3M Science. Applied to Life.™

3M™ Tapes for Solar Panel Fabrication

Bond with trust.

How tomorrow's breakthroughs come together.

Dependable, cost-effective assembly solutions from a world leader in "sticky science."

More than 80 years ago, 3M invented the world's first practical pressure-sensitive tapes. Today, we are a leading manufacturer of tapes, adhesives and films for bonding, protecting, masking, appearance enhancement, cushioning, mounting and more.

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.

Applications for 3M™ Tapes for Solar Panel Fabrication

3M brings you a wide variety of tapes, engineered especially for CPV, CSP, c-Si and thin film solar applications:

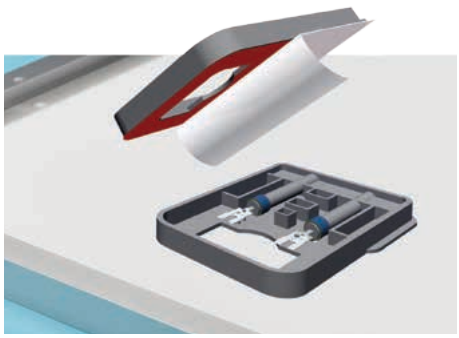
- Frame and rail bonding
- Junction box attachment
- Cell positioning
- Charge collection
- Dielectric insulation
- Cosmetic tracing

3M™ Solar Acrylic Foam Tapes

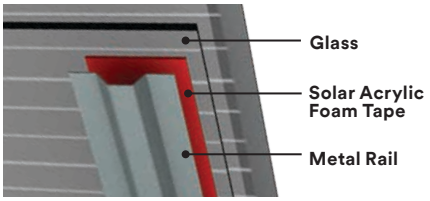
The technology behind 3M™ Solar Acrylic Foam Tapes has been used around the world since 1980 to replace liquid adhesives and mechanical fasteners in permanent bonding and sealing applications. These applications range from assembly of electronic hand-held devices and commercial signage to architectural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

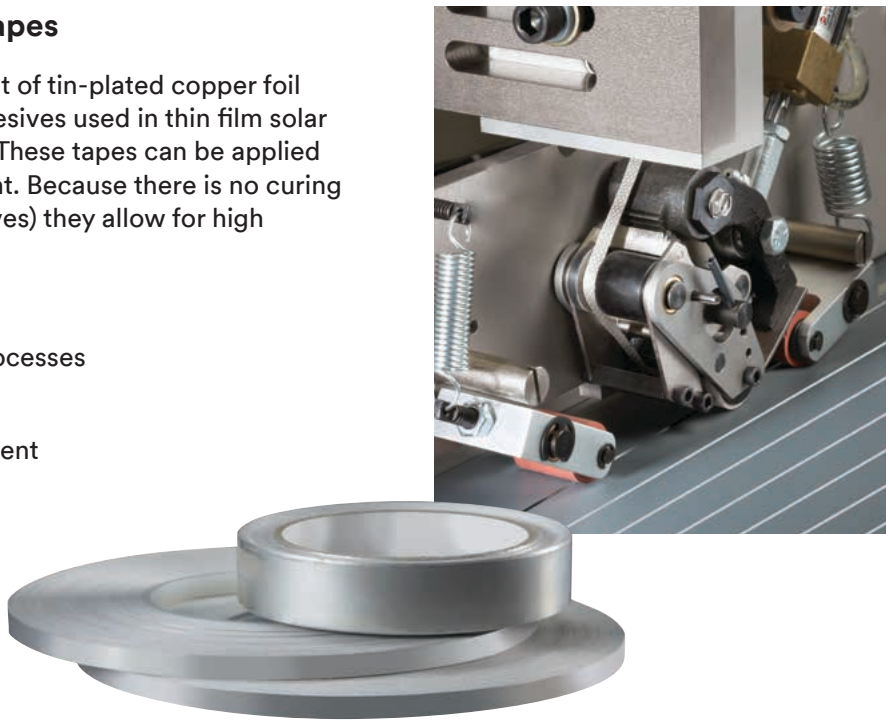
Product Number	Thickness		Density (lb/ft³)	UL*	Color	Key Features	Suggested Applications
	mil	mm					
FB80	31	0.80	44	746C	Grey	▶ Economical ▶ Long-length (level wound) rolls	▶ Frame Bonding
6050	20	0.50	60	746C	Clear	▶ Clear	▶ Cell Positioning
4155	62	1.55	37	746C	Black	▶ Conformable ▶ Adhesion to many substrates	▶ Junction Box Attachment ▶ CSP
4110	45	1.10	37	746C			
4080	32	0.80	37	746C			
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	746C			
2155	62	1.55	52	746C	Dark Grey	▶ Temperature resistant ▶ Stiff	▶ Junction Box Attachment ▶ CPV ▶ CSP
2110	45	1.10	52	746C			
2063	25	0.63	52	746C			

