LOCTITE® 3518™

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PRODUCT DESCRIPTION

LOCTITE® 3518™ provides the following product characteristics:

Technology	Epoxy
Chemical Type	Epoxy
Appearance	Black liquid[LMS]
Components	One component - requires no mixing
Cure	Heat cure
Cure Benefit	Production - high speed curing
Application	Underfill for flip chip devices
Dispense Method	Syringe
Key Substrates	SMD components to PCB
Reworkable	No

LOCTITE® 3518™ is a one part, heat curable epoxy. It is designed as non-reworkable CSP/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	1.54
Viscosity, Cone & Plate, mPa·s (cP):	
Temperature: 25 °C, Shear Rate: 36 s^{-1}	2,300 to 5,500[LMS]
Flow time @ 25 °C, glass to glass, 12.7 mm flow, :	
0.1 mm gap	5 min 40 s
0.15 mm gap	3 min 40 s
Flow time @ 50 °C, glass to glass, 12.7 mm flow, :	
0.1 mm gap	1 min 15 s
0.15 mm gap	50 s
Filler Content, %	55
Pot life @ 22 °C, days	2
Flash Point - See MSDS	

Recommended Curing Conditions

15 minutes @ 120 °C bondline temperature
30 minutes @ 100 °C bondline temperature

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.

TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 1 hour @ 100 °C

Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K^{-1}	≤40×10^{-6} [LMS]
Glass Transition Temperature, °C:	
(Tg) by TMA , ISO 11359-2	≥55[LMS]
Degree of Conversion by DSC, %:	
30 minutes @ 100 °C	≥80[LMS]
Density @ 23 °C, g/cm³	1.58
Shrinkage, %	2.3
Shore Hardness, ISO 868, Durometer D	91
Water Absorption, ISO 62, %:	
24 hours in water @ 25 °C	0.18
Flexural strength , at break, ASTM D790	N/mm² (psi) 99 (14,000)
Flexural Modulus , ASTM D790	N/mm² (psi) 8,100 (1,200,000)

Electrical Properties:

Volume Resistivity, IEC 60093, Ω·cm	130×10^{15}
Surface Resistivity, IEC 60093, Ω	17×10^{15}
Dielectric Breakdown Strength, IEC 60243-1, kV/mm	18
Dielectric Constant / Dissipation Factor, IEC 60250:	
100 kHz	3.59 / 0.008
1 MHz	3.54 / 0.012
10 MHz	3.5 / 0.019
Surface Insulation Resistance, Ω:	
IPC TM 650 2.6.3.1:	
Test Board: IPC-B-25A, comb pattern D:	
Initial	150×10^{12}
Aged for 500 hours @ 85 °C, 85 % RH	2.9×10^{12}
Aged for 1,000 hours @ 85 °C, 85 % RH	3.0×10^{12}
5 DCV loaded	

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 60 minutes @ 100 °C
Lap Shear Strength, ISO 4587:

Epoxyglass	N/mm² (psi)	≥3[LMS] (≥435)
Mild steel (grit blasted)	N/mm² (psi)	19 (2,800)

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 -15 °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. (At this stage, product can be transferred to a -15 °C freezer for storage if not required immediately for use). 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 preheated (typically to 40 °C for about 20 seconds) to allow fast capillary flow and facilitate leveling.
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.

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

Loctite Material Specification[LMS]

LMS dated January 23, 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.

Product shall be ideally stored at ≤-15 °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.

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

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Reference 2.0