United Adhesives

Aerospace
Automotives
Computers
Electronics
Green Energy
Semiconductors
Telecommunications

# Welcome to United Adhesives, Inc.

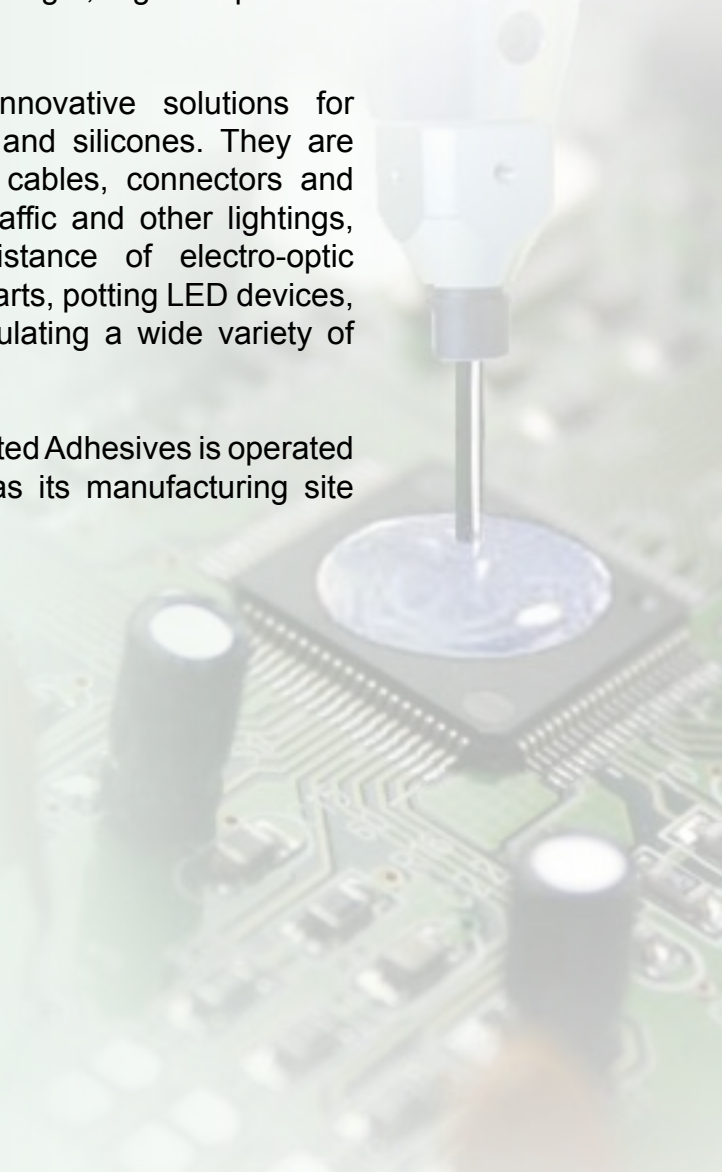
United Adhesives Inc. formulates and manufactures special adhesives for applications in aerospace, automotives, computers, electronics, semiconductors, and telecommunications. Our adhesives are based on three major chemical categories: silicone, epoxy, and fluorocarbon.

- The silicone adhesives, including thermally conductive, electrically conductive, heat cure adhesives, and RTV cure sealants, provide low-stress bonding and coating with high and low temperature stability.

- The epoxy-based adhesives, including electrically conductive adhesives, high temperature, low CTE, and capillary flow underfill encapsulants, provide structural bonding strength, high temperature stability, and chemical resistance.

- United Adhesives also provides innovative solutions for optoelectronics with optical-grade epoxies and silicones. They are applied in bonding and potting fiber-optic cables, connectors and terminations, LCD backlighting, displays, traffic and other lightings, upgrading the vibration and shock resistance of electro-optic assemblies, cementing and coating optical parts, potting LED devices, optical replications, and coating or encapsulating a wide variety of optoelectronics.

The research and development team of United Adhesives is operated in Chicagoland, USA. United Adhesives has its manufacturing site located in Eastern China.



