesive can be improved with a properly designed mechanical clamping system to ensure the conducting particles in the 3M ECATT 9703 maintain electrical contact. Several types of mechanical clamps have been used successfully including foam strips attached to lids or cases and screw-attached plastic clamps. Contact your 3M Technical Service Engineer for further information about mechanical clamping.

Application Techniques (continued)

Temperature Performance

The electrical performance of 3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) 9703 is more sensitive to temperature than the peel performance. 3M ECATT 9703 is not recommended for high or low temperature excursions where the electrical performance might be compromised, even if holding power is not affected. The user is responsible for the temperature performance qualification of 3M ECATT 9703 in their design. Contact your 3M Technical Service Representative for further information about the temperature performance of 3M ECATT 9703.

Rework

Mechanically separate the parts using torque for rigid parts and peel for flexible ones. Remove the adhesive by rubbing it off with a Scotch-Brite® Hand Pad, clean up the site and apply new adhesive. The force needed to separate the parts and/or remove the adhesive can be reduced by softening the adhesive by heating 158°F - 212°F (70°C - 100°C) or using solvents.*

***Note:** When using solvents, be sure to follow the manufacturer's precautions and directions for use when handling such materials.

General Information

3M ECATT 9703 is part of a family of anisotropic (Z-Axis) conductive tapes and thermoset films. For applications where mechanical clamping is not desired, or where improved electrical, thermal and mechanical performance is required, these alternative products should be considered.

Application Ideas

3M™ Electrically Conductive Adhesive Transfer Tape (ECATT) 9703 is ideal for interconnection of flexible circuits with other flexible circuits (flex), rigid printed circuit boards (PCB) or LCD screens. Applications include polyester flex circuit splicing, keyboard manufacturing, LCD assembly and many others. 3M ECATT 9703 is also ideal for EMI/RFI shield and gasket attachment applications. Applications include EMI shields for displays and gasket attachment to EMI/RFI cabinets and enclosures.

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Certificate of Analysis (COA):

The 3M Certificate of Analysis (COA) for this product is established when the product becomes commercially available from 3M. The Technical Data Sheet (TDS) technical information, test methods and data should be considered representative or typical only and should not be used for specification purposes. The Technical Data Sheet (TDS) information is based on a limited set of test results and do not reflect the COA specification limits. Final product specifications and associated manufacturing facility testing methods used for the commercialized product are outlined in the products Certificate of Analysis (COA) that is provided upon request or with the products shipment.

The COA contains the 3M specifications and test methods for the products performance limits that the product will be supplied against. The 3M product is supplied to 3M COA test specifications and the COA test methods. Inquire with 3M for the COA for this product.

Storage and Shelf Life

The shelf life of 3M™ Electrically Conductive Adhesive Transfer Tape 9703 is 24 months from the shipment date from the manufacturing location when stored in original packaging at 21°C (70°F) and 50% relative humidity.

Safety Data Sheet: Consult Safety Data Sheet before use.

Regulatory: For regulatory information about this product, contact your 3M representative.

Technical Information: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

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