UNDERFILL, GLOB-TOP ENCAPSULANTS, LID-SEAL ADHESIVES AND CONFORMAL COATING

FOR

CHIP, COMPONENT, BOARD AND SYSTEM LEVEL PROTECTION

Powering Performance for Advanced Electronic Packaging Materials

With over 30 years of experience in inventing and formulating specialty adhesives for electronic applications, AI Technology, Inc. (AIT) provides some of the most unique film and paste adhesives, thermal interface materials, encapsulants and coatings for electronic protection and performance requiring extreme reliability. This brochure summarizes AIT's materials which protect against moisture penetration and related degradations. They also provide stress absorption, electrical and mechanical protections.

Featured AIT Materials:

- Underfills and glob-tops proven to perform at temperatures beyond the normal range of 150°C to as high as 300°C
- Lid-seal films and pastes that pass fine and gross leaks for close to hermetic performance
- Conformal coatings that allow electronics to function when submerged in water
- UV-blocking protective coating for electronics, plastics and metals under direct sun exposure

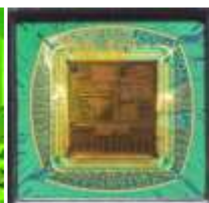
ENHANCING RELIABILITY WITH STRESS MANAGEMENT AND MOISTURE BARRIER

What distinguishes AIT's Underfills, Glob-Tops, Lid-Seals and Conformal Coatings are their unparalleled ability to manage stress while providing an outstanding moisture barrier. These capabilities are achieved with unconventional polymer engineering and designs. AIT's advanced microelectronic protection products are ideal for large high performance devices operating at high temperatures.

- Underfills and Glob-tops proven for use at high temperature of 150-300°C and beyond, in addition to traditional 150°C applications.
- Lid-Seal adhesives in either B-stageable paste or preform arrays for ease of automated pre-application.
- Proven moisture insensitivity and low moisture absorption affords the possibility to meet up to the level 1 in JEDEC component reliability.
- Conformal coating that block against moisture penetration, resist salt-fog corrosion, and effective even with direct water immersion of coated electronics.
- UV-blocking and moisture barrier microelectronic and electronic system coating for long-term usage under direct sun and rain exposure.
- RoHS, REACH and WEEE compliant to meet UL94V-0 rating.

Underfills for High Temperature and Stress Reduction

Glop-Top for Chip-On-Board (COB) Extreme Moisture and Stress Management



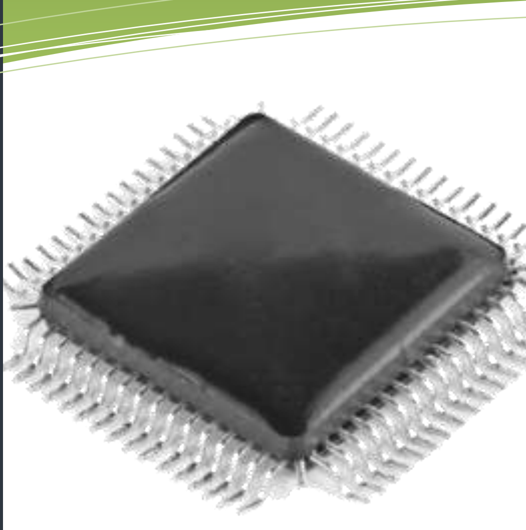
Lid-Seal with B-Stageable or Preform Epoxies Passing Fine and Gross Leaks

