Anisotropic Conductive Film Adhesive 5363

Technical Data Page **September, 2006**

Product Description

3M™ Anisotropic Conductive Film (ACF) Adhesive 5363 is a heat-bondable, electrically conductive adhesive film. It is slightly tacky at room temperature and consists of a thermoset-thermoplastic adhesive matrix randomly loaded with conductive particles. These particles allow interconnection of circuit lines through the adhesive thickness, but are spaced far enough apart for the product to be electrically insulating in the plane of the adhesive. Application of heat and pressure causes the adhesive to flow and to bring the circuit pads into contact by trapping the conductive particles. The adhesive rapidly cures at modest bonding temperature. ACF 5363 may be used to bond a flexible printed circuit to another flexible printed circuit or to a printed circuit board.

Construction

General Properties

Property	
Adhesive Type	Thermosetting Type
Particle Type	Gold-Coated Nickel
Particle Size	8 microns
Liner Type	Polyester Film with Silicone Release
Adhesive Thickness	40 microns
Liner Thickness	50 microns

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.

Design Requirements

Property	Value	Units
Minimum Space Between Conductors	**100** (4)	**Micron** (mil)
Minimum Pitch	**200** (8)	**Micron** (mil)
Temperature Cycling Range	**-40 to 85** (-4 to 176)	**°C** (°F)

Ambient Physical Properties

Property	Test Substrates	Value	Test Method
Interconnect Resistance[1]	Flex to PC board[2]	< 0.10 Ohms	3M TM-2314[3]
Peel Strength[1]	Flex to PC board[2]	≥700 gf/cm	3M TM-2313[4]

Reliability Performance

Test Conditions	Interconnect Resistance[2, 5] (Ω) 3M TM-2314[3]
85°C x 1000 hrs	<0.10
125°C x 1000 hrs	<0.10
-40°C x 1000 hrs	<0.10
85°C/85% RH x 1000hrs	<0.10
-40°C to 85°C x 500 cycles	<0.10

(1) For a given application, values may differ depending on particular flex circuit and PC board materials used.

(2) Measured for gold/nickel/copper polyimide flex circuits bonded to gold/nickel/copper/FR-4 PC board. Contact overlap area was 0.2 sq. mm. Pad pitch was 200 microns.

(3) 3M internal test method TM-2314 based on test method IPC 650 – Section 2.6.24. The flex has the shorting strap located in or near the bond-line to approximate a 4-wire test structure and eliminate extraneous resistance in the measurement due to the circuit lines.

(4) 3M internal test method TM-2313 based on test method IPC 650 – Section 2.4.9.1.

(5) For a given application, values may differ depending on particular flex circuit and PC board materials used.

Assembly Process Techniques

Tacking and Bonding Conditions

Procedure	Conditions
Tacking Conditions	
Temperature[6]	90°C
Pressure	1 - 15 kg/cm^2
Time	~1 second
Bonding Conditions	
Temperature[6]	190°C
Pressure	~30 kg/cm^2
Time[7]	10 seconds

6) Temperature measured in the adhesive. Thermode set points will be higher and will depend upon the substrate materials and bond equipment. A typical bonding set-up for a flex interconnect bond is a thermode temperature of 300°C and a bonding time of 10 seconds (see next note).

7) The required minimum bonding temperature of 190°C is usually reached within the first 5 seconds of bonding. The adhesive should be bonded so that the temperature is held above the minimum of 190C for at least an additional 5 seconds. Also, it may be desirable to hold pressure while cooling to below 100C for maximum performance.

Assembly Process

A source of heat and pressure, such as a thermo-compression (hot bar) bonder is required for use of 3M™ Anisotropic Conductive Film Adhesive 5363. 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.

Bonding of the ACF 5363 requires a three-part procedure:

tacking the film to one substrate (pre-tacking)
removing the release liner
bonding the first substrate to the second substrate.

A pre-tacking temperature of 90°C under a pressure of 10 kg/cm² has been found to be effective. Cut the adhesive to the size of the flex circuit. Place the adhesive on the flex and set flex on hot plate at setpoint up to 90°C. Use roller to press adhesive onto the flex. After allowing flex and adhesive to cool, remove liner.

Final bonding must be done under heat and pressure, with a typical desirable bond line temperature at or above 190°C, held for 10 seconds, and a pressure of 30 kg/cm². During bonding, electrical contact is typically achieved within the first second after the bond line reaches 190°C. Additional time at temperature is necessary to fully cure the epoxy material to generate peel strength and the ultimate reliability. Bond times may vary depending upon the substrates to be bonded. For maximum mechanical and electrical performance, the pressure should be maintained while cooling to below 100ºC. This increases the total bond time. The time required to drop adhesive bond-line temperature below 100ºC is highly dependent upon the bonding equipment used.

Repair

Bonds made with 3M™ Anisotropic Conductive Film Adhesive 5363 are repairable by heating the bond-line to above 170°C (e.g. with a hot plate or rework tool) and peeling the circuits apart. The bond site then requires cleaning with a solvent, after which the circuit can be re-bonded using a fresh piece of ACF 5363. Solvents such as 3M™ Novec™ 72DA Engineered Fluid may be used.

Note: Carefully read and follow the manufacturer's precautions and directions for use.

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Storage

3M™ Anisotropic Conductive Film Adhesive 5363 should be kept frozen in the original airtight shipping bag. The ACF 5363 has a shelf life of at least 6 months following receipt by the customer when stored at temperatures ≤ 2°C. The product should be allowed to warm to room temperature for approximately 30 minutes prior to use to prevent moisture condensation on the film. Whenever possible, ACF 5363 should be kept away from high humidity environments as absorbed water can lead to moisture volatilization producing bubbles during heat bonding or gradual degradation of the product. The ACF 5363 can be held at room temperature for product utilization provided the cumulative room temperature shelf life is not exceeded. The room temperature shelf life is 4 weeks.

Shelf Life Data

Storage Environment	Shelf Life
Freezer (2°C)	9 months
Room Temperature	4 weeks

3M™ Anisotropic Conductive Film Adhesive Product Selection Guide

Product	Flex Type			Connection Type			Pitch		
	Silver Ink on Polyester	Gold/Copper on Polyester	Gold/Copper on Polyimide	Flex to Glass	Flex to PCB	Flex to Flex	Moderate	Fine (≥ 200 micron)	Very Fine (≤ 100 micron)
5363			x		x	x		x	
5460R			x		x	x		x	
5552R			x	x					x
7303	x	x	x	x*	x	x	> 0.50 mm		
7313	x	x	x	x*	x	x	> 0.50 mm		
9703	x		x		x†	x†	> 0.76 mm		
9705	x		x		x†	x†	> 0.76 mm		

* Tested only for silver frit traces; not suitable for ITO traces.

† Requires mechanical backup for lowest electrical resistance.

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Precautionary Information	Refer to Product Label and Material Safety Data Sheet for Health and Safety Information before using this product. For additional health and safety information, call 1-800-364-3577 or (651) 737-6501.
For Additional Information	To request additional product information or to arrange for sales assistance, call toll free 1-800-251-8634. Address correspondence to: 3M Electronics, Building 21-1W-10, 900 Bush Avenue, St. Paul, MN 55144-1000. Our fax number is 651-778-4244. In Canada, phone: 1-800-634-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.
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3M Center, Building 21-1W-10, 900 Bush Avenue
St. Paul, MN 55144-1000
1-800-251-8634 phone
651-778-4244 fax
www.3M.com/electronics

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