



Grounded Heat Sink Bonding Film

7373

Technical Data

September, 2001

Product Description

3M™ Grounded Heat Sink Bonding Film 7373 is an electrically conductive thermoset adhesive film. Comprised of a 2 mil thick, high-performance hybrid epoxy/acrylate adhesive filled with silver-coated glass particles, bonding film 7373 provides stable electrical connections and a thin, low thermal impedance bond line. The particles allow for interconnection through the adhesive thickness (the “Z-axis”) but are spaced far enough apart to the product to be electrically insulating in the plane of the adhesive. During the bonding process the conductive particles become compressed between the substrates, thereby establishing electrical contact, while the adhesive cures to bond the parts together. Bonding film 7373 creates a tough, resilient bond that is less susceptible to brittle failure (fracture) than typical epoxy adhesive films, providing greater electrical stability and overall reliability.

Bonding film 7373 is ideal for bonding and grounding Printed Circuit Boards (PCB’s) to heat sinks and heat spreaders in high frequency power amplifiers applications. Additionally, multilayer lamination and electrical connection may be made with bonding film 7373. These multilayer boards may be comprised of flexible circuit or rigid PCB layers. Bonding film 7373 withstands repeated solder reflows and has excellent electrical stability after environmental aging.

Construction

Property	Value
Adhesive Type:	Filled Epoxy / Acrylate Hybrid
Filler Type:	Silver Coated Glass Beads
Average Particle Size:	1.5 mils (37.5 µm)
Release Liner:	Silicone-treated Polycoated Kraft paper
Approximate Thickness:	
Release Liner:	.006 in. (0.156 mm)
Adhesive Only:	.002 in. (0.05 mm)

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Typical Physical Properties and Performance Characteristics	(cured properties unless otherwise noted)	
	Softening Point (IPC 2.2.24.4)	120°C
Modulus (room temperature)	300 MPa	
Poisson Ratio	0.5 (est.)	
Elongation to Break	30%	
Coefficient of Thermal Expansion:		
Below Tg:	85 ppm/°C (est.)	
Above Tg:	200 ppm/°C	
90° Peel (ASTM D3330) Anodized Aluminum to Mill-Finished Aluminum	10 lb./in. (1.76 kg/cm)	
Low Angle Peel/Fracture Strength	10 lb./in. (1.76 kg/cm) ^[1,2]	
Lap Shear Strength (ASTM D3654)	1000 lb./in. ² (70 kg/cm ²) ^[2]	
Contact Resistance:	1.0 milliohm-cm ² ^[2]	
Recommended Minimum Electrical Contact Area	2500 mils ² (0.75 mm ²)	
Thermal Impedance	0.5°C-in ² /W (est.)	
Solder Reflow	3 repetitions - Pass ^[3,6]	
Solder Float	10 minutes - Pass ^[6]	
85°C / 85% RH	2000 hours - Pass ^[4,6]	
Liquid-Liquid Shock -40/+125°C	250 cycles - Pass ^[3,6]	
Air-Air Shock -65/+125°C	400 cycles - Pass ^[4,6]	
Storage (uncured)	Room Temperature, 1 year. Avoid exposures above 38°C (100°F).	

^[1]Measured by driving a thin wedge between bonded parts.

^[2]Sample assemblies measured as-bonded (not solder reflowed).

^[3]Immersion gold/copper-clad PCB & immersion gold on bare copper heat sink.

^[4]Immersion gold/copper-clad PCB & immersion gold/aluminum heat sink.

^[5]Immersion gold/copper-clad PCB & bare aluminum heat sink.

^[6]Information supplied by customers. Pass meant no physical degradation and electrical resistance stable to 0.5 mΩ or better.