# ▶ Electrically Conductive Adhesives

United Adhesives Inc. makes two categories of Electrically Conductive Adhesives (ECA), silver-filled silicones (Silductor series) and silver-filled epoxies (Eposolder series), in both one-part and two-part systems. They are either dispensable or screen / stencil printable.

The Eposolder series ECAs provide superior bonding strength to most common metal/alloy surfaces while maintaining high electrical & thermal conductivity.

The Silductor series ECAs provide significant stress compliance while maintaining high electrical & thermal conductivity.

[ Applications ]

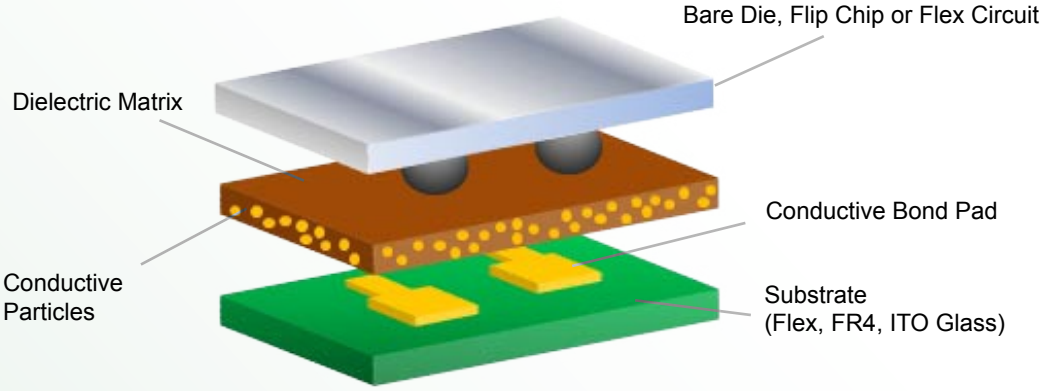
The typical applications are for mounting of heat sensitive dies or components in sensors, disk drive, flip-chip, die attach assembly or packaging, MEMS, LED Driver IC's, CCD chip attach, solar planel interconnections, wafer lamination, CSP. Epoxy based ECAs provide electrically conductive bonding between components and mounting surfaces, and serve as thermal interface material for conducting heat through heat spreader. They are alternatives for solder replacement, chip bonding, and lead terminations.

| Name | Features / Advantages | Rheology | Part | Volume Resistivity (Ohm-cm) | Hardness / Modulus | Adhesion Al/Al, psi | Cure Rate |
|---|---|---|---|---|---|---|---|
| Silductor 6310 | High conductivity. Low stress silicone based. High moisture resistance. Reworkable. | 41,000 cPs | 1-part | $< 5x10^{-4}$ | Shore A = 45 | >150 | 125C 60 min |
| Silductor 6350 | Low cost alternative with Ag coated Cu as conducting media | 42,000 cPs | 1-part | $< 2x10^{-3}$ | Shore A = 68 | >180 | 125C 60 min |
| Silductor 6381 | Low cost alternative with Ag and Cu hybrid as conducting media | 85,000 cPs | 1-part | $< 1x10^{-3}$ | Shore A = 80 | > 230 | 125C 60 min |
| Eposolder 6510 | High electrical conductivity. Strong bonding strength. Dispensable and printable | 35,000 cPs | 1-part | $< 2x10^{-4}$ | Shore D = 78 | > 1200 | 25C 8hrs, or 105C 10 min |
| Eposolder 6537 | Fast cure (snap cure) epoxy-silver. Strong bonding strength. Dispensable and printable | 48,000 cPs | 1-part | $< 2x10^{-4}$ | Shore D = 85 | > 1500 | 180C 15 sec, 125C 5 min |
| Eposolder 6763 | Epoxy based low cost alternative with Ag coated Cu as conducting media | 47,000 cPs | 1-part | $< 5x10^{-3}$ | Shore D = 60 | > 800 | 125C 60 min |
| Eposolder 6869 | High electrical and thermal conductivity (11 W/mK). Strong bonding strength | 98,000 cPs | 1-part | $< 1x10^{-4}$ | Shore A = 70 | > 400 | 125C 60 min |
| Other Products | Eposolder 6503, 6520, 6522, 6526, 6761 – One or two part epoxy based systems with various modifications<br>E-Shielding products, including acrylic Ag-Cu based E-Shield 6037 and carbon based E-Shield 6410, provide conductive coating, RF / EMI shielding solutions<br>Refer to website to check the details of the properties | | | | | | |

