

3M

Bonding Film

620

Technical Data

July, 2002

Product Description

3M™ Bonding Film 620 is a three layer bonding film consisting of a 2 mil polyester film core coated both sides with 2 mils of a polyester based thermoplastic adhesive.

This bonding film exhibits good adhesion to a variety of substrates while also providing a dielectric insulating layer.

Key Features

- Provides dielectric insulating layer
- Consistent, uniform adhesive thickness
- Quick fixturing/holding strength
- 100% solids
- Excellent adhesion to many substrates
- Suitable for die cutting

Typical Physical Properties

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

Adhesive Resin	Polyester Thermoplastic (non-curing)
Three Layer Construction	2 mil Adhesive (.002 in. [0.05 mm]) 2 mil Polyester Film Core (.002 in. [0.05 mm]) 2 mil Adhesive (.002 in. [0.05 mm])
Liner Thickness	3 mil (.003 in. [0.08 mm]) (nominal)
Color	Translucent
Solids	100%
Ball and Ring Softening Range (Adhesive)	240 to 250°F (116 to 123°C)
Tensile Strength @ Break	9000 psi
Elongation @ Break	100%
Two Lb Dead Load Heat Resistance	215°F (102°C)

Note 1: Other combinations of polyester core and adhesive thickness may be available upon request.

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Application Equipment Suggestions

Note: Appropriate application equipment can enhance bonding film performance. We suggest the following equipment for the user's evaluation in light of the user's particular purpose and method of application.

The type of application equipment used to bond 3M™ Bonding Film 620 will depend on the application involved and on the type of equipment available to the user. Thin films and flexible substrates can be bonded using a heated roll laminator where heat and pressure can be varied to suit the application. Larger, thicker substrates can be bonded using a heated static press or, in some cases, an autoclave. For applications where a shaped adhesive is to be transferred to a flat or three-dimensional part, a hot shoe or thermode method may be appropriate.

It is recommended that whatever method of bonding the user chooses, the user should determine the optimum bonding conditions using the specific substrates involved.

Directions For Use

To make a bond using Bonding Film 620, the adhesive can be first tacked (lightly bonded) to one of the substrates using low heat, and placing the second substrate to the exposed adhesive surface, making the bond using heat and pressure.

Alternatively, remove the liner and place the adhesive film between the two substrates and make the bond through heat and pressure using a heated press, a hot roll laminator, a hot shoe thermode method or similar equipment.

Suggested TACKING Conditions

100°F to 120°F (38°C to 49°C) bondline temperature

1-2 seconds dwell time

5-10 psi pressure

The optimum heat, pressure and dwell time will depend upon the type and thickness of the substrates being bonded together.

A suggested starting point is to use a method which will result in an adhesive bondline temperature of 275°F (135°C) for 2-5 seconds using 10-20 psi pressure.

Suggested BEGINNING Bonding Conditions

270°F to 280°F (132°C to 138°C) bondline temperature

2-5 seconds dwell time

10-20 psi pressure

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Directions For Use (continued)

One approach to establishing the correct/optimum bonding conditions for a user's application is to evaluate a series of bonding temperatures, for example 250, 275, 300, 325 and even 350°F (121, 135, 149, 163 and 177°C). Time and pressure will be dictated by the thickness of the substrate and the type of substrate being bonded. Thicker substrates and more difficult to bond surfaces will require longer times, higher pressures and higher temperatures.

Once the bond is made, the bondline should be allowed to cool somewhat before stress is applied to the bond. Generally, cooling the bondline below 200°F (93°C) is adequate to allow the bonded parts to be unfixtured/unclamped and handled.

For reference, the following tables show typical bond strengths for bonds made at various temperatures. **Such tables can be used to evaluate optimum bondline temperatures.** It is very important to note that this table is valid only for the specific substrates shown. Varying temperature, pressure, or substrates can affect bond strengths. **User should develop a similar table using the specific substrates involved.**

Note: Temperatures shown are bondline temperatures and not heat block or roll settings!

Overlap Shear Adhesion vs Bonding Temperature CRS/CRS Overlap Shear	
Bondline Temperature	Bonding Film 620
250°F (121°C)	760 psi
270°F (132°C)	1100 psi
290°F (143°C)	1160 psi
310°F (154°C)	1210 psi
330°F (166°C)	1000 psi

- Bond strength determined using Instron tester at 0.2 in/minute.
- Oven/Weight method, 10 minutes, 4.4 psi pressure.
- CRS is Cold Rolled Steel.

