3M™ Tapes for Solar Panel Fabrication

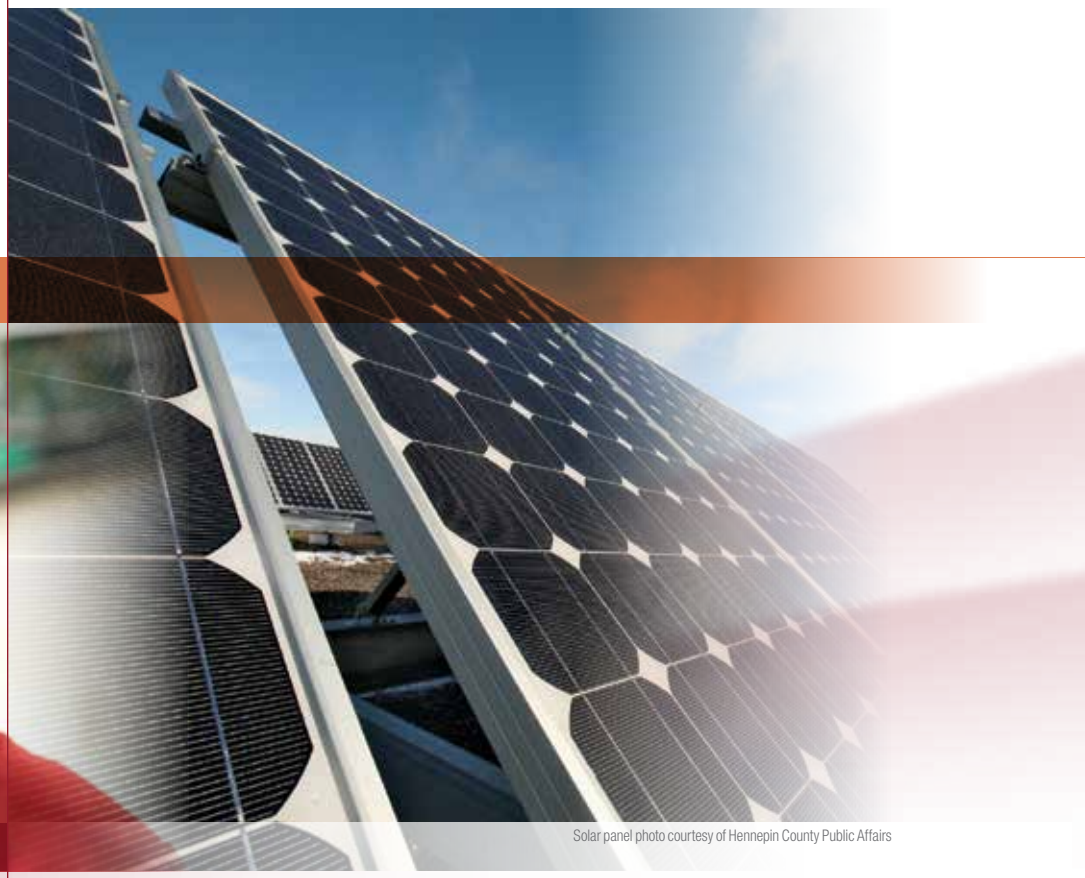
Reliable Tapes for the Solar Industry

More than 80 years ago, 3M invented the world's first practical pressure-sensitive tapes. Today, we are a leading manufacturer of adhesive tapes for industrial and consumer use – offering a broad range of high-performance and specialty tapes for bonding, protecting, masking, appearance, cushioning, mounting, enhancement and more.

Engineered to improve product reliability

...and reduce your costs

These technologies offer proven performance in the manufacture of solar panels and other components, where they are increasingly being used to help control costs, speed assembly and potentially improve product reliability.



