3M™ Anisotropic Conductive Film 7376-30
(for Camera Module Devices)

Product Description

3M™ Anisotropic Conductive Film (ACF) 7376-30 is a heat-bondable, electrically conductive adhesive film. The unbonded film 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 and pressure. The 3M ACF 7376-30 may be used to bond a flexible printed circuit to another flexible printed circuit or flexible printed circuit to polyester-based devices or flexible printed circuit to camera module devices.

Construction

General Properties

Property	Value
Adhesive Type	Thermosetting Type
Particle Type	Gold-Coated Polymer
Particle Size	30 micron
Liner Type	Polyester Film with Silicone Release
Thickness	45 micron
Liner Thickness	50 micron

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 Pad Area	**0.50** (320)	**sq. mm** (sq. mil)

Ambient Physical Properties

Property[1]	Test Substrates	Value	Test Method
Interconnect Resistance	Flex-to-PC Board[2]	< 20 mOhms	3M TM-2314[3]
Interconnect Resistance	Flex-to-Ag-Ink/PET[4]	< 20 mOhms	3M TM-2314[3]
Peel Strength	Flex-to-PC Board[2]	> 900 g/cm	3M TM-2313[5]
Peel Strength	Flex-to-Ag-Ink/PET[4]	> 700 g/cm	3M TM-2313[5]

(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 0.50 sq. mm. Pad pitch was 500 microns.

(3) 3M internal test method TM-2314 based on 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 silver-ink/polyester. Contact overlap area was 2.0 sq. mm. Pad pitch was 2.0 mm.

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

Typical Physical Properties and Performance Characteristics (continued)

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

Reliability Performance – Electrical Contact[6]

Test Conditions	Interconnect Resistance (mOhms) 3M TM-2314[7]
100°C x 1000 hrs	< 100
-40°C to 85°C x 1000 cycles	< 100
85°C / 85% r.h. x 1000 hrs	< 100

Reliability Performance – Peel Strength[8]

Test Conditions	Peel Strength (g/cm) 3M TM-2313[8]
100°C x 1000 hrs	> 700
-40°C to 85°C x 1000 cycles	> 700
85°C / 85% r.h. x 1000 hrs	> 700

Assembly Process Techniques

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 7376-30. 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.

Tacking and Bonding Conditions

Procedure	Conditions
Tacking Conditions	
Temperature[9]	60 - 90°C
Pressure	5 - 15 kg/cm^2
Time	~1 sec
Bonding Conditions	**Flex-to-Ag-Ink/PET**
Temperature[9]	140 - 160°C
Pressure	10 - 20 kg/cm^2
Time[10]	10 - 15 sec
Bonding Conditions	**Flex-to-Camera Module**
Temperature[9]	140 - 160°C
Pressure	10 - 20 kg/cm^2
Time[10]	7 - 15 sec

Assembly Process (continued)

Bonding of 3M ACF 7376-30 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 about 10 kg/cm^2 should be used. **For automated ACF application:** Set the ACF pretacking equipment to deliver the conditions provided in the Tacking and Bonding Conditions Table 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.

(6) Measured for gold/nickel/copper polyimide flex circuits bonded to printed circuit board. Contact overlap area was 0.75 sq. mm. Pad pitch was 500 micron.

(7) 3M internal test method TM-2314 based on 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.

(8) 3M internal test method TM-2313 based on test method IPC 650 – Section 2.4.9.1.

(9) Temperature measured in the adhesive. Thermode set points will be higher and will depend upon the substrate materials and bonding equipment. A typical set-up for tacking is a setpoint temperature of 125ºC. A typical bonding set-up for a bonding is a thermode temperature of 250ºC and bonding time of 10 seconds (see next note).

(10) The required minimum bonding temperature is usually reached at the endpoint of bonding time. The optimum bonding temperature and time may be different depending on customer application and design. Also, it may be desirable to hold pressure while cooling to below 100ºC for maximum performance.

Assembly Process Techniques (continued)

Final bonding must be done under heat and pressure, with a typical desirable bond line temperature that reaches at least 130°C after 4 seconds at a pressure of at least 10 kg/cm^2. This has been achieved using a total bond time of 7-15 sec where over the first 3-5 seconds the adhesive ramps quickly to near the target temperature and over the last 4-10 seconds the temperature reaches between 140°C and 160°C. A plot of the temperature vs. time profile is shown in Figure 1. 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 thermoset material to generate peel strength and the ultimate reliability. Bond times may vary depending upon the substrates to be bonded.

