



UV RESISTANT ADHESIVES FOR SOLAR CELLS & PANELS

- MELT-BONDING BACK-FILM LAMINATE ADHESIVES
- SOLDER-REPLACEMENT MELT-BONDING SILVER FILM ADHESIVES



Proper selection of bonding adhesives and protective coatings are critical to the long-term reliability of solar cells, modules, panels and installed systems.

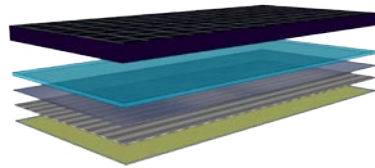
With over 30 years of experience in formulating specialty adhesives for electronic applications, AIT has developed a series of adhesive films and metals for tabbing without soldering.

There is flexibility in processing with an instant melt-bonding back sheet that performs and lasts longer than the standard T/P/T solution.

With the AIT T'/P/T' back sheet adhesive film solutions, AI Technology is now in the position to assist solar panel manufacturers in implementing inline lamination processing rather than batch based vacuum encapsulation process.

- Industries first low pressure, low temperature and instant melt-bondable modified EVA encapsulating materials for inline encapsulation with lamination pressure.
- The same pressure lamination at temperatures of 110-140°C will complete the tabbing process of connecting the solar cells in series.

UV RESISTANT ADHESIVES



Melt-Bonding Film Adhesives & Encapsulants



Melt-Bonding Conductive Tabbing Film Adhesives



UV Resistant Insulation Coatings & Adhesives

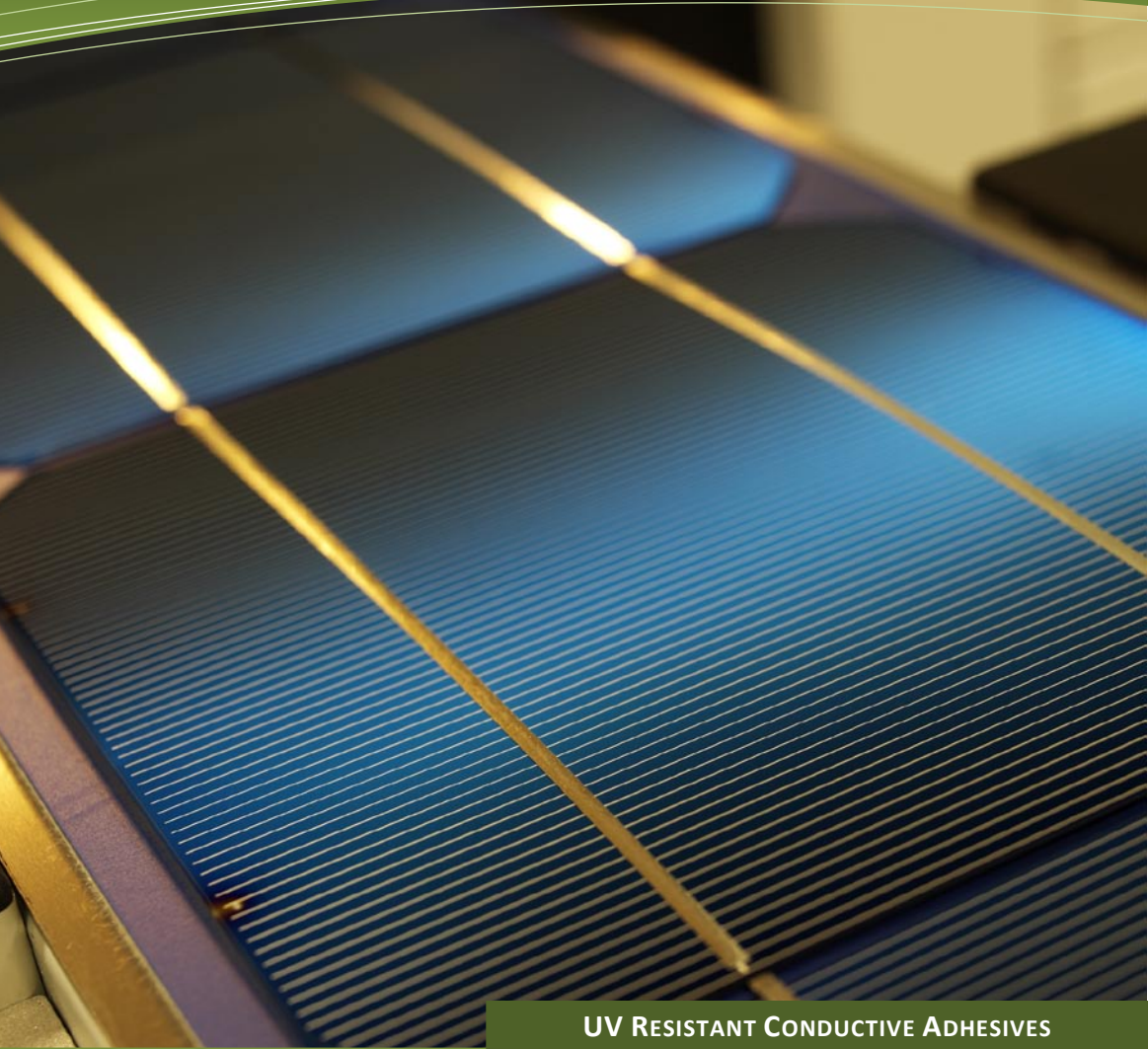
What distinguishes AIT SOLARTAB™, SOLARBLOC™, and SOLARGRIP™ adhesives-coatings and laminates solution for the manufacturing of solar cells, modules, panels and installation are the specific material properties that are designed for solar energy companies. These special UV resistant and moisture-resistant solar manufacturing materials allow:

1. Ultra-low electrical resistance between the solar cells charge collection circuit.
2. Ultra-low moisture absorption and sensitivity.
3. SOLARTAB™ provides the first instant low temperature melt-bonding tabbing solution that dramatically increases productivity, improved reliability and yields with low temperature processing.
4. SOLARBLOC™ back sheet adhesive instantly bonds with the EVA surface of vacuum laminated solar modules.
5. SOLARGRIP™ is ideal for locking in installed solar panels against vibration and bending induced loosening with outstanding moisture and UV resistance to provide long-term protection against degradation and need for re-tightening.
6. RoHS, REACH and WEEE compliant that meets UL94V-0 rating.



SOLARTAB™: UV RESISTANT CONDUCTIVE FILM ADHESIVE

- MELT-TABBING ADHESIVE PRE-COATED ON METAL SOLARTAB™ FOR SOLAR CELL INTERCONNECTIONS
- COMPATIBLE WITH EVA ENCAPSULANT, PET, SOLAR CELLS & BACKFILM



AIT patented (US patent# 7,154,046; 6,581,267; 6,580,0356,297,564; 4,695,404) and pending patents applied to the use of hyper-conductive UV-resistant melt-bonding application processes for solder-tabbing replacement with stress free solar cell interconnections:

- SOLARTAB™ is a solar cell interconnection adhesive designed for cost-effective melt-tabbing to replace traditional pre-tin tab soldering process for solar cell interconnection.
- The SOLARTAB™ film adhesive application uses proven fluorinated polymers and patented process to ensure contact resistance as low as traditional solder-tabbing.
- Melt-tabbing at less than 150°C dramatically reduces solar cell stress induced by traditional solder tabbing.
- SOLARTAB™ melt-tabbing provides instant bonding and enables the use of direct lamination process for solar cells interconnections in solar panel manufacturing.
- SOLARTAB™ conductive tab is made for ambient storage.
- Besides automated melt-bonding lamination, traditional manual soldering irons can be used to melt-bond the SOLARTAB™ conductive tab directly onto solar cells and their interconnections.
- SOLARTAB™ is a cost-effective silver-based metal tab developed and made by AIT to maintain long-term low contact resistance.
- SOLARTAB™ ST8150-DS and ST8150-SS melt-tabbing film adhesive on both sides of metal tab and film on single side of metal tab respectively.

UV RESISTANT CONDUCTIVE ADHESIVES

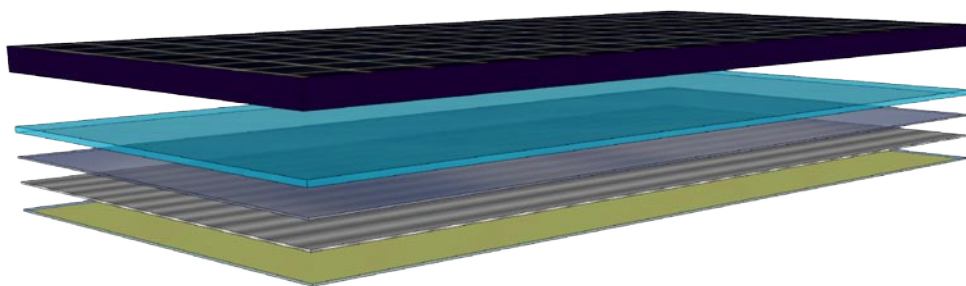
Properties of SOLARTAB™ ST8150 Conductive Tab Adhesives

- Patent-pending low temperature melting conductive adhesive on SUNTAB™ for solder-tab replacement.
- Available as adhesive film, film on one side metal tab, and film on both sides metal tab.

