Membrane Switch Products on Moisture Stable Liner

7945MPL • 7952MPL • 7953MPL • 7955MPL 7956MPL • 7957MPL • 7959MPL • 7961MPL

Technical Data **December, 2005**

Adhesive Description

3M™ Adhesive 200MP High Performance Acrylic

This adhesive meets the requirements of most long-term applications. It offers temperature resistance to 400°F (204°C). Peel adhesion values are excellent on most membrane switch substrate materials. It features exceptional shear strength and adhesion to high surface energy (HSE) plastics and metal surfaces.

Product Description

Adhesives for Selective Die-Cutting (double-linered)

3M™ Laminating Adhesives are available with two liners for ease of processing and selective removal of adhesive.

3M™ Double-Linered Adhesives offer:

- High adhesive strength – for a long-lasting durable bond
- High cohesive strength – to resist lifting and separation especially in harsh environments
- Smooth adhesive – for a uniform graphic appearance
- Environmental stability – for a long-aging performance
- Moisture stable liner – for easy, layflat processing
- Easy release liners – for fast, consistent processing

Spacers for Circuit Separation (double-coated)

3M™ Double-Coated Membrane Switch Spacers feature 2.0 or 5.0 mil adhesive layers for industry-standard, high-performance requirements. 3M adhesive 200MP high performance acrylic provides the assurance your switch will perform through difficult environmental conditions and millions of actuations.

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Adhesives for Selective Die-Cutting (double-linered)

Product Number	Description	Construction				
		Liner (Weight/ Mils)	Adhesive (Mils)	Polyester (Mils)	Adhesive (Mils)	Liner (Weight/ Mils)
3M™ Membrane Switch Adhesive 7952MPL	Double-linered 3M™ Adhesive 467MP.	61.5# PCK 4.4 (0.112mm)	2	–	–	61.5# PCK 4.4 (0.112mm)
3M™ Membrane Switch Tape 7953MPL	Double-coated polyester for adhesive stability and ease of handling.		1.5	0.5	1.5	
3M™ Membrane Switch Adhesive 7955MPL	Double-linered 3M™ Adhesive 468MP.		5	–	–	

Spacers for Circuit Separation (double-coated)

Product No.	Description	Construction				
		Liner (Weight/ Mils)	Adhesive (Mils)	Polyester (Mils)	Adhesive (Mils)	Liner (Weight/ Mils)
3M™ Membrane Switch Spacer 7945MPL	Designed to meet the performance requirements of most membrane keyboards. Outstanding resistance to temperature extremes, chemicals and humidity. Also resists oozing, lifting and separation of switch layers. All products feature 2 mils of 3M™ Adhesive 200MP on each side.	61.5# PCK 4.4 (0.112mm)	2	1	2	61.5# PCK 4.4 (0.112mm)
3M™ Membrane Switch Spacer 7956MPL			2	2	2	
3M™ Membrane Switch Spacer 7957MPL			2	3	2	
3M™ Membrane Switch Spacer 7959MPL			2	5	2	
3M™ Membrane Switch Spacer 7961MPL			2	7	2	

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Typical Physical, Mechanical & Electrical Properties

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Spacers For Circuit Separation (double-coated)

	Peel Adhesion ASTM D3330 Modified, 90° Peel	
		72 hours @ 72°F (22°C)
Product Number	**Film / Substrate**	**Typical Value** oz./in. (N/100mm)
3M™ Membrane Switch Spacer 7945MPL (2-1-2)	PET/Stainless Steel PET/Polycarbonate	105 (115) 68 (75)
3M™ Membrane Switch Spacer 7956MPL (2-2-2)	PET/Stainless Steel PET/Polycarbonate	108 (119) 106 (117)
3M™ Membrane Switch Spacer 7957MPL (2-3-2)	PET/Stainless Steel PET/Polycarbonate	113 (124) 37 (41)
3M™ Membrane Switch Spacer 7959MPL (2-5-2)	PET/Stainless Steel PET/Polycarbonate	112 (123) 56 (62)
3M™ Membrane Switch Spacer 7961MPL (2-7-2)	PET/Stainless Steel PET/Polycarbonate	103 (113) 43 (47)

