



# Z-Axis Adhesive Film

## 5303R

Technical Data

February, 1999

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### Product Description

3M™ Z-Axis Adhesive Film 5303R is a heat-bonded, electrically conductive adhesive film. It is a non-tacky, heat and pressure cured system consisting of an adhesive matrix randomly loaded with conductive particles. These particles allow interconnection of circuit lines 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.

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### General Information

3M film 5303 connects and mechanically bonds flexible printed circuits – especially copper/polyimide circuits – to a variety of electronic substrates and metallizations including printed circuit boards, glass substrates (LCD displays) and flex circuits. Film 5303R is ideal for high performance systems requiring low electrical interconnect resistance, with high stability and reliability over a wide range of demanding environmental conditions, along with repairability.

Film 5303R is supplied on a clean room compatible poly release liner for easy handling. The release liner is removed after the film has been heat tacked to one of the substrates to be bonded. The flex circuit and LCD or flex circuit and PCB are then aligned and a final bond is made using a hot bar bonder (see the Bonding section of this data page).

Design parameters for interconnecting circuit lines with Film 5303R

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

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Minimum free space (gap) between adjacent conductors to ensure electrical insulation	70 $\mu\text{m}$	2.75 mils
Minimum conductor overlap area per conductor to ensure electrical connection in the Z-axis	0.0645 $\text{mm}^2$	100 mils <sup>2</sup>

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## Typical Properties

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Property	Value	Units
Adhesive Type	Cyanate Ester/ Thermoplastic Blend	
Liner Type	Polyester Film with Silicone release	
Adhesive Thickness	25 (1) and 50 (2)	micron (mil)
Liner Thickness	75 microns (3 mil)	
Dielectric Strength (AC, 1Hz - 105 Hz)	> 5	kV / mm
Dielectric Strength (DC)	> 8	kV / mm
Surface Resistivity	10 <sup>12</sup>	Ω / square
Modulus (cured)	> 10 <sup>9</sup>	Pascals
Coefficient of Thermal Expansion	100	ppm / °C
Moisture Absorption (85°C / 85% RH)	1.2	%
Ionic Content		ppm
Chloride	< 5	
Sodium	< 5	
Potassium	< 20	
Tacking Conditions		
Temperature*	80 - 100	°C
Pressure	0.7 (10)	Kg / cm <sup>2</sup> (psi)
Time	2-5	seconds
Bonding Conditions		
Temperature*	180	°C
Pressure	19.6 (280)	Kg / cm <sup>2</sup> (psi)
Time	15-20	seconds

\*Temperature measured in the adhesive. Thermode set points will be higher and will depend upon the substrate materials and bond equipment.

## Typical Performance

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

	Flex to PWB	Flex to ITO/Glass
Interconnect Resistance (200 micron line width) (IPC TM650 2.6.24)	< 50 mΩ	< 1Ω
Peel Strength	> 100 g/cm	> 1000 g/cm
Shear Strength	> 70 Kg/cm <sup>2</sup>	> 70 Kg/cm <sup>2</sup>

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<b>Construction</b>	<p><b>Rolls:</b> 3 mm wide x 50 meters long 3 mm wide x 10 meters long (other widths may be custom ordered and are subject to availability)</p> <p><b>Sheet:</b> 10 cm x 15 cm Custom sizes</p>
<b>Thickness Optimization</b>	<p>3M film 5303R comes in two thicknesses to accommodate interconnect bonding substrates with different types of metallization. The 25 micron (1 mil) thickness is ideal when one or both substrates has a thin film metallization, eg. Indium tin oxide on ITO glass for an LCD to flex interconnection. The 50 micron (2 mil) thickness is recommended when the metallization on both substrates is thicker, e.g. PWB to flex interconnection.</p>
<b>Bonding</b>	<p>Bonding of film 5303R requires a three part procedure: heat tacking the film to the flex circuit (or to the LCD, PCB etc.), removal of the release liner, and bonding the flex to the second substrate. Detailed bonding instructions are available in a Technical Service Bulletin, and these instructions must be followed to obtain good electrical and mechanical bonding.</p> <p>A thermocompression (hot bar) bonder is required for use of film 5303R, and several commercially available models exist; a list of vendors can be obtained by calling the toll free number on the back of this Technical Data Sheet.</p>
<b>Repair</b>	<p>Bonds made with film 5303R are repairable by heating the bondline (eg. with a hot plate or rework tool) peeling the substrates apart. The bond site then requires cleaning with a solvent (Methyl ethyl ketone recommended) and then the circuit can be rebonded using a fresh piece of film 5303R.</p> <p><b>Note:</b> Carefully read and follow manufacturer's precautions and directions for use when using cleaning solvents.</p>
<b>Storage</b>	<p>3M 5303R should be kept frozen (-5°C/23°F) in the original metallized airtight shipping pouch. Prior to use, while still inside the shipping pouch, film 5303R should be allowed to warm to room temperature for approximately 30 minutes to prevent condensation on the film and possible adhesive cracking. Freezer stored materials have a shelf life of 12 months. Reels exposed to room temperature for more than 2 weeks accumulated time may exhibit handling problems such as cracking or flaking of the adhesive and separation of the adhesive from the liner. Sheets of film 5303R or lengths unwound from the reel may show this type of failure earlier. While in storage film 5303R should be kept away from direct sources of heat and light.</p>

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



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