



TCL-202

Thermal Conductive Dual-Curable Epoxy Adhesive

PRODUCT DESCRIPTION:

- Base chemistry: epoxy only, cationic polymerization
- One component Boron Nitride filled non-electrically conductive adhesive ready for use, UV + heat curing.
- Average particle size 7 µm and max size 30 µm

PRODUCT USE:

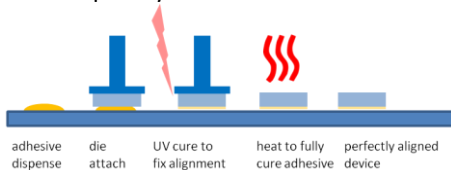
- Bonding integrated circuits and components in semiconductor packaging.
- Heat transfer and dissipation
- Bonding of opaque substrates

FEATURES:

- Thermal conductive, electrical insulating, high adhesion, high Tg, long shelf and working life, low outgas, excellent reliability performances, robust for solder reflow process

INSTRUCTIONS FOR USE:

- 1) Clean the substrates to remove contamination.
- 2) Dispense adhesive on substrates
- 3) Bond substrates
- 4) UV cure to fix alignment
- 5) Thermal cure: heat is mandatory for completely cured adhesive



GENERAL USAGE INFORMATION:

Shipment: adhesive is shipped in “cold pack with ice bricks”, no Dri ice

Storage: After receipt, cold storage at -20 °C or -40 °C in the original container is required

Before use: The cold adhesive needs to reach RT (23-25°C) before use. The container needs to sit at RT, adding heat is not allowed. Room temperature equilibration time is dependent on container size, but a 10-30 gram syringe equilibration time is approximately 30-60 minutes. Condensed water on the container must be removed prior to use

SAFETY AND HANDLING

The uncured adhesive can be cleaned from apparatus with isopropyl alcohol (IPA), methyl ethyl ketone (MEK), or commercial alcohol based cleaning solution. Avoid direct skin and eye contact. Use only in well ventilated areas. Use protective clothing, gloves and safety goggles. Read [Material Safety Data Sheet](#) before handling.

CURING CONDITIONS: 2 curing ways: UV + heat or heat

- 1) **UV + Heat curing:** fix aligned parts with UV, then use heat to completely cure adhesive including adhesive in shaded areas.

First step: UV cure

*Metal halide/Mercury UV: UV-A (320-400 nm), intensity: 100-1,000 mW/cm²

*LED-365 nm, UV light intensity: 100 to 1,000 mW/cm²

| LED-365 nm | | Metal Halide/Mercury(UV-A: 320-400 nm) | |
|-----------------------------------|-----------------|--|----------------|
| UV intensity(mW/cm ²) | x time(sec) | UV intensity(mW/cm ²) | x time(sec) |
| 100 | 100 sec or more | 100 | 50 sec or more |
| or 200 | 50 sec or more | or 200 | 25 sec or more |
| or 300 | 35 sec or more | or 300 | 17 sec or more |
| or 400 | 25 sec or more | or 400 | 13 sec or more |
| or 500 | 10 sec or more | or 500 | 10 sec or more |
| or 1,000 | 5 sec or more | or 1,000 | 5 sec or more |

Second step: heat cure: the adhesive is exposed to UV light first, then heat cure

* 90 °C for 60 to 90 minutes

- 2) **Heat curing:** the adhesive will cure by only heat 90°C for 60 to 90 minutes or 100°C for 60 minutes or 110°C for 45 to 60 minutes
 - The actual heat cure time is dependent on the heating time of the bonded components. The heat time of the components must be added to the total cure time of the adhesive for the process
 - The effect of humidity is greater for very thin film, if the adhesive layer is <25 µm, then longer cure time might be needed
 - To ensure good curing speed, the humidity should be <60% RH
 - Epoxy adhesives have post cure properties. Adhesion strength testing should be conducted at least 24 hrs after part assembly.

TYPICAL PROPERTIES

Uncured resin

| | |
|---|------------------|
| Viscosity at 25 °C, mPa.s or cps (shear rate: 10/s) | 30,000 to 34,000 |
| Thixotropic index (shear rate: 1/s over 10/s) | 3.5 |
| Appearance of uncured adhesive | white paste |
| Shelf life (-40 to -20°C): | 6 months |
| Pot life or working life (20 - 25°C): | 48 hours |
| Density (g/mL) | 1.3 |

Cured film

| | |
|--|-------------------|
| Shrinkage (linear, %) | < 0.3 |
| Hardness – Shore D | 85-90 |
| Outgas, weight % (per MIL-STD 883/5011) | 0.11 |
| Outgas, weight % (per Telcordia GR-1221) | 0.07 |
| Glass transition temperature (DMA, °C) | 183 |
| Volume Resistivity, ohm-cm | >10 ¹³ |

Thermal Properties

| | |
|-----------------------|--------------------------|
| Thermal Conductivity: | 2.8 W/m °K (75 µm film) |
| | 1.2 W/m °K (500 µm film) |

Coefficient of thermal expansion (DMA)

| | |
|---|----|
| below Tg (x10 ⁻⁶), °C ⁻¹ | 21 |
| above Tg (x10 ⁻⁶), °C ⁻¹ | 60 |

Physical properties tested at 25°C, 50% RH (ASTM D638)

| | |
|---------------------------|------------|
| Tensile strength, MPa | 151 |
| Elongation (%) | 3 |
| Young’s Modulus, MPa | 15,700 |
| Operating temperature, °C | -60 to 200 |