	Cohesion Static (shear) ASTM D3654 (0.5 in. sq.)		
		72°F (22°C) / 1000g	158°F (70°C)/500g
Product Number	**Film / Substrate**	**Typical Value** Minutes[1]	**Typical Value** Minutes[1]
3M™ Membrane Switch Spacer 7945MPL (2-1-2)	PET/Stainless Steel	10,000+	10,000+
3M™ Membrane Switch Spacer 7956MPL (2-2-2)	PET/Stainless Steel	10,000+	8,458
3M™ Membrane Switch Spacer 7957MPL (2-3-2)	PET/Stainless Steel	10,000+	6,048
3M™ Membrane Switch Spacer 7959MPL (2-5-2)	PET/Stainless Steel	10,000+	10,000+
3M™ Membrane Switch Spacer 7961MPL (2-7-2)	PET/Stainless Steel	10,000+	10,000+

[1]Cohesion static shear testing was stopped after 10,000 minutes.

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Spacers For Circuit Separation (double-coated) – *continued*

	Cohesion Dynamic (shear) ASTM D1002 (1 in. sq.)		**Tensile Strength** (Yield) ASTM D2370	
	158°F (70°C)/500G		72°F (22°C)	
Product Number	**Film / Substrate**	**Typical Value** PSI / MPa	**Typical Value** Mils (Microns)	**Typical Value** PSI
3M™ Membrane Switch Spacer 7945MPL (2-1-2)	PET/Stainless Steel PET/Polycarbonate	68 (0.47) 70 (0.48)	5 (125)	2556
3M™ Membrane Switch Spacer 7956MPL (2-2-2)	PET/Stainless Steel PET/Polycarbonate	103 (0.72) 78 (0.54)	6 (150)	3971
3M™ Membrane Switch Spacer 7957MPL (2-3-2)	PET/Stainless Steel PET/Polycarbonate	79 (0.55) 66 (0.46)	7 (175)	5062
3M™ Membrane Switch Spacer 7959MPL (2-5-2)	PET/Stainless Steel PET/Polycarbonate	78 (0.54) 69 (0.48)	9 (225)	6462
3M™ Membrane Switch Spacer 7961MPL (2-7-2)	PET/Stainless Steel PET/Polycarbonate	76 (0.52) 66 (0.46)	11 (275)	7945

	Dielectric Strength ASTM D149	**Dielectric Constant/ Dissipation Factor**	**Volume / Surface Resistivity**	
	Short time method (air)	ASTM D150 72°F (22°C)	ASTM D257 72°F (22°C)	
Product Number	**Typical Value** Volts/Mil	**Typical Value** D.C. / D.F.	**Typical Value V.R.** Ohm - cm	**Typical Value S.R.** Ohms
3M™ Membrane Switch Spacer 7945MPL (2-1-2)	1500	3.48 / 0.016	5.7×10^{14}	$> 5.6 \times 10^{16}$
3M™ Membrane Switch Spacer 7956MPL (2-2-2)	1700 P	3.40 / 0.015	8.9×10^{14}	$> 5.6 \times 10^{16}$
3M™ Membrane Switch Spacer 7957MPL (2-3-2)	1700 P	3.33 / 0.013	1.3×10^{15}	$> 5.6 \times 10^{16}$
3M™ Membrane Switch Spacer 7959MPL (2-5-2)	1600 P	3.32 / 0.011	1.5×10^{15}	$> 5.6 \times 10^{16}$
3M™ Membrane Switch Spacer 7961MPL (2-7-2)	1500	3.42 / 0.010	2.2×10^{15}	$> 5.6 \times 10^{16}$

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Typical Physical, Mechanical & Electrical Properties

