Electrically Conductive Tape
9703

Technical Data **August, 2000**

Product Description

3M™ Electrically Conductive Tape 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 tape 9703 easy to use in assembly operations.

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

Tape 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. Tape 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.

Construction

Property		Value
Adhesive Type		Filled Acrylic Pressure Sensitive
Release Liner		Silicone-treated Polycoated Kraft paper
Approximate Thickness		
	Adhesive	2 mil (50 µ m)
	Liner	2 mil (50 µ m)

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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

	Temperature	
Dwell Time	23°C (72°F)	70°C (158°F)
15 min	> 35 oz./in. (3.82 N/cm)	50 oz./in. (5.45 N/cm)
1 hour	50 oz./in. (5.45 N/cm)	60 oz./in. (6.54 N/cm)
24 hour	55 oz./in. (6.00 N/cm)	65 oz./in. (7.08 N/cm)

(ASTM D3330), 2 mil Aluminum foil used as backing

Outgassing: (NASA SP-R-0022 or ASTM E595)	125°C, 24 hrs, 2 x 10^{-6} Torr vacuum	
	Total Mass Loss (TML)	0.7%
	Collected Volatile Condensable Materials (CVCM)	0.01%
Temperature Performance	Application Use Temperatures: -20 to +40°C Application Storage Temperatures: -30 to +70°C See also the Application section of this document	
Shelf Life and Storage Conditions	Tape in roll form: Shelf life 24 months from the date of manufacture when stored in original cartons at 21°C (70°F) and 50% relative humidity.	

Electrical Properties:

Insulation Resistance[1]	3.4 x 10^{14} Ohms/□
Contact Resistance[2]	1.25 milliOhm-in^2
Contact Resistivity[2]	1.6 Ohm-cm
Current Carrying Capacity[3]	1 amp/in^2
Minimum Gap[4]	15 mil (0.4 mm)
Minimum Overlap Area[5]	500 mil^2 (3.2 mm^2)

1. Based upon ASTM D-257
2. 4 wire resistance measurement, 2500 mil^2 overlap area, 0.5 Ohm measured resistance between overlaping silver ink traces (50 mil wide) on PET flex circuit. Contact your 3M Technical Service Engineer for more details of this testing.
3. Estimated, customers are required to qualify the maximum current capability for their application.
4. Minimum free space between adjacent conductors recommended to ensure electrical isolation. Customers may quality 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 conduction.

Available Sizes

Slit Tape Width	Standard Length	Maximum Length
0.25 to 0.5 inch (6.9 mm - 13 mm)	36 yds. (32.9 m)	36 yds. (32.9 m)
0.5 to 12* inch (13 mm - 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.

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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™ Tape 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.
- Tape 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 a stability of tape 9703 in any flexible circuit interconnection application, a mechanical clamp should be considered in the design of the application. Without clamping, over time, any shear stress or temperature excursions applied to the bond line could result in an electrical open in the bonded circuit. A well designed mechanical clamp will reduce the environmental stress on the bond line and improve the electrical reliability of the bond. 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.

Temperature Performance

The electrical performance of tape 9703 is more sensitive to temperature than the peel performance. Tape 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 tape 9703 in their design. Contact your 3M Technical Service Engineer for further information about the temperature performance of tape 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 3M™ Scotch-Brite™ 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.

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General Information

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

ZAF Product Selection Guide

	Flex Type		Connection Type			Pitch		
Product	*Silver Ink on Polyester*	*Copper on Polyimide*	*Flex to Glass*	*Flex to PCB*	*Flex to Flex*	*Moderate*	*Fine (≥ 100 micron)*	*Very Fine (≤ 100 micron)*
9703	x	x		x*	x	> .76mm		
7303	x	x		x	x	> .50mm		
5352R		x	x				x	
5552R		x	x					x
5460R		x		x	x		x	

*Requires mechanical backup for lowest electrical resistance

Application Ideas

3M tape 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 tape 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.

For Additional Information

To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550 or visit www.3M.com/bonding. Address correspondence to: 3M Bonding Systems 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: 1-809-750-3000. In Mexico, phone: 5-728-2180.

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ISO 9002

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

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