*UL 746C category QOQW2 file number MH17478

3M™ Charge-Collection and Bus Tapes

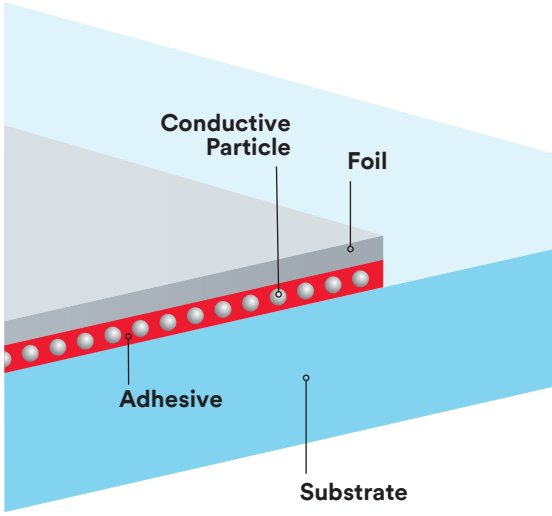
3M™ Charge-Collection Solar Tapes consist of tin-plated copper foil with acrylic-based, pressure sensitive adhesives used in thin film solar applications requiring z-axis conductivity. These tapes can be applied at high speeds using automation equipment. Because there is no curing required (as with liquid conductive adhesives) they allow for high productivity during panel manufacturing.

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



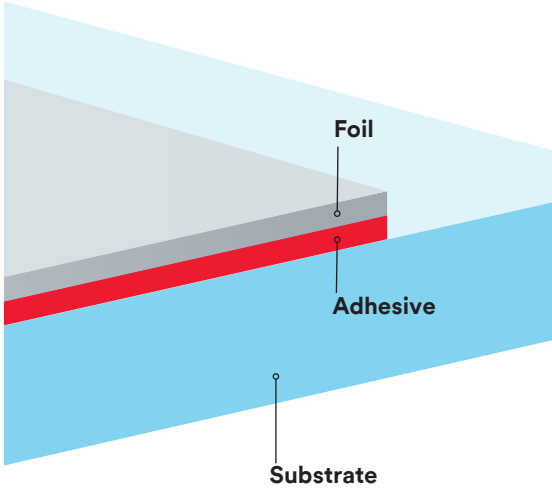
Product Number	Thickness		Adhesive		Highlights
	mil	mm			
3011**	4.8	0.12	Conducting	High Temperature	▸ Electrically conductive, particle filled non-corrosive acrylic adhesive ▸ 1-ounce tin-plated deadsoft copper foil ▸ Excellent for high current applications ▸ 3011B is black in color
3011B					
3007*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

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



Product Number	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

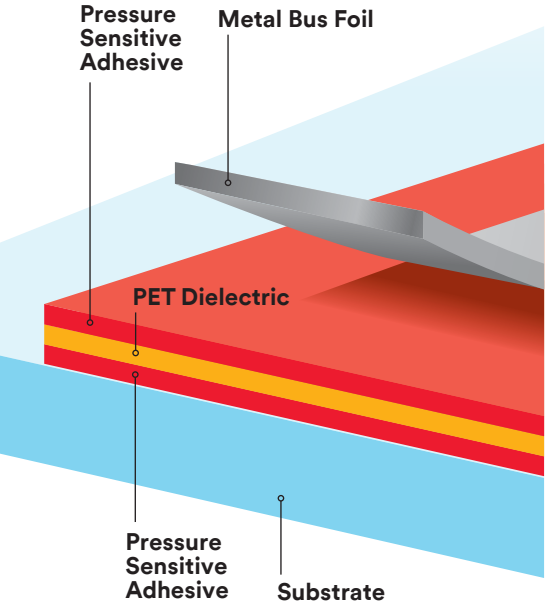
*UL 510 Category OANZ file number E17385.