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Spacers For Circuit Separation (double-coated) – *continued*

	Insulation & Moisture Resistance	**Coefficient of Thermal Expansion**
	Mil-I-46058C (100VDC, 60 sec.)	ASTM D696 25-175°C
Product Number	**Typical Value** Ohms	**Typical Value** M/M/°C
3M™ Membrane Switch Spacer 7945MPL (2-1-2)	1.0×10^{13}	6.1×10^{-4}
3M™ Membrane Switch Spacer 7956MPL (2-2-2)	1.1×10^{13}	5.1×10^{-4}
3M™ Membrane Switch Spacer 7957MPL (2-3-2)	1.1×10^{13}	5.4×10^{-4}
3M™ Membrane Switch Spacer 7959MPL (2-5-2)	1.9×10^{13}	4.7×10^{-4}
3M™ Membrane Switch Spacer 7961MPL (2-7-2)	1.6×10^{13}	4.1×10^{-4}

Adhesives For Selective Die Cutting (double-linered)

	Peel Adhesion ASTM D3330 Modified, 90° Peel	
		72 hours @ 158°F (70°C)
Product Number	**Film / Substrate**	**Typical Value** oz./in. (N/100mm)
3M™ Membrane Switch Adhesive 7952MPL (2-0-0)	PET/Stainless Steel PET/Polycarbonate	97 (107) 63 (70)
3M™ Membrane Switch Tape 7953MPL (1.5-0.5-1.5)	PET/Stainless Steel PET/Polycarbonate	112 (123) 81 (89)
3M™ Membrane Switch Adhesive 7955MPL (5-0-0)	PET/Stainless Steel PET/Polycarbonate	152 (166) 94 (102)

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Typical Physical, Mechanical & Electrical Properties

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Adhesives For Selective Die Cutting (double-linered) – *continued*

		Cohesion Static (shear) ASTM D3654 (0.5 in. sq.)	
		72°F (22°C) / 1000g	158°F (70°C)/500g
Product Number	**Film / Substrate**	**Typical Value** Minutes[1]	**Typical Value** Minutes[1]
3M™ Membrane Switch Adhesive 7952MPL (2-0-0)	PET/Stainless Steel	10,000+	10,000+
3M™ Membrane Switch Tape 7953MPL (1.5-0.5-1.5)	PET/Stainless Steel	10,000+	10,000+
3M™ Membrane Switch Adhesive 7955MPL (5-0-0)	PET/Stainless Steel	10,000+	10,000+

[1]Cohesion static shear testing was stopped after 10,000 minutes.

		Cohesion Dynamic (shear) ASTM D1002 (1 in. sq.)	**Tensile Strength** (Yield) ASTM D2370	
		72°F (22°C)		
Product Number	**Film / Substrate**	**Typical Value** PSI / MPa	**Sample Thickness** Mils (Microns)	**Typical Value** PSI
3M™ Membrane Switch Adhesive 7952MPL (2-0-0)	PET/Stainless Steel PET/Polycarbonate	103 (0.72) 80 (0.55)	2 (50)	51
3M™ Membrane Switch Tape 7953MPL (1.5-0.5-1.5)	PET/Stainless Steel PET/Polycarbonate	105 (0.72) 88 (0.61)	3.5 (88)	1593
3M™ Membrane Switch Adhesive 7955MPL (5-0-0)	PET/Stainless Steel PET/Polycarbonate	97 (0.67) 80 (0.55)	5 (125)	51

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Adhesives For Selective Die Cutting (double-linered) – *continued*