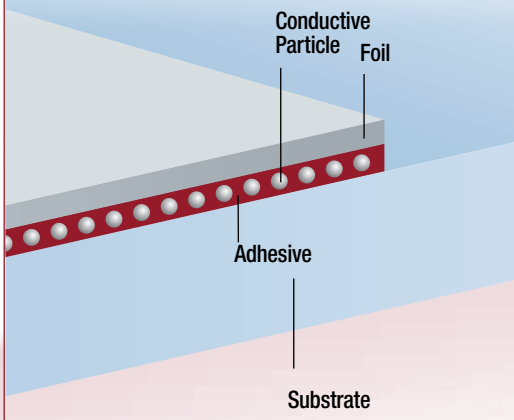
Solar panel photo courtesy of Hennepin County Public Affairs

3M™ Charge-Collection and Bus Tapes

3M Charge-Collection Solar Tapes consist of tin-plated copper foil with acrylic-based, pressure sensitive adhesives used in thin film solar applications requiring z-axis conductivity. These tapes can be applied at high speeds using automation equipment. Since there is no curing required (as with liquid conductive adhesives) they allow for high productivity during panel manufacturing. The 3M Bus Tape (1007N) is not z-axis conductive and it is used as a bus tape for routing charge in thin film panels.

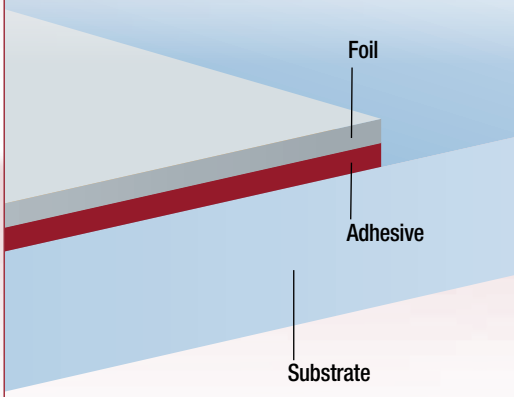
- Stable electrical performance
- Compatible with typical lamination processes
- Tin plated foil allows for solderability
- Available in many formats to suit different manufacturing processes

	Thickness		Adhesive		Highlights
3011**	4.8	0.12	Conducting	High Temperature	• Electrically conductive, particle filled non-corrosive acrylic adhesive • 1-ounce tin-plated deadsoft copper foil • Excellent for high current applications • 3011B is black in color
3011B					
3007*	2.3	0.06	Conducting	High Temperature	



	Thickness		Adhesive		Highlights
	mil	mm			
1007N*	2.6	0.07	Non-Conducting	High Temperature	• Non-conductive adhesive • Non-corrosive acrylic adhesive • 1-ounce tin-plated deadsoft copper foil • Excellent for bus applications

*UL 510 Category OANZ file number E17385.
**UL Category Q1HE2 file number E316895.



3M™ Solar Acrylic Foam Tapes

Reliable and Immediate Bonding

The technology behind 3M™ Solar Acrylic Foam Tapes has been used around the world since 1980 to replace liquid adhesives and mechanical fasteners in permanent bonding and sealing applications. These applications range from assembly of electronic hand-held devices and commercial signage to architectural cladding and glazing on skyscrapers.

- Acrylic adhesive chemistry offers long-term outdoor durability against heat and UV
- Closed-cell foam construction seals against dust, dirt and rain
- Viscoelastic response of foam accommodates for differential thermal expansion/contraction between bonded surfaces
- Uniform thickness provides consistent separation between bonded surfaces when optical path-length is critical, as in Concentrated Photovoltaic (CPV) applications
- Pressure sensitive adhesive tape holds immediately and neatly without the mess, clamping and curing time of liquid adhesives and sealants
- Level wound rolls available for certain products. Ask your Sales Representative for details.

