LOCTITE® 3568™

May 2005

PRODUCT DESCRIPTION

LOCTITE® 3568™ provides the following product characteristics:

Technology	Epoxy
Chemical Type	Epoxy
Appearance (uncured)	Black liquid[LMS]
Components	One component - requires no mixing
Cure	Heat cure
Cure Benefit	Production - high speed curing
Application	Underfill
Specific Application	Reworkable underfill for CSP, BGA & µBGA assemblies
Dispense Method	Syringe
Key Substrates	SMD components to PCB
Reworkable	Yes

LOCTITE® 3568™ is an epoxy based liquid underfill compatible with polyimide and silicon nitride passivated flip-chip, CSP, BGA and µBGA assemblies. The adhesive cures in 5 to 15 minutes when exposed to temperatures of 150 to 165 °C, is easy to dispense, and quickly penetrates gaps as small as 0.025 mm. This underfill is designed to provide processing and reliability similar to conventional thermoset underfills, with the added advantage of reworkability: when heated to high temperatures for short periods of time (typically 210 to 220 °C for 1 minute) the cured epoxy matrix undergoes physical and chemical transformations, and this allows removal of the component when torque is applied.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.32
Viscosity, Cone & Plate, mPa·s (cP):	
Temperature: 25 °C, Shear Rate: 5 s^{-1}	300 to 2,000
Temperature: 25 °C, Shear Rate: 20 s^{-1}	300 to 2,000[LMS]
Capillary Flow Rate, seconds:	
Flow time, 100 °C, glass to glass, 25 µm:	
6.35 mm flow	≤10
12.7 mm flow	≤30[LMS]
25.4 mm flow	≤90
VOC, ASTM D 3960, g/l	301
Moisture Content, ASTM D 4017, %	<0.1
Total Volatile Content, ASTM D 2369, %	<25
Filler Content, %	30
Particle Size, µm:	
Average	2
Maximum	10
Pot life (50 % viscosity increase), hours	30
Heat of reaction, ASTM D 3417, J/g	250
Flash Point - See MSDS	

RECOMMENDED CURING CONDITIONS

>15 minutes @ 150 °C
7 minutes @ 165 °C

Note: With all fast cure systems, the time required for cure depends on the rate of heating. Conditions where a hot plate or heat sink is used are optimum for fastest cure. Cure rates depend on the mass of material to be heated and intimate contact with the heat source. Use suggested cure conditions as general guidelines. Other cure conditions may yield satisfactory results.

Differential Scanning Calorimetry

Temperature Program from 25 to 225 °C at 20 °C/minute:

Peak Onset, °C	138
Peak Maximum, °C	152
Curing Exotherm, J/g	250

TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 30 minutes @ 150 °C

Physical Properties:

Glass Transition Temperature, °C:		
(Tg) by TMA , ASTM D 3418		70
Coefficient of Thermal Expansion, ASTM E 831, K^{-1}:		
Pre Tg (alpha 1)		40
Post Tg (alpha 2)		145
Shrinkage, %		≤4
Water Absorption, ISO 62, %:		
2 hours in boiling water		≤2
Extractable Ionic Content, µg/g:		
Chloride		<10
Sodium		<10
Potassium		<10
Elongation, at break, ISO 527, %		1 to 4
Tensile Strength, ISO 527	N/mm²	25
	(psi)	(3,625)
Tensile Modulus, ISO 527	N/mm²	1.4
	(psi)	(200)

Electrical Properties:

Dielectric Constant / Dissipation Factor, IEC 60250:	
0.1 MHz	3.3 / 0.022
1 MHz	3.2 / 0.028
10 MHz	3.1 / 0.037
Volume Resistivity, IEC 60093, Ω·cm	100×10^{12}
Dielectric Breakdown Strength, , kV/mm	31.5

TYPICAL PERFORMANCE OF CURED MATERIAL

Cured for 30 minutes @ 165 °C, tested @ 22 °C

Adhesive Properties

Lap Shear Strength, ISO 4587:		
Epoxyglass:		
0.127 mm gap	N/mm²	≥10.5[LMS]
	(psi)	(≥1,520)

GENERAL INFORMATION

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

Handling Information

1. **Receiving Frozen Shipments**

   All shipping boxes are packed with dry ice to maintain temperature below -40 °C during transit.

   Due to the extremely low temperature of dry ice, appropriate care and precautions must be taken during handling operations; thermally insulated gloves should be worn

2. **Thawing**

   To prevent introduction of air voids due to thermal shock, a new delivery of material must be maintained at -40 °C for a minimum period of eight hours before further handling. Following this "warming" period, product can be removed from the freezer and allowed to stand at room temperature (22±2 °C) for one hour: cartridges or syringes can then be removed from inner packages and allowed to equilibrate in tip-down orientation at room temperature (22±2 °C) for 1 to 2 hours before use (actual time required will vary with package size / volume).

   Do not loosen container lids, caps or covers until equilibration is complete. Heat must never be used as partial polymerization (curing) could occur.

Directions for use

Load product into dispensing equipment. A variety of application equipment types are suitable and include: hand dispense / time pressure valve; auger style valve; linear piston pump and jet valve. Selection of equipment should be determined by application requirements - for advice on equipment selection and process optimization, users should contact their Technical Service Center.

1. Ensure that air is not introduced to product during equipment set-up.
2. For best results, the substrate should be pre-heated (typically to 90 to 100 °C for about 20 seconds) to allow fast capillary flow and facilitate leveling. The dispense nozzle may also be pre-heated (30 to 50 °C maximum) to further increase capillary flow.
3. Dispense product at moderate speed (2.5 to 12.7 mm/s). Ensure that needle tip is about 0.025 to 0.076 mm from substrate surface and from chip edge - this will ensure optimal flow conditions for the Underfill.
4. The dispense pattern is typically "I" along one side or "L" pattern along two sides, focused at the corner. Application should start at the location furthest away from the chip center - this helps ensure a void free fill underneath the die. Each leg of the "L" or "I" pattern should not exceed 80 % of the length of each die edge being dispensed.
5. In some cases second or third application of product may be necessary.

Rework Process

1. Once testing determines that a component is defective, a simple rework procedure is used to replace the defective part. Simply heat the package and underfill to standard rework temperatures to easily remove the defective component from the printed circuit board.
2. An uncomplicated cleanup procedure requiring no solvents or acids prepares the site for a replacement device - gentle high speed brushing eliminates any residue remaining after the defective device is removed. Examination of the boards by IR verifies the cleanup.
3. Thermal cycling tests conducted on the second device confirm that this rework process does not significantly diminish the thermal cycling performance of the replaced device. Thorough testing is always recommended.

Do Not return product to refrigerated storage; any surplus product should be discarded

Loctite Material Specification[LMS]

LMS dated April 10, 2002. Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Quality.

Storage

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

Product shall be ideally stored at ≤-40 °C. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Note

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