Peel Strength of Bonds Made at Various Temperatures		
Bondline Temperature	Bonding Film 620 Copper to Copper	Bonding Film 620 SS to PC
138°F (59°C)	0.3 piw	0.7 piw
156°F (69°C)	1.7 piw	15.0 piw
178°F (81°C)	5.5 piw	17.1 piw
196°F (91°C)	8.4 piw	19.5 piw
214°F (101°C)	10.2 piw	20.0 piw
236°F (113°C)	12.4 piw	23.1 piw
258°F (126°C)	10.0 piw	26.0 piw
278°F (137°C)	8.6 piw	28.0 piw
300°F (149°C)	8.2 piw	26.5 piw
318°F (159°C)	—	21.7 piw

- Substrates used – 0.0015 in foil copper, 0.008 in stainless steel (SS) and 0.125 in polycarbonate (PC).
- Bonds made using 5 second dwell, 5 lbs pressure.
- Peels tested at 90° angle, 2 in/minute, Instron tester.

T-Peel Adhesion of PET/PET and PI/PI Bonded at Various Temperatures		
Bondline Temperature	Bonding Film 620 PET/PET	Bonding Film 620 PI/PI
180°F (82°C)	0.4 piw	0.4 piw
196°F (91°C)	1.1 piw	0.8 piw
216°F (102°C)	1.8 piw	3.0 piw
235°F (113°C)	2.5 piw	5.9 piw
256°F (124°C)	4.4 piw	6.1 piw
277°F (136°C)	5.1 piw	6.8 piw
298°F (148°C)	6.5 piw	7.5 piw
315°F (157°C)	6.3 piw	8.1 piw

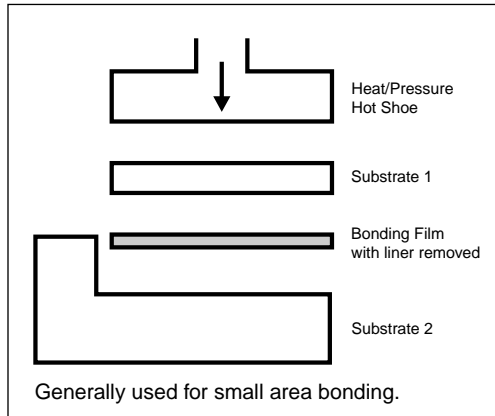
- PET is 2 mil polyester film.
- PI is 3 mil polyimide film.
- Bonds made using 5 second dwell, 5 lb gauge pressure.
- T-Peel adhesion is 90° peel pulled @ room temperature using Instron tester @ 2 in/minute.

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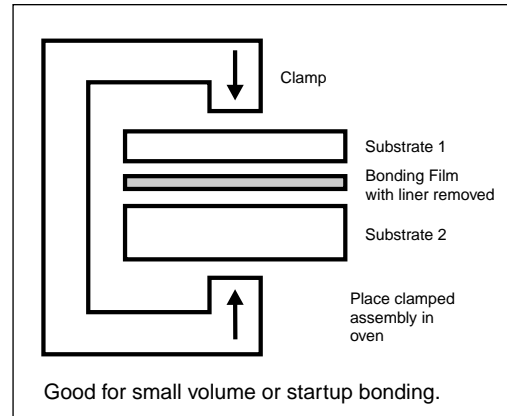
Typical Methods For Bonding 3M™ Bonding Film Adhesives

The following illustrations show several of the many methods that can be used to make bonds using 3M™ Bonding Film Adhesives. Equipment is generally available commercially or can be built or modified by the user to fit a particular application.