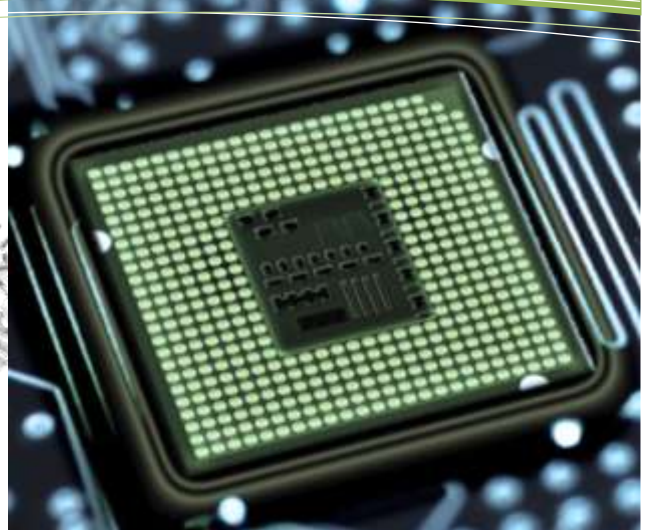
Conformal Coating for Protection Against Moisture and Salt Fog Exposure

UV Blocking Moisture Barrier for Sensitive Electronics

GLOB-TOP AND LID-SEALS FOR CHIP PROTECTION

WITH SECOND GENERATION OF MODIFIED EPOXY COMPOUNDS





ELECTRICAL INSULATING, MECHANICAL AND MOISTURE PROTECTION

LID-SEALING ADHESIVES AND GLOB-TOP ENCAPSULANTS WITH PROVEN RECORDS OF LONG-TERM RELIABILITY

B-stageable paste and preform lid-sealing adhesives from AIT have been used extensively for high performance cavity package protection for over 20 years. In this brochure, we are presenting a new generation of glob-top encapsulation compounds that have been proven in recent years for advanced microelectronics with high temperature and high power dissipation requirements.

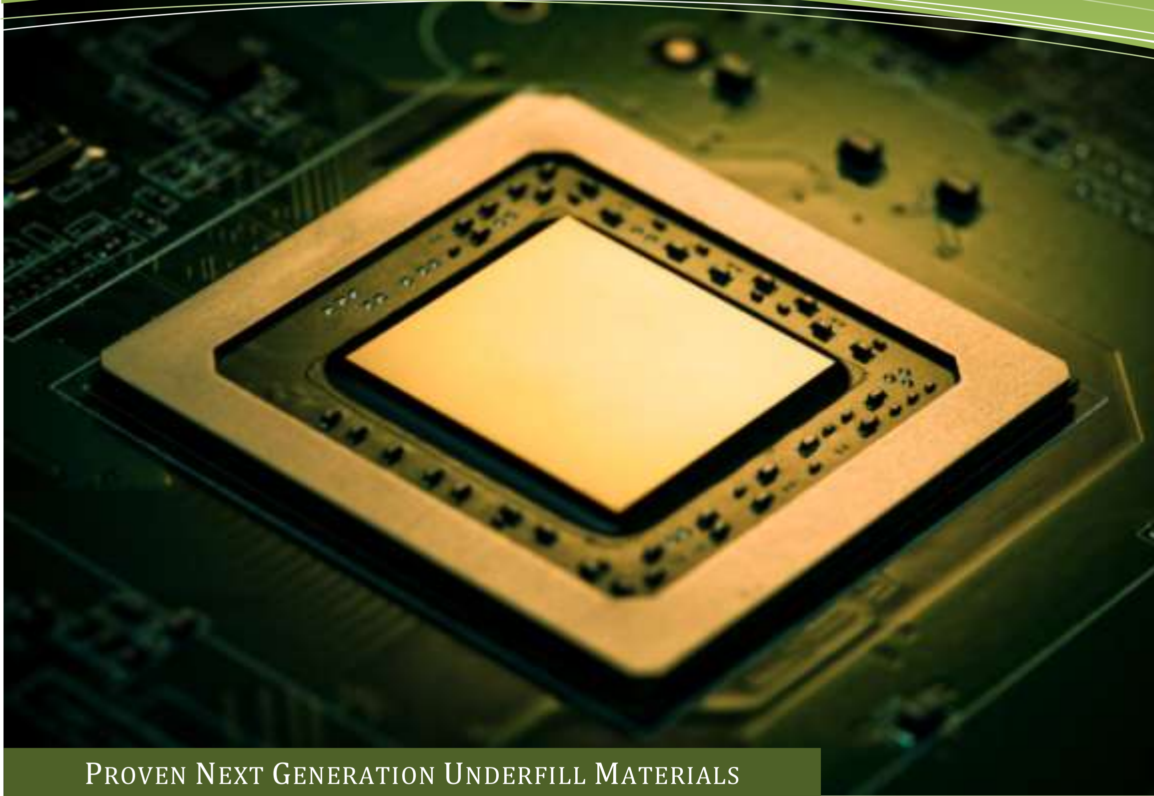
- All of the proven lid-sealing film adhesives are available in B-stageable film-forming paste format that can be dispensed directly onto the lids.
- Most of the Lid-Seal adhesives have been proven to pass both the fine leak and gross leak testing
- AIT glob-top encapsulants have ultra-high Tg of 175-240°C to suit the lead-free soldering processing
- All of the AIT glob-top encapsulants also provide thermal dissipation capability in addition to mechanical protection and moisture barrier.