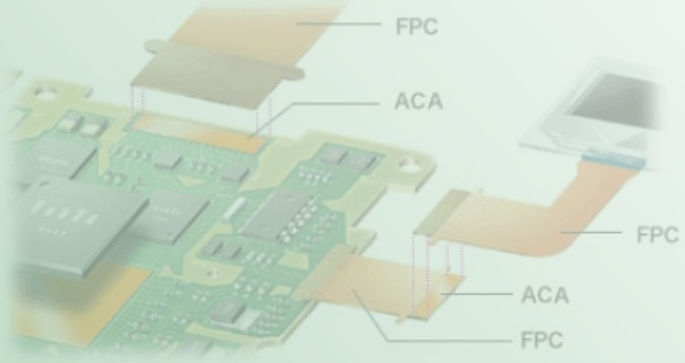
# Anisotropic Electrically Conductive Adhesives

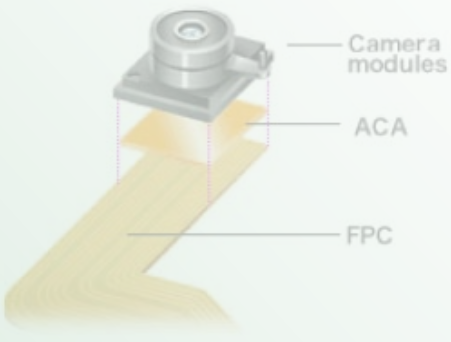
Anisotropic conductive adhesives (ACA) provide high-speed interconnection for flip chip, fine pitch chip-on-film (COF), and chip-on-glass (COG) LCD packaging, flexible printed circuits (FPC) cables, and various fine pitch assemblies. They are often used as interconnect material in mainstream applications such as flat panel displays, LCD, smart card, camera modules, mobile phones, direct access sensors, semiconductor packages and RFID tags.

United Adhesives makes Au-based ACAs, and Ag-based low cost ACAs for these applications. They all have a rapid snap-cure speed at elevated temperatures in seconds with a thermo-compression. They forms a structural bonding to various substrates and films with conductivity only in z-direction while remaining insulation in the x,y plane.




| Name | Features / Advantages | Rheology | Part | Volume Resistivity (Ohm-cm) | Hardness / Modulus | Adhesion Al/Al, psi | Cure Rate |
|---|---|---|---|---|---|---|---|
| AE6062 | Z-axis anisotropic electrically conductive adhesive. Gold coated nickel as filler, 2.5 um. Snap cure with compressing | 26,000 cPs | 1-part | > $1x10^{-12}$ (x, y dir); z dir < 0.1 Ohm-$mm^2$ | Shore D = 90 | > 1800 | 180C 4 to 6 sec. 150C 20 sec |
| AE6075 | Z-axis anisotropic electrically conductive adhesive. Gold coated nickel as filler, 5.0 um Snap cure with compressing | 21,000 cPs | 1-part | > $1x10^{-12}$ (x, y dir); z dir < 0.1 Ohm-$mm^2$ | Shore D = 90 | > 1800 | 180C 4 to 6 sec. 150C 20 sec |
| AE6025 | Z-axis anisotropic electrically conductive adhesive. Silver coated copper as filler, 3.0 um Snap cure with compressing | 22,000 cPs | 1-part | > $1x10^{-12}$ (x, y dir); z dir < 0.5 Ohm-$mm^2$ | Shore D = 86 | > 1500 | 180C 4 to 6 sec. 150C 20 sec |



# ▶ Thermal Management

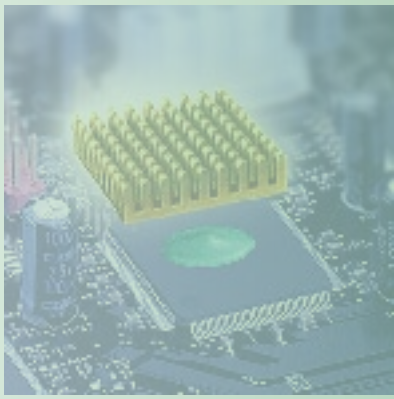
United Adhesives Inc. makes thermally conductive adhesives (TCA) for bonding electronic devices with heat dissipations. They have following features:

- Very high thermal conductivity.
- High bonding strength to most common plastics and metals
- Soft rubber and flexible (Thermondbond series) to couple thermal stress while dissipating heat
- High dielectric strength for voltage insulation

[ Potential Uses ]

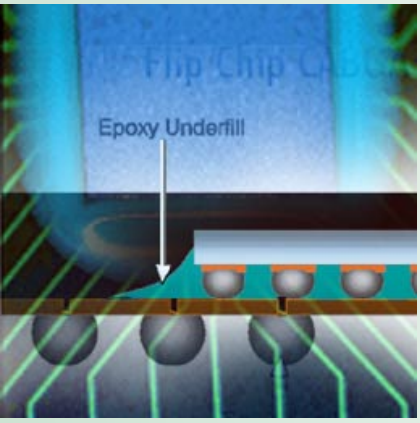
For high heat dissipation and bonding in automotive electronics, semiconductors, and telecommunications, typically applied between a high heat power device and heat sink; any places where require coupling thermal stress while dissipating heat, or require thermally conductive vibration dampening; attachment of PCB to heat sink, cooling fans to devices, bonding or encapsulation of powder devices.





| Name | Features / Advantages | Rheology | Part | Thermal Conductivity | Hardness / Modulus | Adhesion Al/Al, psi | Cure Rate |
|---|---|---|---|---|---|---|---|
| Thermobond 3513 | Silicone with high bonding Strength. Low stress | Flowable 56,000 cPs | 1-part | 1.4 W/mK | Shore A =70 | > 600 | 125C 60 min |
| Thermobond 3517 | Silicone with high thermal conductivity. Strong bonding. Non-Slump | Thixotropic, 120,000 cPs | 1-part | 1.9 W/mK | Shore A = 90 | > 550 | 125C 60 min |
| Thermobond 3831 | Boron nitride filled for very high thermal conductivity | Thixotropic, 230,000 cPs | 1-part | 3.2 W/mK | Shore A = 63 | 580 | 125C 45 min |
| ET1628 | High thermal conductivity. High bonding Strength. Easy flow. Rmt curable. | 220,000 cPs | 2-part 2 : 1 | 2.3 W/mK | Shore D = 70 | > 1500 | 25C 8hrs, or 105C 10 min |
| ET1643 | High thermal conductivity. High bonding Strength. Easy flow. Low CTE. | 210,000 cPs | 2-part 1 : 1 | 2.0 W/mK | 6.7 GPa | > 1800 | 25C 18hrs, or 125C 30 min |
| ET1645 | High thermal conductivity. Good flow. High bonding Strength | 50,000 cPs | 1-part | 1.5 W/mK | Shore D = 70 | > 1000 | 150C 45 min |
| TF2619 | High thermal conductivity gap filling silicone | Thixotropic, 230,000 cPs | 1-part | 1.9 W/mK | Shore OO=40 | N/A | 125C 45 min |
| Eposolder 6869 | Silver filled epoxy for extremely high thermal conductivity | 98,000 cPs | 1-part | 11 W/mK | Shore A = 70 | > 400 | 125C 60 min |
| Other Products | Thermobond 3508, 3519, 3821, 3830 – One or two-pat silicone systems with various modifications<br>ET1608, 1642, 1645NS, 1653BN, 1655, 1658 – One or two part epoxy systems with various modifications<br>Refer to website to check the details of the properties | | | | | | |