	Dielectric Strength ASTM D149	**Dielectric Constant/ Dissipation Factor**	**Volume / Surface Resistivity**	
	Short time method (air)	ASTM D150 72°F (22°C)	ASTM D257 72°F (22°C)	
Product Number	**Typical Value** Volts/Mil	**Typical Value** D.C. / D.F.	**Typical Value V.R.** Ohm - cm	**Typical Value S.R.** Ohms
3M™ Membrane Switch Adhesive 7952MPL (2-0-0)	880	3.40 / 0.021	1.0×10^{15}	$> 5.6 \times 10^{16}$
3M™ Membrane Switch Tape 7953MPL (1.5-0.5-1.5)	1400	3.29 / 0.017	5.8×10^{14}	$> 5.6 \times 10^{16}$
3M™ Membrane Switch Adhesive 7955MPL (5-0-0)	600	4.06 / 0.022	1.1×10^{15}	$> 5.6 \times 10^{16}$

	Insulation & Moisture Resistance	**Coefficient of Thermal Expansion**
	Mil-I-46058C (100VDC, 60 sec.)	ASTM D696 25-175°C
Product Number	**Typical Value** Ohms	**Typical Value** M/M/°C
3M™ Membrane Switch Adhesive 7952MPL (2-0-0)	1.3×10^{13}	7.2×10^{-4}
3M™ Membrane Switch Tape 7953MPL (1.5-0.5-1.5)	1.7×10^{13}	6.7×10^{-4}
3M™ Membrane Switch Adhesive 7955MPL (5-0-0)	8.8×10^{12}	9.2×10^{-4}

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Environmental Performance

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Temperature Range:
- Low: -40°F (-40°C)
- High long term (days, weeks): 250°F (121°C)
- High short term (min., hours): 300°F (149°C)

Chemical Resistance:
Solvent resistance is excellent when this product is properly applied to impervious materials. The adhesive resists softening through edge contact with mild acids, alkalies, oil, gasoline, kerosene, JP-4 fuel, cleaning solutions, germicidals, etc. NOT RECOMMENDED FOR TOTAL IMMERSION.

Moisture and Humidity Resistance:
No adverse effect on the bond after exposure to 100% R.H. at 100°F (38°C).

Bond Build-up:
The bond strength of 3M™ Adhesive 200MP high performance acrylic generally increases as a function of time and temperature.

UV Resistance:
Adhesive is resistant to oxidation and ozone when exposed to air or sunlight (UV).

Processing

Cutting:
Steel rule, punch press die-cuttable, digital cutter-plotter, and laser.

Roll Laminating:
Use rubber over steel roll set up with firm application pressure. Make adhesive to substrate contact at nip area only to exclude air entrapment. Use large radius platen press type system. Laminating heat assist is desirable to achieve best bond.

Special Considerations

Bond strength is dependent upon the amount of adhesive-to-surface contact developed. Firm application pressure develops better adhesive contact and thus improves bond strength.

To obtain best adhesion, the bonding surfaces must be clean, dry, and smooth. Some typical surface cleaning solvents are isopropyl alcohol or heptane. Consult manufacturer's Material Safety Data Sheet for proper handling and storage of solvents.

Ideal tape application temperature range is 70°F (21°C) to 100°F (38°C). Initial tape application to surfaces at temperatures below 50°F (10°C) is not recommended because the adhesive becomes too firm to adhere readily. However, once properly applied, low temperature holding is satisfactory.

Storage

Store at 70°F (21°C) and 50% relative humidity.

Shelf Life

To obtain best performance, use these products within 24 months from date of manufacture.

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Product Use

All statements, technical information and recommendations contained in this document are based upon tests or experience that 3M believes are reliable. However, many factors beyond 3M's control can affect the use and performance of a 3M product in a particular application, including the conditions under which the product is used and the time and environmental conditions in which the product is expected to perform. Since these factors 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.

Warranty and Limited Remedy

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Limitation of Liability

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ISO 9001:2000

This Industrial Adhesives and Tapes Division product was manufactured under a 3M quality system registered to ISO 9001:2000 standards.

3M

Industrial Business
Converter Markets
Industrial Adhesives and Tapes Division

3M Center, Building 21-1W-10, 900 Bush Avenue
St. Paul, MN 55144-1000
800-223-7427 • 651-778-4244 (fax)
www.3M.com/converter

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