Properties of Lid-Seal Adhesives and Glob-Top Encapsulants

PROPERTY	MC7865-GT (Glob-Top Encapsulant)	MC7685-GTS (Glob-Top Encapsulant)	LESP7670-HF (ESP7670-HF) (Lid-Sealing)	LRTK7660-HF (RTK7660-HF) (Lid-Sealing)
Electrical Resistivity	$>2X10^{14}$ Ω-cm	$>2X10^{14}$ Ω-cm	$>5X10^{14}$ Ω-cm	$>2X10^{15}$ Ω-cm
Viscosity @5.0 rpm /Thixotropic Index	60,000 cps/2.5	60,000 cps/2.5	65,000 cps/4.0	65,000 cps/4.0
Material Form Factors	Syringe and Frozen Storage	Syringe and Frozen Storage	B-Stageable at 50-70°C to dry preform	B-Stageable at 50-70°C to tacky preform
Customizable Parameters	Viscosity and Thixotropic Index	Viscosity and Thixotropic Index	Conductive and/or Thermally Conductive	Conductive and/or Thermally Conductive
Glass Transition Tg (°C)	240	175	130	165
Device Push-off Strength (psi)	>3500	>4000	>3000	>4000
Hardness (Type)	~ 90D	~ 90D	~ 90D	~ 85D
Cured Density of Conductive Adhesive Portion (gm/cc)	2.5	2.5	1.6	1.6
Thermal Conductivity	> 2.0 W/m-°K	> 1.8 W/m-°K	> 0.20 W/m-°K	> 0.20 W/m-°K
Thermal Expansion Coefficient (ppm/°C)	18 (X-Y=Z, Isotropic)	19 (X-Y=Z, Isotropic)	35 (X-Y=Z, Isotropic)	35 (X-Y=Z, Isotropic)
Maximum Continuous Operation Temperature (°C)	> 250	> 200	150	150
Decomposition Temperature @5% weight loss (°C)	>450	>450	>450	>450
Recommended Curing Temperature/Time (°C/min.)	>125/60	>125/120	>150/30	>150/30

New Generation of Ultra High Tg Underfill

with Glass Transition of Over 240°C for Ultimate Flip-Chip and Component Stress Management



