

LOCTITE 3517

March 2016

PRODUCT DESCRIPTION

LOCTITE 3517 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 (FBGA) or BGA
Dispense Method	Syringe
Key Substrates	SMD components to PCB
Reworkable	Yes

LOCTITE 3517 is a one part, heat curable epoxy. It is designed for use as a reworkable CSP(FBGA) or BGA underfill for protection of solder joint against mechanical stress when used for hand held electronics devices.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Specific Gravity @ 25 °C	1.13
Viscosity, Cone & Plate, mPa·s (cP), Temperature: 25 °C, Shear Rate: 36 s ⁻¹ :	2,000 to 4,500 ^{LMS}
Flow time @ 25 °C, glass to glass, 12.7 mm flow, :	
0.1 mm gap	10 min 20 s
0.15 mm gap	8 min 30 s
Flow time @ 50 °C, glass to glass, 12.7 mm flow, :	
0.1 mm gap	2 min 20 s
0.15 mm gap	2 min
Pot life @ 22 °C, days	7
Shelf Life @ 2 to 8°C, days	365
Flash Point - See SDS	

Recommended Curing Conditions

5 minutes @ 120 °C

10 minutes @ 100 °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.

Isothermal DSC Conversion

30 minutes @ 100 °C, % ≥90^{LMS}

TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 60 minutes @ 100 °C

Physical Properties

Shore Hardness, ISO 868, Durometer D	88
Glass Transition Temperature, °C: (T _g) by DMTA	≥85 ^{LMS}
Coefficient of Thermal Expansion, ISO 11359-2, K ⁻¹ :	
Pre T _g (Alpha 1)	60×10 ⁻⁶
Post T _g (Alpha 2)	200×10 ⁻⁶
Density @ 23 °C, g/cm ³	1.16
Shrinkage, %	2.7
Water Absorption, ISO 62, %:	
24 hours in water @ 25 °C	0.21
Flexural strength , at break, ASTM D790	N/mm ² 120 (psi) (17,400)
Flexural Modulus , ASTM D790	N/mm ² 3,500 (psi) (507,630)

Electrical Properties

Dielectric Constant / Dissipation Factor, IEC 60250:	
100 kHz	3.13 / 0.01
1 MHz	3.1 / 0.01
10 MHz	3.06 / 0.02
Volume Resistivity, IEC 60093, Ω·cm	88×10 ¹⁵
Surface Resistivity, IEC 60093, Ω	25×10 ¹⁵
Surface Insulation Resistance, Ω:	
IPC TM 650 2.6.3.1:	
Test Board: IPC-B-25A, comb pattern D:	
Initial	42×10 ¹²
Aged for 500 hours @ 85 °C, 85 % RH	1.4×10 ¹²
Aged for 1,000 hours @ 85 °C, 85 % RH	1.7×10 ¹²
5 DCV loaded	

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 60 minutes @ 100 °C

Lap Shear Strength, ISO 4587:	
Epoxyglass	N/mm ² ≥10 ^{LMS} (psi) (≥1,450)

GENERAL INFORMATION

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

Handling Information

- Receiving Cold Shipments**
 - All shipping boxes are packed with cold gel packs to maintain temperature below 8 °C during transit.
- Temperature Equilibration**
 - A new package of material can be brought to ambient conditions by allowing to stand at room temperature (

22±2 °C) for 1 to 2 hours (actual time required will vary with package size / volume).

- Do not loosen container lids, caps or covers: syringe packs must be allowed to equilibrate in tip down orientation. 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.

- Ensure that air is not introduced to product during equipment set-up.
- For best results, the substrate should be preheated (typically to 40 °C for about 20 seconds) to allow fast capillary flow and facilitate leveling.
- 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.
- 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.
- In some cases second or third application of product may be necessary.

For Rework

1. Removal of CSP from PCB

- Any instrument capable of melting solder is suitable for removing the CSP in this step.
- When a sufficiently high temperature has been reached, touch the fillet of underfill around the CSP using a scraper to see if it is softened. If the fillet is soft enough, remove the fillet.
- When bondline reaches temperature above melting point of solder, indicated by molten solder blowing out between CSP & PCB, remove the CSP from the PCB with a scraper.

2. Removing Underfill Residue from PCB

- After removing the CSP, scrape away underfill and solder residues on the surface of the PCB using the Soldering Iron.
- Typically recommendation of iron top temperature is 250 to 300 °C (setting temperature). Scraping of residue should be carefully executed to avoid damaging resist and pads on PCB.

3. Clean Up

- Wipe the surface using a cotton swab soaked with a suitable solvent (e.g. LOCTITE® 7360™ or acetone). Repeat this step with a clean dry cotton swab.

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

Loctite Material Specification^{LMS}

LMS dated May 12, 2004. 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.

Optimal Storage: 2 °C to 8 °C. Storage below 2 °C or greater than 8 °C can adversely affect product properties. 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.

Conversions

(°C x 1.8) + 32 = °F
 kV/mm x 25.4 = V/mil
 mm / 25.4 = inches
 µm / 25.4 = mil
 N x 0.225 = lb
 N/mm x 5.71 = lb/in
 N/mm² x 145 = psi
 MPa x 145 = psi
 N·m x 8.851 = lb·in
 N·m x 0.738 = lb·ft
 N·mm x 0.142 = oz·in
 mPa·s = cP

Note:

The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. The product can have a variety of different applications as well as differing application and working conditions in your environment that are beyond our control. Henkel is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product.

Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded, except if otherwise explicitly agreed and except in relation to death or personal injury caused by our negligence and any liability under any applicable mandatory product liability law.

In case products are delivered by Henkel Belgium NV, Henkel Electronic Materials NV, Henkel Nederland BV, Henkel Technologies France SAS and Henkel France SA please additionally note the following:

In case Henkel would be nevertheless held liable, on whatever legal ground, Henkel's liability will in no event exceed the amount of the concerned delivery.

In case products are delivered by Henkel Colombiana, S.A.S. the following disclaimer is applicable:

The information provided in this Technical Data Sheet (TDS) including the recommendations for use and application of the product are based on our knowledge and experience of the product as at the date of this TDS. Henkel is, therefore, not liable for the suitability of our product for the production processes and conditions in respect of which you use them, as well as the intended applications and results. We strongly recommend that you carry out your own prior trials to confirm such suitability of our product.

Any liability in respect of the information in the Technical Data Sheet or any other written or oral recommendation(s) regarding the concerned product is excluded, except if otherwise explicitly agreed and except in relation to death or personal injury caused by our negligence and any liability under any applicable mandatory product liability law.

In case products are delivered by Henkel Corporation, Resin Technology Group, Inc., or Henkel Canada Corporation, the following disclaimer is applicable:

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, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel 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 Henkel Corporation patents that 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.

Trademark usage: [Except as otherwise noted] All trademarks in this document are trademarks and/or registered trademarks of Henkel and its affiliates in the U.S. and elsewhere.

Reference 1.2