

3M

Thermo-Bond Film

557 and 557 EG

Technical Data

August, 1996

Product Description 3M™ Thermo-Bond Films 557 and 557 EG are flexible, light colored, thermoplastic adhesive bonding films which exhibit good adhesion to a variety of substrates, especially many plastics.

Thermo-Bond Film 557	–	4.0 mil	adhesive layer
Thermo-Bond Film 557 EG	–	2.5 mil	adhesive layer

Key Features

- Quick fixturing/holding strength
- Suitable for kiss or through die cutting
- Consistent, uniform adhesive thickness
- Solvent-free

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.

Base Resin	Ethylene Vinyl Acetate
Adhesive Thickness	557 – 4 mil (.004 in) 557 EG – 2.5 mil (.0025 in)
Liner Thickness	3 mil (nominal)
Color	Translucent
Specific Gravity	0.97
Solids	100%
Ball and Ring Softening Range	220 to 230°F (104 to 110°C)
Tensile Strength @ Break (ASTM D882)	500 psi
Elongation @ Break (ASTM D882)	500-600%
Two Lb. Dead Load Heat Resistance	140°F (60°C)

Note 1: The data reported in this data sheet were determined using 4.0 mil film thickness (Thermo-Bond Film 557). Performance values using the 2.5 mil Thermo-Bond Film 557 EG are expected to be similar, but should be tested in user's application before use.

Note 2: As noted above the Thermo-Bond 557 and 557 EG products are 4.0 mil and 2.5 mil thickness, respectively. If required, this bonding film can be supplied in thicknesses from 0.8 to 40 mil. Contact your local 3M sales representative for details.

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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™ Thermo-Bond Film 557 or 557 EG 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 die-cut 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 Thermo-Bond Film 557 or 557 EG, remove the liner and place the adhesive film between the two substrates. The bond is then made through heat and pressure using a heated press, a hot roll laminator, a hot shoe thermode method or similar equipment. Alternatively, the adhesive can be first tacked (lightly bonded) to one of the substrates using low heat, then, removing the liner and placing the second substrate to the exposed adhesive surface, making the bond using heat and pressure.

Suggested TACKING Conditions

130 to 150°F (54 to 65°C) bondline temperature

1-2 seconds dwell time

5-10 psi pressure

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

A suggested starting point, however, is to use the conditions shown below.

Suggested BEGINNING Bonding Conditions

250 to 275°F (121 to 135°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 optimum bonding conditions for a user's application is to evaluate a series of bonding temperatures, for example 200, 220, 230 and even 250°F (93, 104, 110 and 121°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 table shows typical bond strengths for bonds made at various temperatures. **Such a table 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!

Bondline Temperature	Peel Adhesion Vs Bonding Temperature	
	Alum. / Alum.	T-Peel Strength Alum. / Polycarbonate
120°F (49°C)	3.9 piw	4.0 piw
130°F (54°C)	4.9 piw	4.1 piw
140°F (60°C)	5.7 piw	5.0 piw
150°F (66°C)	6.3 piw	5.7 piw
160°F (71°C)	6.5 piw	6.3 piw
170°F (77°C)	6.6 piw	7.5 piw
180°F (82°C)	6.8 piw	7.6 piw
190°F (88°C)	7.0 piw	7.7 piw
200°F (93°C)	7.2 piw	7.6 piw
210°F (99°C)	7.0 piw	7.4 piw
220°F (104°C)	5.6 piw	7.5 piw
230°F (110°C)	5.7 piw	7.1 piw
240°F (116°C)	6.3 piw	6.8 piw
250°F (121°C)	6.3 piw	6.9 piw
260°F (127°C)	6.3 piw	6.7 piw
270°F (132°C)	6.5 piw	6.2 piw
280°F (138°C)	6.1 piw	5.8 piw
290°F (143°C)	6.0 piw	5.6 piw
300°F (149°C)	5.9 piw	5.4 piw
310°F (154°C)	5.7 piw	5.1 piw

- Bonds made using 3 second dwell, 5 lbs pressure.
- Peels done at 90° angle, 2 in/minute, Instron tester.
- Alum. is 4.5 mil thickness.

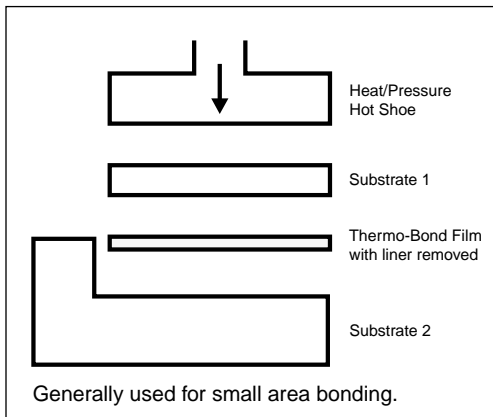
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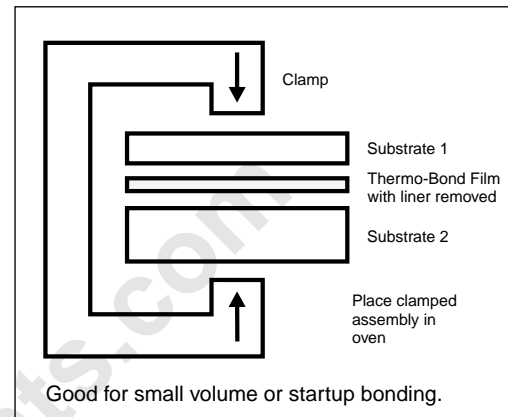
Typical Methods For Bonding 3M™ Thermo-Bond Film Adhesives

The following illustrations show several of the many methods that can be used to make bonds using Thermo-Bond Film adhesives. Such equipment is generally available commercially or can be built or modified by the user to fit a particular application.