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



Double Coated Dielectric Carrier with Non-Conductive High-Temp Acrylic Adhesive

Product Number	Carrier Type	Carrier Thickness		Total Thickness		UL*	Outgassing**		Dielectric Breakdown Voltage
		mil	mm	mil	mm		µ/in²	µ/cm²	
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

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

Single Coated Dielectric Backing with Non-Conductive High-Temp Acrylic Adhesive

Product Number	Backing Type	Backing Thickness		Total Thickness		UL*	Outgassing**		Dielectric Breakdown Voltage
		mil	mm	mil	mm		µ/in²	µ/cm²	
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™ Double-Coated Polyethylene Foam Tapes

3M™ Double-Coated Polyethylene Foam Tapes combine a conformable closed cell foam with a high-strength acrylic adhesive, providing good initial tack and offering high ultimate adhesion to a wide variety of surfaces. In addition, 3M™ Double-Coated Polyethylene Foam Tapes also have good shear properties which provide long-term holding power, even under elevated temperature and environmental conditions.

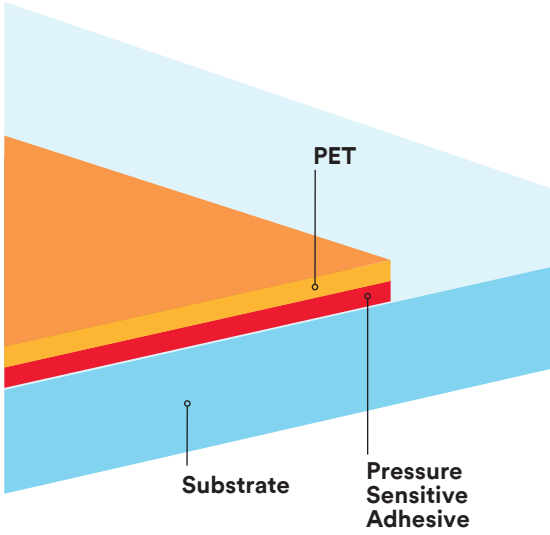
Product Number	Backing Type	Tape Thickness		Adhesive Type	Color	Release Liner	Suggested Application
		mil	mm				
9R090	Closed Cell PE Foam	35.4 ±20%	0.9 ±20%	Acrylic	White, Gray, Black	Clear, PET Film	Frame Bonding
9R110	Closed Cell PE Foam	43.3 ±20%	1.1 ±20%	Acrylic	White, Gray, Black	Clear, PET Film	Frame Bonding
P7100B	Closed Cell PE Foam	41.3 ±7.9 mils	1.05 ±0.2 mm	Modified Acrylic	Black	Blue, PP Film	Frame Bonding

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 Number	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	1.9	0.05	Polyester	Acrylic	White		
8306	2.2	0.05	Polyester	Acrylic	Clear		Cell positioning
1306	2.5	0.06	Polyester	Acrylic	Black	510**	Cosmetic tracing
4414	5.5	0.14	Polyester	Rubber	Caramel Translucent		Cable bundling

* Listed in category OANZ2, file E230409 (per UL 510)
** Listed in category OANZ2, file E17385 (per UL 510)



3M™ Solar Edge Tape 1060

3M™ Solar Edge Tape 1060 is specifically designed for solar module sealing and protection. It consists of high-quality acrylic foam adhesive with superior weathering black backing film. Solar Edge Tape 1060 may be used to bond a variety of substrates.

Product Number	Total Thickness		Backing Type	Adhesive Type	Color	UL	Key Features/ Applications
	mil	mm					
1060	0.74	0.029	Durable Black Film	Acrylic Foam	Black (gray adhesive)		Sealing and bonding

* Listed in category OANZ2, file E230409 (per UL 510)
** Listed in category OANZ2, file E17385 (per UL 510)

3M™ Adhesives

A world leader in adhesive technology, 3M has 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.

Connecting you to a world of 3M resources.

Your reliable supplier of technologies for solar modules

With over 100 years of experience in manufacturing roll goods, 70 years developing products for outdoor applications, and a proven history of producing renewable energy solutions for more than 40 years, 3M is ideally positioned to provide the solar power industry with innovative, reliable solutions.

From frame bonding to light directing film, our extensive portfolio is based on a platform of core technologies including fluoro-materials, polymer melt processing, films, adhesion and weathering. Because we produce both raw materials and finished goods, we are able to conduct extensive reliability testing on the entire 3M Bill of Materials – ensuring consistent high performance and optimal compatibility between module components.

Working with a single, dedicated supplier gives you one contact for many issues. And as a global company with operations in 70 countries, and laboratories in 36 countries, we have the ability to connect you with local 3M personnel to provide expert technical and business support almost anywhere in the world. Contact us today to see how our renewable energy expertise can help determine the best process for your module design, on your equipment.

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For more information on our solar manufacturing product line, contact 3M Renewable Energy at 800 755 2654 or visit us at 3M.com/solar

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