# ▶ Chip Scale Packaging



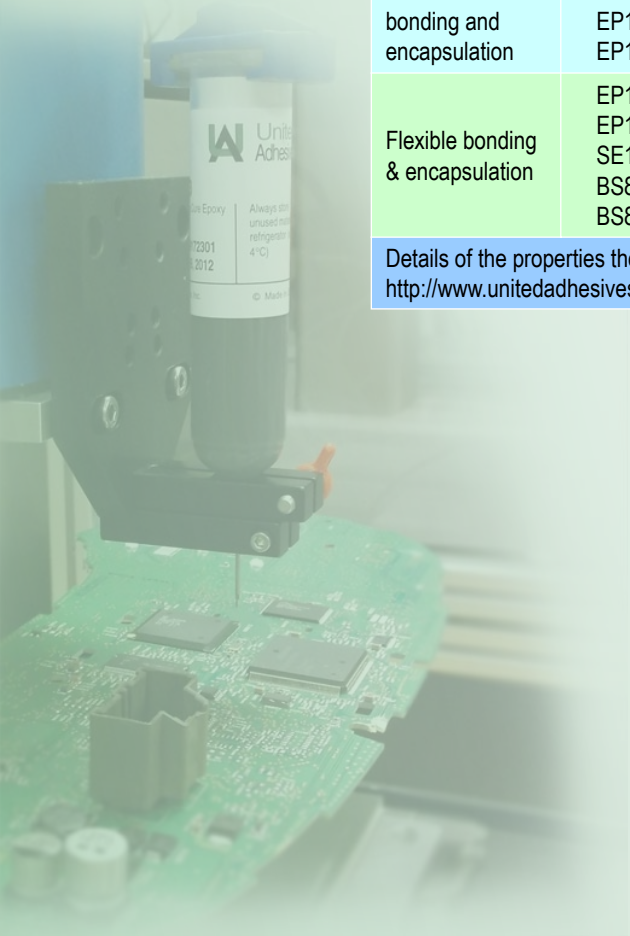

Epoxy based underfill and encapsulant products from United Adhesives are for semiconductor applications such as to attach chip-on-board, bare die, BGA, flip-chip, CSP, etc, or to under-fill the gap between die /chip and substrate, or to encapsulate dies, chips, components, or powder devices.

They provide various superior features such as:

- Excellent capillary flow capability.
- High Tg formulation for high temperature stability.
- Very low CTE formulation to minimize the thermal mismatch.
- High voltage insulation formulation.
- Strong bond to FR4, ceramic, polyimide, metals, and other difficult materials.
- Good dielectric property. Low current leakage.

Thermally conductive underfills are also available.

| Applications | Products | Features / Advantages |
|---|---|---|
| Flip chip, BGA underfill | TUF1210<br>UF1230<br>UF1240<br>SE1260 | Thermally conductive underfill<br>Fast flow with low CTE low alpha emission<br>Underfill with rubber toughen for high strength<br>Flexible / soft underfill |
| Die attach | EP1637<br>EP1723<br>EP1678<br>Eposolder 6869 | Snap cure in seconds, flowabe, 1-part<br>Snap cure in seconds, non-slump, 1-part<br>2-part, room temperature curable epoxy<br>Extremely high thermal conductivity k = 11 W/mK |
| Low CTE bonding and encapsulation | EP1640<br>EP1641<br>EP1641NS | 2-part 1:1 mixing low CTE epoxy. Low T curable<br>1-part heat cure. High thermal stability<br>1-part non-slumping. High Tg |
| Flexible bonding & encapsulation | EP1346<br>EP1386<br>SE1262<br>BS8311<br>BS8460 | 2-part (2:1) flexible, room temp curable<br>2-part (1:1) flexible, room temp curable<br>2-part (1:1) flexible, heat cure<br>1-part silicone, heat cure<br>2-part silicone, room temp curable |
| Details of the properties these adhesives can be found on the website: http://www.unitedadhesives.com | | |



# ▶ Special Applications

United Adhesives Inc. makes high performance epoxy and silicone adhesives for electronic structural bonding, severe thermal shock and vibration bonding, and media resistance applications. Some epoxy adhesives can be used in other industries such as medicine and construction.