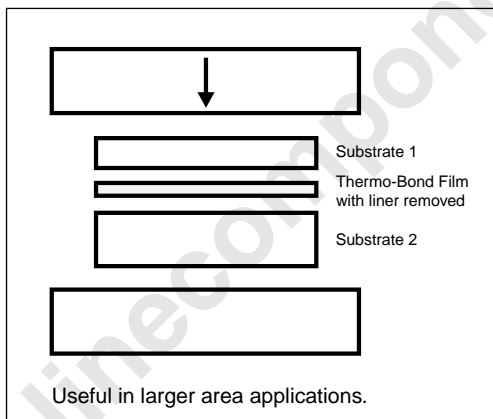
Hot Shoe or Thermode Bonding



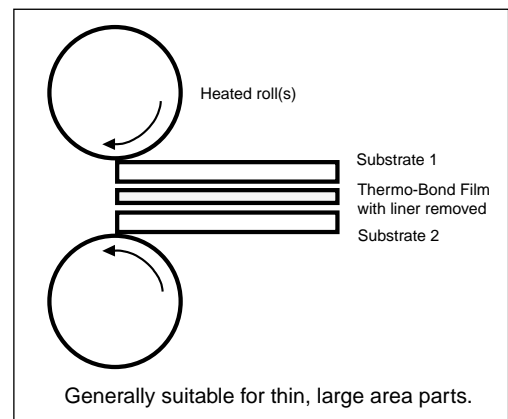
Oven (Static or ConveyORIZED) Bonding



Hydraulic or Mechanical Press Bonding



Lamination Bonding of Thin Substrates



Debonding – Since Thermo-Bond Films are thermoplastic materials, no curing during heating or aging occurs. To debond or open bonded parts, simply heat the bonded part to an adequate temperature (typically 210-230°F/99-110°C) to soften the adhesive and then pry or peel the substrates apart.

Solvents, such as acetone, methyl ethyl ketone (MEK), toluene and 3M™ Citrus Based Cleaner will soften these Thermo-Bond Film adhesives 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:** Before using solvents, extinguish all ignition sources and follow the manufacturer's precautions and directions for use for handling such materials.

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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.

Test Substrate	Overlap Shear Strength to Various Substrates
	OLS Strength Thermo-Bond Film 557 (4.0 mil)
ABS	100 psi
PVC	290 psi
Polycarbonate	210 psi
HD Polyethylene	280 psi
Polypropylene	120 psi
Fir Wood	330 psi
FR-4 PCB	410 psi
Cold Rolled Steel	670 psi
Etched Aluminum	600 psi
Stainless Steel	490 psi

- OLS (overlap shear) bonds were made oven/clip method 0.125 in. thick substrates, 270°F (132°C) bonding temperature, 15 minutes for plastics and 350°F (171°C) for the wood and metal substrates.
- Adhesion determined using Instron tester @ 0.2 in/minute.

Test Substrate	Peel Strength to Various Substrates		
	Bondline Temperature	Peel Angle	Peel Strength
HDPE / AL	270°F (132°C)	90°	6.7 piw
	300°F (149°C)	90°	5.9 piw
PP / AL	270°F (132°C)	90°	0.9 piw
	300°F (149°C)	90°	3.5 piw
PVC / AL	270°F (132°C)	90°	6.8 piw
	300°F (149°C)	90°	5.7 piw
ABS / AL	270°F (132°C)	90°	6.6 piw
	300°F (149°C)	90°	6.5 piw
SS / SS	270°F (132°C)	180°	3.6 piw
	300°F (149°C)	180°	3.4 piw
PET / PET	235°F (113°C)	180°	1.7 piw
	255°F (124°C)	180°	1.3 piw
PI / PI	235°F (113°C)	180°	3.6 piw
	255°F (124°C)	180°	3.4 piw

- Peel bonds made using hot shoe laminator, 3 second dwell, 5 lbs gauge pressure.
- Peel bonds tested at R.T. using Instron tester at 2 in/minute.
- AL is 4.5 mil aluminum foil.
- SS is 8 mil stainless steel.
- PET is 2 mil polyester film.
- PI is 3 mil polyimide film.

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Thermal Data

Test	Method	Value
Weight Loss By TGA (Thermal gravimetric analysis)	Perkin-Elmer Series 7 RT to 800°C, 5°C/min, in air	1% wt loss @ 222°C 5% wt loss @ 303°C 10% wt loss @ 335°C
Coefficient of Thermal Expansion By TMA (Thermal mechanical analysis)	Perkin-Elmer Series 7 -40°C to +30°C @ 10°C/min	110 x 10 ⁻⁶ unit/unit/°C

Precautionary Information

Refer to Product Label and Material Safety Data Sheet for Health and Safety Information before using this product.

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 Industrial Tape and Specialties Division, 3M Center, Building 220-7E-01, St. Paul, MN 55144-1000. Our fax number is 612-733-9175. 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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For Additional Product Safety and Health Information, See Material Safety Data Sheet, or call:



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