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

Available Sizes

Standard Roll Sizes:

Available Lengths:

Minimum 36 yds. (32.9 m)
Maximum 108 yds. (98.8 m)

Available Widths:

Minimum 1 in. (25 mm)
Maximum 14 in. (356 mm)
Custom widths are slit to order.*

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Application Techniques

Cleaning

Substrates to be bonded should be free of contaminants. If they have become lightly contaminated in some manner (fingerprint), we recommend cleaning with isopropyl alcohol and a lint free wiper. For heavier contamination (e.g. machine oil) a stronger solvent may be required.

Pre-Tacking

Bonding film 7373 is slightly tacky and supplied in roll form (on a single release liner), or as a die cut (between two liners). It is necessary to tack together bonding film 7373 and the two substrates to be bonded). The final tacked assembly is heat bonded according to the guidelines given below.

Roll/sheet product

Bonding film 7373 can be applied to substrates at room temperature using a nip laminator (e.g. a dry film photoresist laminator), or by hand rolling bonding film 7373 onto the first substrate. The user should try to avoid air entrapment. When hand applying bonding film 7373 the preferred method of pre-tacking is to apply the film starting at the center of the substrate and then using a rubber roller to eliminate air bubbles.

The release liner is then removed and the second substrate is applied. If possible, a second rolling is used to complete the lay-up of the assembly.

Die-cut parts

It is important to apply die cut bonding film 7373 parts onto the substrates without entrapping any air and with proper alignment of the parts. Bonding film 7373 can be lowered onto the tooling pins, tacky side down, onto either the PWB or heat sink substrate. Bonding film 7373 is slightly tacky and will stick to the substrate, but may be repositioned without damage to the bonding film by lifting the edge of the die-cut. Once properly aligned, the bonding film must be rolled down with a rubber roller or pressed down by hand. Then the paper liner is removed leaving bonding film 7373 on the substrate. The user is encouraged to find the process that works best in their manufacturing operation.

Bonding

The pre-tacked substrates (PCB/heat sink assembly) is then placed into a well-aligned standard PCB laminating press and bonded under heat and pressure.

Recommended press cycle:

Pressure:	300 psi (apply immediately)
Heat Rise:	10-20°F/min (preheated press may be used)
Cure Time:	Minimum 30 minutes at 320°F (160°C)
Cooling Cycle:	User defined, cool under pressure down to 100°C at a minimum.

These are recommended conditions. Users are responsible for determining the exact bonding conditions for their applications.

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General Information During the bonding process the conductive particles become compressed between the substrates, thereby establishing electrical contact, while the adhesive cures which mechanically bonds the parts together. Bonding film 7373 creates tough, resilient bond that is less susceptible to brittle failure (fracture) than typical epoxy adhesive films, providing greater electrical stability and overall reliability. See our Technical Bulletin – *Notes on 3M Grounded Heat Sink Bonding Film 7373 Performance Testing (70-0709-3817-3)* or more information on testing of bonding film 7373. Bonding film 7373 also withstands solder reflow and has excellent electrical stability after environmental aging.

Application Ideas High frequency PCB's, such as cellular base station amplifiers, often require grounded bonding to a heat sink spreader. Bonding film 7373 provides for both the mechanical and electrical bond during a single lamination cycle. Compared with bolt or rivet attachment, bonding film 7373 provides superior electrical performance with no design constraints typical with mechanical fasteners. Bonding film 7373 can be die cut to match any cut-outs made in the PCB for through board component attachment to the heat sink.

Another possible application for bonding film 7373 is multilayer lamination and electrical connection between PCB layers. These multilayer boards may be comprised of flexible circuit or rigid PCB layers. The lamination results in a buried via interconnection between layers replacing the through hole drilling process typically used to interconnect layers.

Precautionary Information Refer to product label and Material Safety Data Sheet for safety and health information before using this product. For additional health and safety information, call 1-800-364-3577 or (651) 737-6501.

Certification/Recognition Meets IPC-3408 General Requirements for Anisotropic Conductive Adhesive Films.

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 220-8E-05, 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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