



1001 Trout Brook Crossing
 Rocky Hill, CT 06067-3910
 Telephone: (860) 571-5100
 FAX: (860) 571-5465

Technical Data Sheet

Product 3561

Electronics Products, November 1996

PRODUCT DESCRIPTION

LOCTITE® Product 3561 is a high purity, liquid epoxy designed for use as an underfill for flip chip devices. This product cures on exposure to heat. Its rheology is designed to allow it to penetrate gaps as small as 1 mil. This material is easily dispensed, minimizes induced stresses, provides improved temperature cycling performance, and excellent chemical resistance.

TYPICAL APPLICATIONS

Flip Chip/Underfill applications. Product 3561 is suitable for bare chip protection in a variety of advanced packages such as IC memory cards, chip carriers, hybrid circuits, chip-on board, multi-chip modules, ball grid arrays and pin grid arrays. Its low alpha emissions make it particularly suitable for memory devices.

PROPERTIES OF UNCURED MATERIAL

| | Value | Typical Range |
|------------------------------|------------|-----------------|
| Chemical Type | Epoxy | |
| Appearance | Blue-black | |
| Specific Gravity @ 25°C | 1.74 | |
| Filler Content, % | 70 | 67 to 72 |
| Viscosity @ 25°C, Brookfield | | |
| Cone/Plate | | |
| CP-52 @ 2.5 rpm, cP | 13,000 | 7,500 to 18,000 |
| CP-52 @ 20 rpm, cP | 8,500 | |
| Particle Size, microns | 40 | Maximum |

TYPICAL CURING PERFORMANCE

Recommended Cure 2 hours @ 150°C

Suggested cure schedules are general guidelines for maximum performance, other cure schedules may yield satisfactory results. Curing below 130°C is not recommended for most applications.

TYPICAL PROPERTIES OF CURED MATERIAL

Physical Properties

All measurements taken @ 25°C unless otherwise noted.

| | |
|--|---------------------|
| Coefficient of Linear Thermal Expansion, ASTM D3386, in/in/°C, maximum | 27x10 ⁻⁶ |
| Glass Transition temperature (Tg) °C, minimum | 150 |
| Extractable Ionic Content | |
| Chloride (Cl), ppm, maximum | 10 |
| Potassium (K), ppm, maximum | 10 |
| Sodium (Na), ppm, maximum | 20 |

PERFORMANCE OF CURED MATERIAL

| | Typical Value |
|-----------------------------------|---------------|
| Flexural Strength, ASTM D792, psi | 16,400 |
| Young's Modulus @ 25°C G Pa | 3.96 |

Electrical Properties

Dielectric constant & loss, 25°C, ASTM D150:

| | Constant | Loss |
|--------------------------------------|----------|------------------------|
| measured at 1kHz: | 3.55 | 0.003 |
| 10kHz: | 3.53 | 0.004 |
| 100kHz: | 3.50 | 0.005 |
| Volume resistivity, ASTM D257, Ω.cm: | | 6 x 10 ¹⁵ |
| Surface resistivity, ASTM D257, Ω: | | 1.4 x 10 ¹⁶ |

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Material Safety Data Sheet, (MSDS).

Directions for Use

| | |
|--|----|
| Gel Time @ 121°C, minutes | 12 |
| Pot Life @ 25°C, 200 grams mass, hours | 16 |

Frozen packages must be completely thawed before use. Warm at room temperature until no longer cool to the touch (normally 20 to 60 minutes). **Do not thaw in an oven or hot water bath.**

This product is supplied in ready-to-use syringes which fit directly into a variety of pressure/time or positive displacement dispensing machines commonly available. After storage in a freezer the product must be allowed to equilibrate to room temperature before use. Avoid cross contamination with other epoxy or acrylic adhesives by ensuring dispense nozzles, adapters etc. are thoroughly cleaned. Do not leave dirty nozzles on machine for long periods while machine is not in use. Do not leave dirty nozzles to soak in solvents for long periods.

The quantity of adhesive dispensed will depend on the dispense pressure, time, nozzle size and temperature of either the needle, substrate or both. These parameters will vary depending on machine type and should be optimized accordingly.

To underfill flip chips by capillary action, the chip and substrate must be thoroughly cleaned. A bead of product 3561 is then applied to one or two side (L-shaped) of the chip perimeter. For best results, the material should be dispensed onto a chip which has been preheated to approximately 70°C and held at that temperature until flow stops (3 to 10 minutes).

After the material has completely flowed under the chip, the device must be promptly cured at a minimum temperature of 130°C to achieve full properties. Devices with wet encapsulant should not be exposed to ambient humidity. If the material cannot be initially gelled to a hard finish within one hour after dispensing, storage in a desiccator cabinet is suggested until full cure can be performed.

Proper curing is critical to achieve full material properties and device performance. The glass transition, T_g , of the hardened encapsulant is a good indicator of full cure. Cure conditions must be confirmed by the user on live production devices. Improper cure may seriously reduce device yield or reliability.

Storage

Products must be stored in a dry location in unopened containers at or below a temperature of -40°C (-40°F). To prevent contamination of unused product, do not return any material to its original container. For specific shelf-life information, contact your local Technical Service Center.

Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents which may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.