Product	Thickness		Density (lb/ft^3)	UL*	Color	Key Features	Suggested Applications
	mil	mm					
FB80	31	0.80	44	746C	Grey	• Economical • Long-length(level wound) rolls	• Frame Bonding
FB60	24	0.60	44				
6050	20	0.50	60	746C	Clear	• Clear	• Cell Positioning
4155	62	1.55	37	746C	Black	• Conformable • Adhesion to many substrates	• Jbox Attachment • CSP
4110	45	1.10	37				
4080	32	0.80	37				
4063	25	0.63	37	746C			
3230	90	2.30	43	746C	Grey	• Thick • Gap Filling	• Rail Bonding
2304	120	3.00	45	746C	White		
2204	79	2.00	45				
2155	62	1.55	52	746C	Dark Grey	• Temperature Resistant • Stiff	• Jbox Attachment • CPV • CSP
2110	45	1.10	52				
2063	25	0.63	52				

*UL 746C category QOQW2 file number MH17478

3M™ Solar Acrylic Foam Tapes in Solar Applications

3M™ Solar Acrylic Foam Tapes can provide for durable attachment, bonding and sealing solutions during solar panel and module manufactruing. The immediate holding feature allows high productivity in typical manufacturing process. Compared to sealants, there is no clean-up of excess material, resulting in less labor and a more professional look in the finished panel. With field experience in millions of solar panels around the world, 3M™ Solar Acrylic Foam Tapes are time-tested solutions for various solar applications.

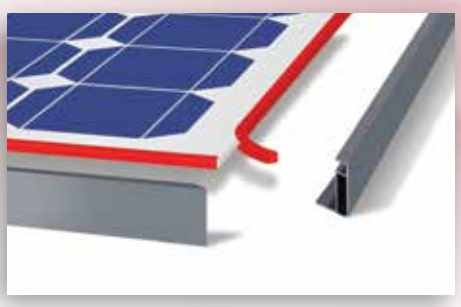
Advantages and Benefits for Frame Bonding

- Pressure-sensitive adhesive provides immediate holding strength with no process bottlenecks for drying time or clamping
- "No-mess" application
- Proven long-term durability in demanding outdoor applications
- Designed to help save money and time through improved productivity

Advantages and Benefits for Junction Box Bonding

Attaches and seals junction boxes on solar panels quickly, and with no mess on crystalline and thin film modules.

- Proven outdoor weatherability
- Provides immediate holding strength—allows immediate wet leakage testing
- Can be applied manually or with automated equipment
- Consistent bond thickness—no "squeeze-out"
- Closed cell foam construction seals against moisture intrusion
- Can be custom die-cut into virtually any shape
- Modules using 3M™ Solar Acrylic Foam Tapes have passed IEC, UL and TÜV testing



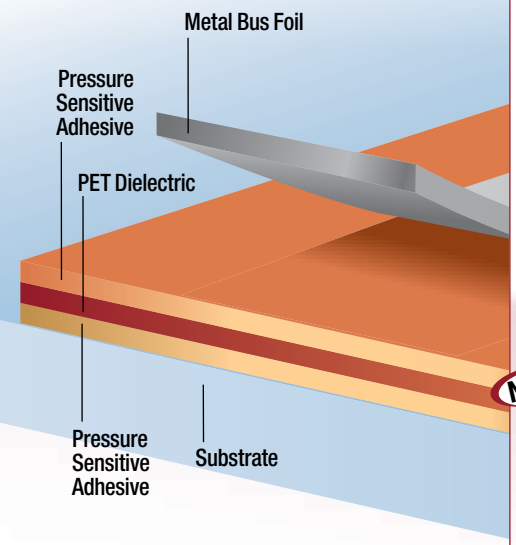
3M™ Solar Acrylic Foam Tape attaches panels to the frame

3M™ Solar Acrylic Foam Tape bonds and seals junction boxes to panel backs

3M™ Dielectric Tapes

3M™ Dielectric Tapes perform as reliable insulators when used in conjunction with buses/foils in thin film solar panels. They consist of a polymeric film with acrylic adhesive on one or both sides. These tapes can be applied at high speeds using automation equipment, resulting in high productivity during panel manufacturing.