Proven Next Generation Underfill Materials

Underfill Liquid and Film Adhesives

FUNCTION	AIT PART#	THERMAL, ELECTRICAL, & other RELEVANT PROPERTIES
Stress and Thermal Management	MC7866-UF	• Tg ~240°C to ensure minimal stress during lead-free soldering • Low curing temperature and low CTE to achieve lower stresses • Outstanding thermal conductivity and low interface resistance
Stress and Thermal Management	MC7863-UF	• Tg ~240°C to ensure minimal stress during lead-free soldering • Low curing temperature to achieve lower stresses • Lowest CTE for internal stress reduction
Stress Management	MC7686-UF	• Tg ~220°C to ensure minimal stress during lead-free soldering • Low curing temperature and low CTE to achieve lower stresses • Outstanding thermal conductivity and low interface resistance
Flow-Over-Wire Underfill Film Adhesive	ESP7660-FOW	• Tg ~175°C to ensure minimal stress during reflow soldering • High flow at low curing temperature of 100-150°C to achieve lower internal stresses • High flow at minimal pressure of less than 2 psi for flow-over-wire for stack-chip encapsulation and bonding
Flow-Over-Wire Underfill Film Adhesive	CXP7860-FOW	• Tg ~240°C to ensure minimal stress during reflow soldering • High flow at low curing temperature of 100-150°C to achieve lower internal stresses • High flow at minimal pressure of less than 2 psi for flow-over-wire for stack-chip encapsulation and bonding
Preform Underfill for Thermal and Stress Management	CXP7686-UF	• Tg ~220°C to ensure minimal stress during reflow soldering • High flow at minimal pressure of less than 2 psi for flow-over-wire for stack-chip at low curing temperature of 100-150°C to achieve lower internal stresses • Outstanding thermal conductivity and low thermal interface resistance
Preform Underfill for Thermal and Stress Management	ESP7666-FOW	• Tg ~175°C to ensure minimal stress during reflow soldering • High flow at minimal pressure of less than 2 psi for flow-over-wire for stack-chip at low curing temperature of 100-150°C to achieve lower internal stresses • Outstanding thermal conductivity and low thermal interface resistance

Liquid Underfills with Ultra-high Glass Transition (Tg):

- Modified cyanate ester to balance the high Tg and high temperature capability with engineered stress absorption.
- Outstanding thermal conductivity and low thermal resistance to allow power chip to dissipate heat to both the top and bottom sides of the microelectronic package.
- Proven in some of the most stringent military applications

High Melt-Flow Film Underfill for FOW:

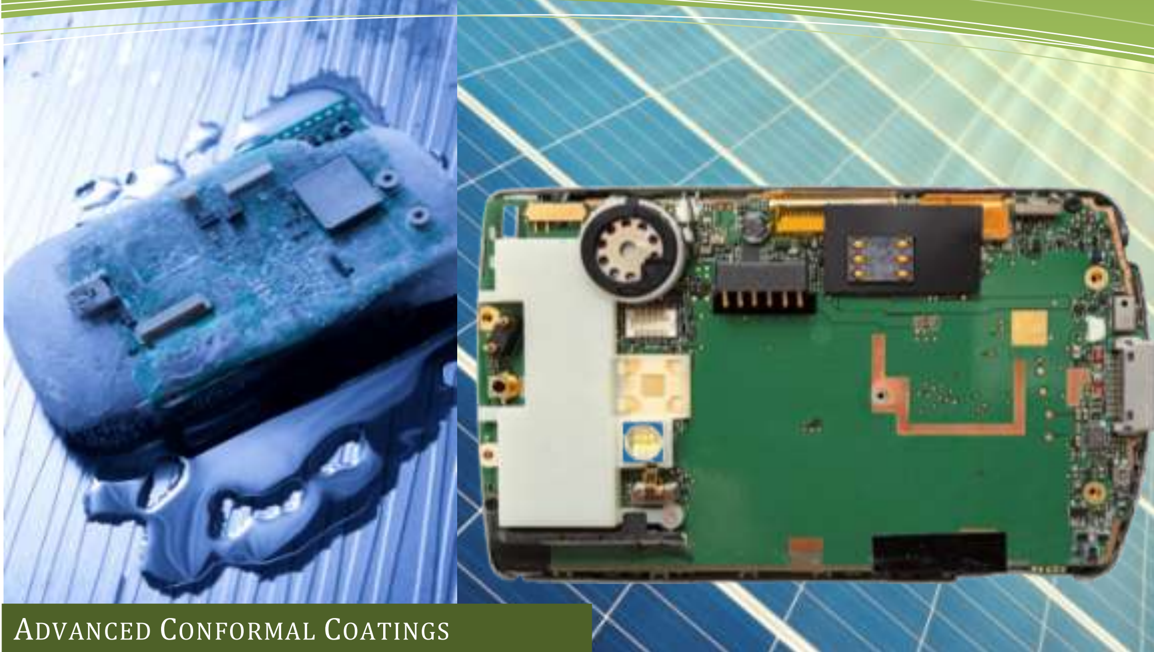
- Outstanding melt-flow and wetting to flow-over-wire for stack-chip applications
- Ability to cure at lower temperature from 100-150°C for lower interfacial stresses
- Ideal for large area stack-chip and module