Repair

Bonds made with 3M™ Anisotropic Conductive Film Adhesive 7376-30 may be repairable. The method for successful rework can show considerable variation for different design applications, process parameters, and equipment capabilities. Contact your local Tech Service Representative for further information.

Storage

The 3M ACF 7376-30 should be kept frozen in 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, 3M ACF 7376-30 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 3M ACF 7376-30 can be held at room temperature for product utilization provided the cumulative room temperature shelf life of 4 weeks is not exceeded.

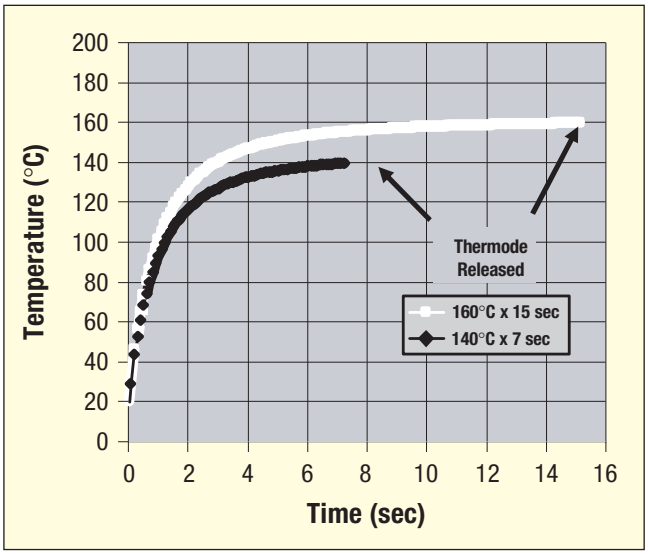

Figure 1. Graph of ACF temperature vs. time profile showing typical examples of bonding cycle.

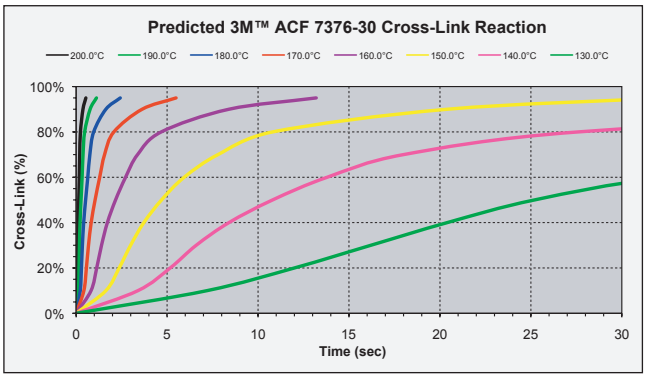

Figure 2. Graph of predicted cross-link reaction compared with bonding temperature and time.

Shelf Life Data

Storage Environment	Value
Freezer (< 2°C)	12 months
Room Temperature	4 weeks

Product Selection Guide

	Flex Type			Connection Type				Pitch and Space Requirements	
	Silver Ink on Polyester	Gold/Copper on Polyester	Gold/Copper on Polyimide	Flex to Glass	Flex to Plastic Device	Flex to PCB	Flex to Flex	Minimum Space Between Conductors	Minimum Pad Area
ACF 5363			X			X	X	100 micron	0.15 sq. mm
ACF 7303	X	X	X	X[1]	X[2]	X	X	250 micron	0.75 sq. mm
ACF 7371	X	X	X	X	X		X	100 micron	0.10 sq. mm
ACF 7371-20	X	X	X	X	X		X	100 micron	0.50 sq. mm
ACF 7376-10	X	X	X	X	X	X	X	70 micron	0.10 sq. mm
ACF 7376-30	X	X	X	X	X	X	X	100 micron	0.50 sq. mm
ACF 7379	X	X	X	X				50 micron	0.05 sq. mm

[1]Tested only for silver frit; not suitable for ITO traces.

[2]Suitable for silver ink traces only; not suitable for ITO traces.

Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use

Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

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Electronics Markets Materials Division
3M Center, Building 225-3S-06
St. Paul, MN 55144-1000
1-800-251-8634 phone
651-778-4244 fax
www.3M.com/electronics

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