- Compatible with typical lamination process
- Available in one- and two-sided adhesive versions
- Available in many formats to suit different manufacturing processes



Product	Carrier Type	Carrier Thickness		Total Thickness		UL*	Outgassing**		Dielectric Breakdown Voltage
		mil	mm	mil	mm		µ/in²	µ/cm²	
Double Coated Dielectric Carrier with Non-Conductive High-Temp Acrylic Adhesive									
3508	PET	0.9	0.02	3.1	0.08	510	52	8.1	6.6kV
3514	PET	0.9	0.02	5.6	0.14	510	57	8.8	6.7kV

Product	Backing Type	Backing Thickness		Total Thickness		UL*	Outgassing**		Dielectric Breakdown Voltage
		mil	mm	mil	mm		µ/in²	µ/cm²	
Single Coated Dielectric Backing with Non-Conductive High-Temp Acrylic Adhesive									
8006C	PET	0.9	0.02	1.9	0.05	510	2	0.3	5.9kV
1506S	PET	1.0	0.03	2.5	0.063	510	10	1.5	5.5kV

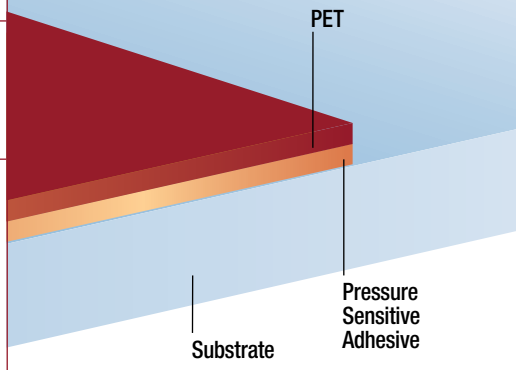
* Listed in category OANZ2, file E230409 (per UL 510)
** Single-headspace extraction (160°C/30 minutes)

3M™ Specialty Tapes

3M™ Specialty Tapes are used for a variety of applications for thin film and crystalline silicon panel manufacturing. Those with acrylic adhesives offer durability and can undergo typical lamination processes. Rubber-based adhesives offer quick-stick properties and are ideal for temporary applications.

Product	Total Thickness		Backing Type	Adhesive Type	Color	UL	Key Features/Applications
	mil	mm					
8006C	1.9	0.05	Polyester	Acrylic	Clear	510*	• Low Outgassing
8006B	1.9	0.05	Polyester	Acrylic	Black		
8006W					White		• Cosmetic Tracing • Cell Positioning
8306	2.2	0.05	Polyester	Acrylic	Clear		
1306	2.5	0.06	Polyester	Acrylic	Black		
4414	5.5	0.14	Polyester	Rubber	Caramel Translucent		• Cable Bundling

* Listed in category OANZ2, file E230409 (per UL 510)



3M™ Adhesives

A world leader in adhesive technology, 3M had developed thousands of structural and non-structural bonding products in a wide range of formulations, cure times and dispensing systems. 3M™ Adhesives are optimized to meet the unique and demanding conditions of the solar industry.

3M Renewable Energy Division: Unmatched Capabilities

3M's commitment to the renewable energy industry includes a global organization of research and development, sales, marketing, manufacturing, and technical service – all dedicated to developing reliable materials that reduce costs and improve performance.

Expertise

Founded in 1902, 3M has extensive experience developing durable materials for outdoor applications in transportation, commercial graphics and optics. This includes world-class facilities for simulated and real-time weathering exposure and testing.

Innovation

At 3M, the innovation is never-ending. Whether the free-flow of ideas and solutions is occurring among our people, our technologies, our industries or the geographies where we operate, the human and technological connections within 3M enable infinite combinations and applications of expertise as ideas multiply and solutions expand.

Laboratories	Manufacturing	Sales and Marketing	
USA	USA	USA	Singapore
Japan	Poland	Canada	China
Germany	Germany	Mexico	South Korea
South Korea	South Korea	Germany	Japan
Singapore	Singapore	Denmark	Taiwan
China	Japan	Spain	Malaysia
	Taiwan	UK	India
	China	France	Brazil
		Italy	

For more information on our wind energy product line, contact 3M Renewable Energy at 800-755-2654 or visit us at www.3M.com/wind.

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Issued: 8/13 9298HB
98-0150-0057-7