Electrical Resistivity	<0.00005 ohm-cm
Contact Resistance	<0.01 ohm-square
Glass Transition Temp. (°C)	-50
Peel Strength (Pound/inch)	>3
Device Push-off Strength (psi)	>1500
Hardness (Type)	~ 80 (A)
Cured Density of Conductive Adhesive Portion (gm/cc)	4.5
Thermal Conductivity	> 12.0 W/m-°K
Linear Tab-Composite Thermal Expansion Coefficient (ppm/°C)	25 (X-Y=Z, Isotropic)
Maximum Continuous Operation Temp. (°C)	> 180
Decomposition Temperature @5% weight loss (°C)	>450
Recommended Lamination Pressure/Temperature/Time (psi/°C/Second)	>10/>140/0.5

SOLARBLOC™ T'/P/T'™: UV RESISTANT BACK FILM

- INSTANT MELT-BONDING BACK SHEET ADHESIVE LAMINATES
- GOOD ADHESION ON CURED EVA ENCAPSULATION



AIT T'/P/T'™ SOLARBLOC™ backfilm laminates are designed for instant melt-bonding on cured EVA encapsulated solar panels with outstanding adhesion. The reverse processing is also applicable whereby the EVA can be used to encapsulate solar panels onto the backfilm directly.

Properties of SOLARBLOC™ T'/P/T' Backfilm (BF7110) Laminate

- Laminate of Modified PVDF/PET/Modified PVDF (T'/P/T')
- Good melt-bonding adhesion with cured EVA Encapsulant

Electrical Resistivity	>10 ¹⁴ ohm-cm
Dielectric Strength @ Combined T'/P/T' Thickness (Volts)	>3000 V
Peel Strength with EVA (Pound/inch)	>3
Device Push-off Strength with EVA (psi)	>1000
Cured Density of Composite Dielectric (gm/cc)	1.35
Thermal Conductivity	> 0.2 W/m-°C
Linear Thermal Expansion Coefficient (ppm/°C)	55 (X-Y=Z, Isotropic)
Maximum Continuous Operation Temp. (°C)	> 125
Recommended Melt-Lamination Pressure/Temperature/Time (psi/°C/Second)	>15/>110/0.5

Properties of SOLARBLOC™ T'/P/T' Backfilm (BF7140) Laminate

- Laminate of Modified PVDF/AL/Modified PVDF
- Good melt-bonding adhesion with cured EVA Encapsulant

Electrical Resistivity	>10 ¹⁴ ohm-cm
Dielectric Strength @ Combined T'/P/T' Thickness (Volts)	>3000 V
Peel Strength with EVA (Pound/inch)	>3
Device Push-off Strength with EVA (psi)	>1000
Cured Density of Composite Dielectric (gm/cc)	1.35
Thermal Conductivity	> 0.2 W/m-°C
Linear Thermal Expansion Coefficient (ppm/°C)	55 (X-Y=Z, Isotropic)
Maximum Continuous Operation Temp. (°C)	> 125
Recommended Melt-Lamination Pressure/Temperature/Time (psi/°C/Second)	>15/>140/0.5

The following is a representative process:

- Panel & Lamination Material Handling
 - SOLARBLOC™ laminate can be stored in ambient conditions for at least 12 months (3-4 times longer than that of traditional laminates).
 - No pre-staging is necessary.
 - Laminate at 15 psi, 110°C or 140°C for BF7110 or BF7110 and BF7140 respectively for as short as few milliseconds.
- Tabbing and Panel Preparation
 - Tab and interconnect all solar cells in series
 - Tooling/Registration
 - Inspect and test for functioning
- EVA Encapsulation
 - Vacuum encapsulate the front and backside of the solar module/panel
 - Inspection and QC for functioning
- Lamination and Monitoring
 - Pre-heat the back film and/or the encapsulated solar module panel to close to melt-flow temperature
 - Laminate the panel onto back sheet with speed that ensures the adhesive reaching above melt-flow temperature
- Inspection and Rework
 - Make sure the back film adhesive has flowed to minimize trapped air bubbles
 - The lamination process can be repeated in case of less than desirable flow is observed
- Trimming and Framing
 - Trim off excess material that flowed out during manufacturing
 - Frame the finished panel
- Finishing Operation
 - Inspect for quality
 - Test and certify panel



SOLARBLOC™ & SOLARGRIP™ :UV STABLE COATINGS-ADHESIVES

- HIGH MOISTURE BARRIER ADHESIVES WITH UV STABLE ADHESION AND FLEXIBILITY
- HIGH MOISTURE BARRIER COATINGS WITH UV STABLE ADHESION AND FLEXIBILITY



About AI Technology, Inc.

Since pioneering the use of flexible epoxy technology for microelectronic packaging in 1985, AI Technology has been one of the leading forces in developing advanced materials and adhesive solutions for electronic interconnection and packaging.