- Thixotropic bonding epoxy to anti-sag in processing.
- High Tg formulation for high temperature stability.
- Very low CTE formulation to minimize the thermal mismatch.
- High flow and penetration to fill micro cracks and voids
- Very soft / flexible epoxy formulation offering rubbery flexibility.
- High voltage insulation formulation
- Fast cure (snap cure) in seconds.


| Applications | Products | Features / Advantages |
|---|---|---|
| High Tg Adhesive | EP1551<br>EP1635 | High Tg over 150C. Non-slump, low CTE<br>High Tg over 150C. High thermal stability |
| High Voltage Resistance | EP1646<br>EP1660<br>BS8440 | 2-part, room Temp curable<br>One or two part, heat cure. High Tg<br>2-part silicone, heat cure |
| High Thermal Conductivity | ET1642<br>ET1645<br>ET1653BN<br>TB3508<br>TB3517<br>TB3830<br>Eposolder 6869 | 2-part epoxy, k=1.5W/mK, flowable<br>1-part epoxy, k = 2.0 W/mK<br>1-part epoxy, k =3 W/mK, BN filled<br>1-part silicone, k =1W/mK, high bonding strength<br>1-part silicone, k= 2W/mK, high bonding strength<br>2-part silicone, k = 3.2 W/mK, BN filled<br>1-part epoxy, k= 11W/mK, silver filled |
| High Chemical Resistance | EP1635<br>EP1636 | 1-part high Tg and low CTE, heat cure<br>2-part structural epoxy, heat cure |
| High Moisture Resistance | UF1225<br>MC7130<br>BS8350 | 1-part epoxy encapsulant<br>Silicone moisture rubber adhesive<br>Silicone heat cure runner adhesive |
| Fast cure | EP1678<br>EP1710<br>EP1733 | Quick set epoxy, 2-part mixing<br>Very fast cure. Cure at 185C for 5 to 7 seconds<br>Snap cure low CTE epoxy. Cure in seconds |
| Please contact our sales representatives or refer to website for other products for various special applications | | |


EP1660 Voltage Breakdown

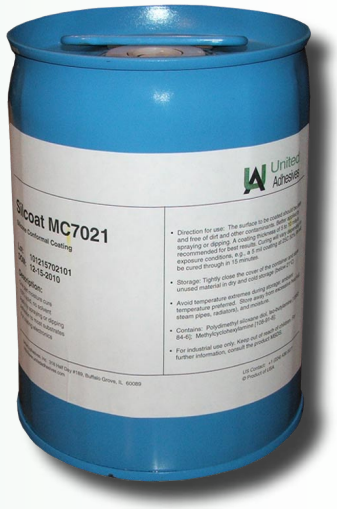
| Thickness | Initial After Cure | After Humidity Treatment (85C /85% RH 500 hrs) | After Thermal Aging (150C 500 hrs) |
|---|---|---|---|
| 1 mil | 1100 | 850 | 1300 |
| 2 mils | 1800 | 1500 | 2000 |
| 5 mil | > 4000 | > 4000 | > 4000 |
| Average | > 800 volts/mil | > 700 volts/mil | > 800 volts/mil |

# ▶ Coating and Potting Protection

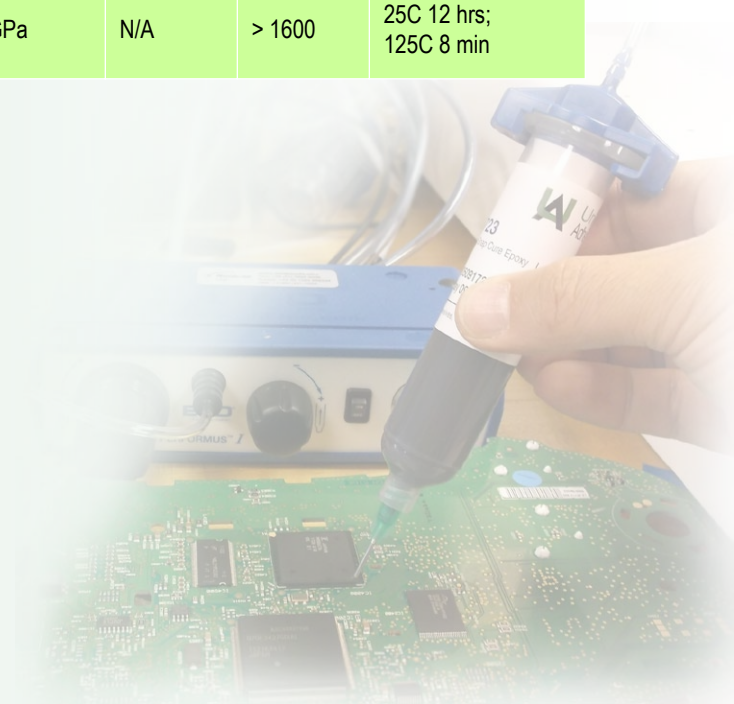
United Adhesives Inc. provides various dielectric adhesives for electronic potting applications. They have following features:

- High dielectric strength for voltage insulation
- Soft rubber and flexible to couple thermal stress
- Some products provide high thermal conductivity
- Some products provide superior high voltage resistance

They are typically applied to pot or encapsulate parts and cavities, seal lids, covers, housings, connectors, or coat various electronic parts to provide dielectric insulation, vibration dampening, thermal stress coupling, etc.




| Name | Features / Advantages | Rheology | Hardness / Modulus | Elongation | Adhesion Al/Al, psi | Cure Profile |
|---|---|---|---|---|---|---|
| MC7130 | Moisture cure silicone. Long elongation. Low stress, non-sag. Strong bonding strength | 1-part paste | Shore A = 43 | 300% | 150 psi | Tack free time 45 min @ 24C 50%RH |
| BS8311 | Heat cure to form silicone rubber. Non-corrosion sealant. Strong bonding to most plastics | 1-part, dispensable 45,000 cPs | Shore A = 47 | 280% | > 600 | 125C 60 min |
| BS8350 | Heat cure to form silicone rubber. Non-corrosion sealant. Strong bonding to most plastics | 1-part paste non-sag 110,000 cPs | Shore A = 62 | 250% | 550 psi | 125C 60 min |
| BS8440 | Two part. Heat cure to form silicone rubber. Non-corrosion sealant / adhesive. | 1:1 mixing 40,000 cPs | Shore A = 51 | 240% | > 550 psi | 25C 12 hrs; 125C 15 min |
| EP1611 | Flexible epoxy, room temp curable | 60,000 cPs | Shore A = 60 | 50% | > 1500 | 25C 12 hours; 125C 30 min |
| EP1646 | High voltage resistant sealant based on non-slump epoxy | 2-part (2:1) 22,000 cPs | 6.2 GPa | N/A | > 1600 | 25C 12 hrs; 125C 8 min |

# ▶ Sealing Solutions

Silicone rubber based RTV sealants / adhesives from United Adhesives Inc. provide strong bonding to most common plastics and metals with excellent thermal stress release and water resistance.

Epoxy based sealants / adhesives provide strong structural bonding to most common plastics and metals with strong oil and chemical resistance.

They are used to bond and seal electronic devices, components, equipment, connectors, cover plates, housings, etc; make formed-in-place gaskets; assemble and repair electronic devices. They can also be applied as general-purpose sealants for other applications.

| Name | Features / Advantages | Rheology | Hardness / Modulus | Dielectric Strength | Adhesion Al/Al, psi | Cure Profile |
|---|---|---|---|---|---|---|
| Silcoat 7021 | Moisture cure soft silicone gel. Sprayable & dispensable. Easy apply. Excellent protection of moisture, media, & corrosion. | 1-part liquid 600 cPs | Shore A =32 | 450 V/mil | N/A | 1.8mm / 24 hrs<br>2.5mm / 72 hrs<br>@ 25C 50%RH |
| Silcoat 8022 | Soft coating and potting gel. Sprayable & dispensable. Excellent moisture & media resistance. | 1:1 mixing, 3,000 cPs | Shore A = 35 | 450 V/mil | N/A | 125C 15 min |
| Silcoat 8026 | Soft Non-Sag gel. Dispensable. Excellent moisture and media resistance | 1:1 mixing, 25,000 cPs | Shore A = 40 | 450 V/mil | N/A | 125C 15 min |
| SP4011 | Readily flowable. Thermal cure to form firm rubbery dielectric gel. Non-corrosive. | 1-part gel 560 cPs | Shore A = 20 | > 480 V/mil | N/A | 125C 60 min |
| SP4012 | Readily flowable. Thermal cure to form firm rubbery dielectric gel. Non-corrosive. | 2-part gel 450 cPs | Shore OO = 35 | > 480 V/mil | N/A | 125C 30 min |
| EP1238 | Low viscosity epoxy potting adhesive. Good bond to various substrates | 1:1 mixing, 3,000 cPs | Shore D = 50 | > 500 V/mil | > 2500 | 25C 8 hrs;<br>80C 60 min |
| Other Products | SP4017 is thixotropic version encapsulant. OE1582, OP4047 are optical encapsulants<br>Refer to website to check the details of the properties | | | | | |