High Melt-Flow Preform Film Underfills:

- Preform with specific thickness to accommodate the flip-chip or ball-grid-array parts with preformed cut-outs for solder ball arrays.
- High melt-flow to encapsulate the soldered interconnection for protection

CONFORMAL AND UV-BLOCKING COATINGS

WITH ENGINEERED MOLECULAR STRUCTURE FOR PROVEN PERFORMANCE



ADVANCED CONFORMAL COATINGS

Conformal Coatings and UV Protection Coatings

FUNCTION	AIT PART#	Moisture, Water, Electrical other Relevant Properties
Conformal Coating for PWB	CC7090-ES	• Designed to conform to properties in IPC-CC-830, IPC-TM-650, MIL-I-UL 94 • Brush and spray coating for applications below 90ºC
Higher Temperature Conformal Coating	CC7130-PR	• Designed to conform to NASA-STD-8739.1 • Brush and spray coating for applications below 130ºC
Transparent UV Blocking Coating	SC7050-UVB	• Optically transparent but UV blocking coating • Outstanding protection for moisture, salt-fog and UV for exposed plastics and protecting metals from tarnishing and rust
Non-Transparent UV Blocking Coating	SC7133-"X"	• Optically opaque and UV blocking coating with "X" colors • Outstanding protection for moisture, salt-fog and UV for exposed plastics and protecting metals from tarnishing and rust
Transparent UV Transparent Coating	SC7130	• Optically transparent and UV blocking coating • Outstanding protection for moisture, salt-fog and UV for exposed plastics and protecting metals from tarnishing and rust

About **AI Technology, Inc.** in Chip to Board Protection

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

AIT has not participated in the areas of flip-chip underfill, glob-top or conformal coating actively until recently. These advanced chip to board protection products offers unparalleled performance deriving from modified epoxies, cyanate esters, flouropolymers and other molecular engineering in protecting the new generation of chip and component level packages in the much high temperature lead-free soldering process.

With the introduction of AIT's patented solar materials and solutions (US8,394,650 and others pending), AIT offers UV blocking and UV transparent coatings as well as proven materials for electronic board and system level protection against moisture, salt-fog and water immersion.

AI Technology, Inc. (AIT) offers one of the most comprehensive lines of advanced materials for packaging and protection from chip to board level:

- Die attach film and dicing die-attach film adhesive for chip stacking and high power microelectronic devices
- Die-Attach films and pastes for extreme high temperatures, extreme stress management requirements and extreme high power applications
- Thermal interface materials including greases, gels, adhesives, patented compressible phase-change pads, high compressibility and conforming "gum-pads" with unparalleled performance
- EMI/RFI mitigation material solutions with conductive caulks and adhesives
- Advanced flexible and Insulated Metal Circuit Substrates for camber-free modules
- Insulated metal substrate for high temperature and high power modules

AIT develops and manufactures its product in an ISO 9001:2008 certified 16 acres campus in Princeton Junction, NJ, USA with service centers in China and Philippines.