

LINQBOND UF-3501R

Reworkable CSP Epoxy Underfill



- High elasticity, fatigue and crack resistant
- Low viscosity and excellent fluidity
- RoHS, UL 94 V0 compliant, and halogen-free

LINQBOND UF-3501R is a solvent-free, one-component, reworkable epoxy underfill for electronic devices. This resin provides excellent protection against moisture and vibration. It develops tough and strong bonds to components providing outstanding shear, peel and impact strength at low temperature. **LINQBOND UF-3501R** cures rapidly at elevated temperatures, increasing production cycles. It can alleviate the expansion and contraction stress on solder ball contacts and absorb the shear force resulting from reaction forces during drop tests with its low modulus.

LINQBOND UF-3501R is designed for CSP and BGA underfill. It also exhibits excellent manufacturability and can be applied on various electronic components as potting, casting and sealing.

Cure Schedule

- 80°C for 30 min
- Alternative Cure schedules:
 - 100°C for 15 min
 - 150°C for 5 min

Uncured Properties

Property	Value	Unit
Color	Black	–
Viscosity (25 °C, 10 rpm)	3,250 ± 750	cP
Pot life @ 25°C	24	hours
Shelf life @ -40°C to -5°C	240	days

Instructions for Use:

1. Before use, thaw the product to reach room temperature for 1–2 hours. Syringe should be placed vertically while thawing. Keep container airtight until room temperature is reached.
2. Ensure the surface to be bonded is clean and free of contaminants like dirt, grease, or mold release agents. A simple solvent wipe is often sufficient.
3. Cure time may vary based on the actual part geometry, material volume, and equipment. It is recommended to test on actual parts and equipment.
4. For large-scale applications, consider a staged curing process: start with a lower temperature precure, followed by a full cure at a higher temperature to effectively manage heat release.
5. Cool down gradually after curing to minimize thermal stress.
6. The epoxy cannot be refrozen once exposed to room temperature.

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Cured Properties¹

Property	Value	Unit
Glass Transition Temperature, T _g (TMA)	50	°C
Coefficient of Thermal Expansion (CTE), α ₁	30	ppm/ °C
Coefficient of Thermal Expansion (CTE), α ₂	177	ppm/ °C
Shear Strength, (Al vs Al)	173	Kgf/cm ²
Young's Modulus	400	MPa
Water Absorption Ratio (25 °C /24 h)	0.95	%
Water Absorption Ratio (80 °C /24 h)	2.40	%
Durometer Hardness	80	Shore D
Surface Resistivity	4.5 × 10 ¹⁴	Ω
Volume Resistivity	2.2 × 10 ¹⁵	Ω · cm
Dielectric Constant @ 1kHz	3.2	–
Degradation Temperature (TGA, 10 °C /min)	325	°C
Weight Loss Ratio @300°C	1.8	%
Specific Gravity	1.22	–
Temperature Range	-40 to 100	°C

¹ Above values were measured with material cure condition 80 °C for 30 min

Rework Process:

- Component Removal.** Component solder joints must be heated above their reflow temperature. At this temperature, the underfill will be soft and easy to remove. Component may then be pulled or removed by twisting or with a use of a vacuum pick-up nozzle.
- Site Preparation.** Cleaning of residues after component removal may be done by the following methods
 - Scraping. Heat the site to 250°C to 300°C and scrape off the underfill carefully avoiding damage of pads on the substrate. Alternatively, heating can also be done from the bottom of the substrate.
 - Rotating Brush. Apply sufficient amount of pressure onto the brush to clean the residues. Care should be taken to avoid damage to substrate.
- Component Replacement.** Isopropanol or a flux pen may be used to ensure no residue remain on the circuit board after cleaning. Brush solder paste or flux on the board and align the new component using vacuum and reflow using hot air. Underfill will likewise be applied followed by cure step.

Storage and Handling

Store and transport in a -40°C to -5°C Temperature. Keep away from moisture and heat sources. It is strictly forbidden to store in outdoor environments.

- Shelf life at -40 °C to -5°C is 240 days.

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