Typical adhesion to different substrates

| Adhesion to Substrates | MC7010 | MC7130 | MC7240 | MC7350 | Bondseal 8440 | EP1611 |
|---|---|---|---|---|---|---|
| Aluminum | Excellent | Excellent | Excellent | Excellent | Excellent | Good |
| Cupper | Excellent | Excellent | Excellent | Excellent | Excellent | Good |
| PBT | Excellent | Fair | Fair | Excellent | Good | Excellent |
| Nylon | Excellent | Good | Excellent | Excellent | Good | Excellent |
| PPS | Good | Fair | Fair | Good | Fair | Excellent |
| Polycarbonate | Prohibit | Fair | Excellent | Prohibit | Excellent | Excellent |
| Epoxy Resin | Excellent | Excellent | Excellent | Excellent | Fair | Excellent |
| Silicone Rubber | Good | Fair | Fair | Good | Fair | Fair |

# ▶ Optical Encapsulants and Adhesives

United Adhesives Inc. provides innovative solutions for optoelectronics with optical-grade epoxy and silicone encapsulants, coatings, adhesives, and sealants. They are applied in bonding and potting fiber-optic cables, connectors and terminations, LCD backlighting, displays, traffic and other lightings, upgrading the vibration and shock resistance of electro-optic assemblies, cementing and coating optical parts, potting LED devices, optical replications, and coating or encapsulating a wide variety of electro-optic and laser components. They have the following features:

- Excellent light transmission characteristics.
- Superior non-yellowing properties or anti-yellowing
- Silicone based system can cure to low stress elastomer
- Resistance to ozone and UV Degradation
- Broad operating at temperatures of -40 to 180°C.
- High adhesion, high purity, moisture resistance
- Reworkable for silicones.


| Name | Features / Advantages | Rheology | Hardness / Modulus | Refractive Index ($n_D$ @ 25C) | % Transmission (350 nm to 1000 nm) | Flexible Strength (FS) or Tensile Strength (TS) | Cure Profile |
|---|---|---|---|---|---|---|---|
| OE1582 | Optically clear epoxy. 2-parts, cures at room temperature or can be accelerated at elevated temperatures. Anti-yellowing formulation | 2:1 mixing, 240 cPs | 77 (Shore D) | 1.564 | 95% to 99% | F.S. = 120 MPa | 80C 60 min 125C 15 min |
| OE1583 | Optically clear epoxy. 1-part ready to apply, cures at elevated temperature. Anti-yellowing formulation | 1-part liquid 470 cPs | 70 (Shore D) | 1.564 | 95% to 99% | F.S. = 120 MPa | 85C 2 hrs 125C 30 min |
| OP4036 | Optically clear silicone tough rubber, 2-part ready to apply. Transparency, non-yellowing. Compliance to thermal stress | 1:1 mixing, 16,000 cPs | 47 (Shore A) | 1.41 | 97% to 99% | N/A | 125C 15 min |
| OP4047 | Optically clear silicone tough rubber, 1-part ready to apply. Transparency, non-yellowing. Compliance to thermal stress | 1-part liquid 16,500 cPs | 47 (Shore A) | 1.41 | 97% to 99% | N/A | 125C 60 min |

United Adhesives focuses on challenging technologies in electronics industries and producing custom formulations. We assure our customers the highest quality in adhesives products through a dedication to product performance, reliability, specifications, and timely delivery. We are committed to distinguishing ourselves as a reliable and responsive adhesives company for our global customers.

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