Besides pioneering the use of "phase-change" materials (PCM) as a thermal interface materials (TIM), AIT has provided the microelectronic packaging industries with its flexible epoxy thermal adhesives. By managing interfacial stress induced by differential coefficient of thermal expansion between bonding adherents, these thermal management materials have found extensive use and success in critical military and aerospace applications.

The same stress-free dielectric adhesives are now adapted for use in insulated metal substrates with copper and aluminum clad. The key advantage of these thermal management materials is the unparalleled long-term reliability attributed to its ability to withstand repeated thermal cycling and stress-free bonding between the heat-spreader plate and the circuit layer. AIT also offers the same flexible epoxy pre-preg with high thermal conductivity for the more advanced multilayer insulated metal substrate circuits and modules. This novel class of thermal management materials provides a platform and infrastructure for large area thermal management of power modules such as solar cells, LED panels, etc.

AIT has a full line of die and substrate attach films and pastes, thermal interface materials, (EMI/RFI) mitigation material solutions, conductive caulks and adhesives, and advanced flexible and Insulated Metal Circuit Substrates.

The company has an ISO9001:2000 certified manufacturing and R&D facility on a 16-acre campus in Princeton Junction, NJ. Sales support includes company direct offices in Shenzhen-HK China and sales reps in Europe and Asia.

Adhesives and Coatings for Solar Cell, Panel and Installation Applications

Solar applications encounter some of the most challenging material applications. AIT has developed a specific series of adhesives in film, paste and coatings with different properties for the solar cell, module, panel and installation applications. All of these specialty adhesives and coatings are made with proven fluorinated polymers engineered for outstanding adhesion on metals, glasses and most plastics used in solar applications. They possess the proven UV stability and outstanding moisture barrier and embedded with designed electrical conductivity or high dielectric strength or anti-static properties for the intended application.

These patent-pending applications of UV resistant, high moisture barrier adhesive-coatings are specifically engineered to be compatible for the melt-bonding process in advancing the speed of manufacturing that has been a hurdle in reducing the cost of solar applications. Besides the previous pages for tabbing and panel lamination, this page discusses some of the applications in protective coatings and adhesives for environmental protection and long term reliability.

AIT Adhesives & Thermal Interface Materials for SOLAR Applications

FUNCTION	AIT PART #	UV, MOISTURE, THERMAL, ELECTRICAL AND OTHER RELEVANT PROPERTIES
Insulating Moisture Barrier Coating	SOLARBLOC™ SB 7122	<ul style="list-style-type: none"> • Insulating flexible moisture barrier coating with high voltage insulation • Ideal for terminations and electrical junction protection with ease of rework • Designed to provide unparalleled protection for plastics enclosures
Anti-static Moisture Barrier Coating	SOLARBLOC™ SB 9122	<ul style="list-style-type: none"> • Semi-conductive anti-static flexible moisture barrier coating • Ideal for terminations and electrical junction protection with ease of rework • Designed to provide unparalleled discharge protection for plastics enclosures
Moisture Barrier Nut-Bolt "Lock"	SOLARGRIP™ SG 7152 Air-Dry Adhesive	<ul style="list-style-type: none"> • UV stable, high moisture barrier adhesion on metal, glass and most plastics • Engineered to provide unparalleled nut-bolt locking against vibration • Ideal for maintenance-free installation for environmental and flexing protection
Structural Bond UV Stable, Moisture Barrier	SOLARGRIP™ SG 7130 Film Adhesive	<ul style="list-style-type: none"> • UV stable, high moisture barrier adhesion on metal, glass and most plastics • Engineered to provide unparalleled large area lamination panel adhesion • Ideal for structural panel bonding of different materials and substrates

Other AIT Adhesives & Thermal Interface Materials for SOLAR Applications

Insulating Thermal Interface	COOL-PAD™ CPR7065-LB	<ul style="list-style-type: none"> • Low thermal resistance interface, electrical insulating pad • Compressible, phase-change interface pad
Conductive Thermal Interface	COOL-SILVER™ PAD CPR8850-LB	<ul style="list-style-type: none"> • Lowest thermal resistance, electrically non-conductive interface pad • Compressible, phase-change interface pad
Electrical Interface Grease	COOL-GREASE™ CGR8550	<ul style="list-style-type: none"> • Non-curing, electrically conductive interface grease for moving parts • Lowest thermal resistance non-silicone grease, proven long-term stability
Thermal Interface Grease	COOL-GREASE™ CGR7559-LB	<ul style="list-style-type: none"> • Lowest thermal resistance, electrically insulating interface grease • Non-curing, non-silicone, proven long-term stability

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