

3M™ Anisotropic Conductive Film Adhesive 7398

Product Description

3M™ Anisotropic Conductive Film (ACF) Adhesive 7398 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 inter-connection 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 7398 may be used to bond a flexible printed circuit to another flexible printed circuit or to a printed circuit board.

Construction

General Properties

Property	Value
Adhesive Type	Thermosetting Type
Particle Type	Gold-Coated Glass
Particle Size	10 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 (-40 to 190)	°C (°F)

Ambient Physical Properties

Property	Test Substrates	Value	Test Method
Interconnect Resistance⁽¹⁾	PI Flex to PCB ⁽²⁾	< 0.1 Ohms	3M TM-2314 ⁽³⁾
Peel Strength⁽¹⁾	PI Flex to PCB ⁽⁴⁾	≥ 700 gf/cm	3M TM-2313 ⁽⁵⁾

Reliability Performance

Test Conditions ⁽⁶⁾	Interconnect Resistance ^(2,4) (Ω) 3M TM-2314 ⁽³⁾
70°C/90% RH x 1000 hrs	< 0.1
-40°C to 85°C x 250 cycles ⁽⁷⁾	< 0.1

⁽¹⁾ For a given application, values may differ depending on particular substrate material or type of circuitry.

⁽²⁾ Measured for gold/nickel/copper polyimide flex circuits bonded to printed circuit board. Contact overlap area was 0.15 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 near the bond-line to approximate a 4-wire test structure and eliminate most extraneous resistance in the measurement due to the circuit lines.

⁽⁴⁾ Measured for gold/nickel/copper polyimide flex circuits bonded to printed circuit board.

⁽⁵⁾ 3M internal test method TM-2313 based on test method IPC 650 – Section 2.4.9.1.

⁽⁶⁾ For a given application, values may differ depending on particular flex circuit and printed circuit board materials used.

⁽⁷⁾ Testing is ongoing. To date 250 cycles are complete.



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Assembly Process Techniques

Tacking and Bonding Conditions

Procedure	Conditions
Tacking Conditions	
Temperature ⁽⁸⁾	90°C
Pressure	1 - 15 kg/cm ²
Time	~1 second
Bonding Conditions	
Temperature ⁽⁹⁾	150-190°C
Pressure	30-40 kg/cm ²
Time ⁽⁹⁾	5-9 seconds

⁽⁸⁾ 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 200°C and a bonding time of 5-9 seconds (see next note).

⁽⁹⁾ The required minimum bonding is usually reached at the endpoint of the bonding time. Higher temperature and longer bond time than the minimum specified may be needed depending on customer application and design. Also, it may be desirable to hold pressure while cooling to below 100°C 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 (ACF) Adhesive 7398. 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 ACF 7398 requires a three-part procedure:

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

A pre-tacking temperature of 90°C under a pressure of about 10 kg/cm² should be used. **For automated ACF application:** Set the ACF pretacking equipment to deliver the conditions provided above. Slight adjustment to these conditions may be necessary for each application or for different types of circuitry. **For manual ACF application:** 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 that is held at least 150°C for 5-9 seconds and a pressure of 30-40 kg/cm². During bonding, electrical contact is typically achieved shortly after the thermode is pressed against the parts. 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. (Optionally, for maximum mechanical and electrical performance, the pressure may be maintained while cooling to below 100°C. This increases the total bond time. The time required to drop adhesive bond-line temperature below 100°C is highly dependent upon the bonding equipment used.)

Repair

Bonds made with 3M™ Anisotropic Conductive Film Adhesive 7398 are repairable by heating the bond-line to above 150°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 7398. Solvents such as 3M™ Novec™ Engineered Fluid 72DA may be used.

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

Storage

3M™ Anisotropic Conductive Film (ACF) Adhesive 7398 should be kept frozen in the original airtight shipping bag and 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 7398 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. ACF 7398 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.

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Assembly Process Techniques (continued)

Shelf Life Data

Storage Environment	Shelf Life
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	Polyimide	Flex to Glass	Flex to Plastic device	Flex to PCB	Flex to Flex	Moderate	Fine (200 micron)	Very Fine (≤ 100 micron)
5363			x				x	x		x	
5552R			x		x			x			<0.10 mm
7303	x	x	x		x*	x†	x	x	0.50 mm		
7313	x	x	x		x*	x†	x	x	0.50 mm		
7393	x	x	x		x	x		x	<0.50 mm		
7396	x	x	x		x	x†	x	x	0.50 mm		
7398		x	x				x	x		x	
7399			x		x			x			<0.05 mm

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

†Suitable for silver ink traces only, not suitable for ITO traces.

Certification/Recognition

TSCA: This product is defined as an article under the Toxic Substances Control Act and therefore, it is exempt from inventory listing requirements.

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 Markets Materials Division, Building 21-1W-10, 900 Bush Avenue, St. Paul, MN 55144-1000. Our fax number is 651-778-4244 or 1-877-369-2923.

In Canada, phone: 1-800-364-3577.

In Puerto Rico, phone: 1-787-750-3000.

In Mexico, phone: 52-70-04-00.

Important Notice

Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use.

Warranty; Limited Remedy; Limited Liability.

This product will be free from defects in material and manufacture at the time of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. **Except where prohibited by law, 3M will not be liable for any indirect, special, incidental or consequential loss or damage arising from this 3M product, regardless of the legal theory asserted.**



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