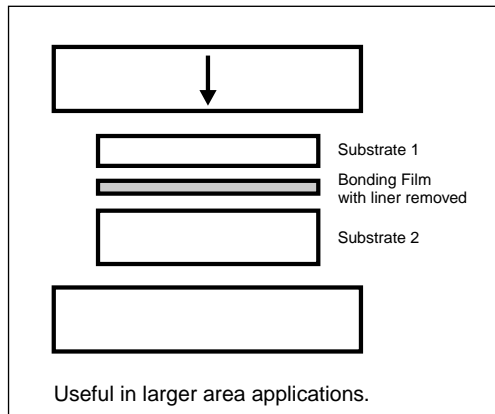
Hot Shoe or Thermode Bonding



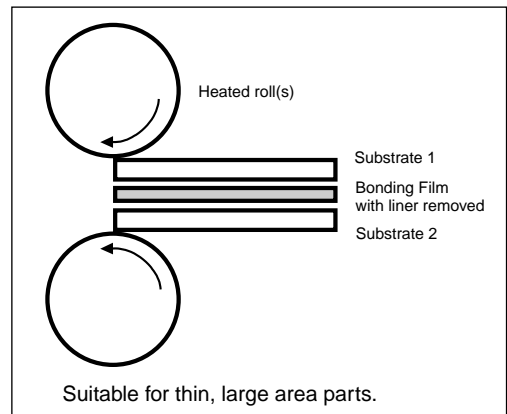
Oven (Static or ConveyORIZED) Bonding



Hydraulic or Mechanical Press Bonding



Lamination Bonding of Thin Substrates



Debonding – Since Bonding Film 620 is a thermoplastic material, no curing during heating or aging occurs. To debond or open bonded parts, simply heat the bonded part to an adequate temperature (typically 275-300°F / 135-149°C) to soften the adhesive and then pry or peel the substrates apart.

Solvents, such as acetone, MEK, toluene and 3M™ Citrus Base Cleaner will soften this bonding film adhesive and can be used to remove excess adhesive in unwanted areas.* Soaking bonds in these solvents can also aid in debonding operations where appropriate.

***Note:** When using solvents, extinguish all ignition sources and follow the manufacturer's precautions and directions for use.

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Typical Performance Characteristics

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

Adhesion to Various Substrates	
Test Substrate	90° Peel Bonding Film 620
Polycarbonate	9.5 piw
ABS	10.8 piw
HDPE	4.6 piw
Polypropylene	2.1 piw
PVC	9.9 piw
LCP (Vectra A-130)	4.2 piw
LCP (Vectra B-130)	8.2 piw
LCP (Zenite 6130 L)	4.5 piw
Nylon 6,6	7.8 piw
PPS (Polyphethylene Sulfide)	8.6 piw

- Peel bonds made bonding 1.5 mil copper foil to test substrates using 280°F (138°C) bondline temperature, 5 seconds dwell, 5 lbs gauge pressure.
- Adhesion tests done using Instron tester @ 2 in/minute.

Bond Strength Retention After Humidity Aging	
Stainless Steel to Polycarbonate Bonds	Bonding Film 620
Initial (Before Aging)	27.0 piw
6 days @ 95% RH / 150°F (66°C)	22.8 piw
21 days @ 95% RH / 150°F (66°C)	21.2 piw
6 days @ 95% RH / 185°F (85°C)	23.9 piw

- Bonds made bonding 8 mil stainless steel foil bonded to 0.125 in polycarbonate @ 260°F (127°C), 5 second dwell, 5 lbs gauge pressure.
- Bonds tested by Instron peel @ 2 in/minute @ 90° peel angle.

Adhesion Strength <u>TESTED</u> at Various Temperatures	
Test Temperature	Bonding Film 620 Peel Strength SS to PC
75°F (24°C)	28.4 piw
113°F (45°C)	16.0 piw
150°F (66°C)	2.6 piw
185°F (85°C)	2.3 piw
203°F (95°C)	0.8 piw

- SS is 8 mil stainless steel, PC is 0.125 in polycarbonate.
- Peel bonds made @ 260°F (127°C), 5 seconds dwell, 5 lbs pressure.
- Adhesion determined using Instron tester @ 2 in/minute.

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Electrical Data

Test	Method	Value
Dielectric Constant	ASTM D-150	3.7 @ 1 kilohertz 3.7 @ 3 kilohertz
Dissipation Factor	ASTM D-150	0.012 @ 10 kilohertz 0.014 @ 100 kilohertz 0.014 @ 1000 kilohertz
Dielectric Breakdown Strength	ASTM D-149	1500 volts/mil
Surface Resistivity	ASTM D-257	8 x 10 ¹³ ohms/sq.
Volume Resistivity	ASTM D-257	3 x 10 ¹⁴ ohm-cm

Thermal Data

Test	Method	Value
Weight Loss (of Adhesive) By TGA (Thermal gravimetric analysis)	Perkin-Elmer Series 7 RT to 800°C, 5°C/min, in air	1% wt loss @ 202°C 5% wt loss @ 268°C 10% wt loss @ 307°C
Coefficient of Thermal Expansion By TMA (of Adhesive) (Thermal mechanical analysis)	Perkin-Elmer Series 7 -60°C to 125°C @ 10°C/min	102 x 10 ⁻⁶ unit/unit/°C (-60°C to 20°C)

Storage and Shelf Life

Storage: Store in a dry (preferably <50% RH) location at 35°F (2°C) to 80°F (27°C).

Shelf Life: Shelf life is 2 years from the date of manufacture under the storage conditions mentioned above.

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 1-800-362-3550. Address correspondence to: 3M Engineered Adhesives 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: 1-787-750-3000. In Mexico, phone: 52-70-04-00.

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