

# LOCTITE 3616

January 2014

## PRODUCT DESCRIPTION

LOCTITE 3616 provides the following product characteristics:

<b>Technology</b>	Epoxy
<b>Chemical Type</b>	Epoxy
<b>Appearance (uncured)</b>	Red viscous paste <sup>LMS</sup>
<b>Components</b>	One component - requires no mixing
<b>Cure</b>	Heat cure
<b>Application</b>	Surface mount adhesive
<b>Key Substrates</b>	SMD components to PCB
<b>Other Application Areas</b>	Small parts bonding
<b>Dispense Method</b>	Stencil print
<b>Wet Strength</b>	High

LOCTITE 3616 is designed for the bonding of surface mounted devices to printed circuit boards prior to wave soldering. Particularly suited to printing a range of dot heights with one stencil thickness and where high wet strength characteristics, and high print speeds are required.

## TYPICAL PROPERTIES OF UNCURED MATERIAL

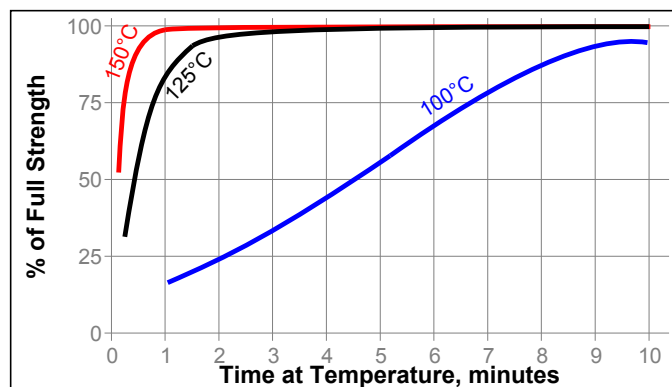
Specific Gravity @ 25 °C	1.33
Yield Point, 25 °C, Pa	250 to 650 <sup>LMS</sup>
Cone & Plate Rheometer:	
Haake PK 100, M10/PK 1 2° Cone	
Casson Viscosity @ 25 °C, Pa·s	15 to 55
Cone & Plate Rheometer:	
Haake PK 100, M10/PK 1 2° Cone	
Flash Point - See SDS	

## TYPICAL CURING PERFORMANCE

Recommended conditions for curing are exposure to heat above 100 °C (typically 90-120 seconds @ 150 °C). Rate of cure and final strength will depend on the residence time at the cure temperature.

## Cure Speed vs. Time, Temperature

The following graph shows the rate of torque strength developed with time at different temperatures. These times are defined from the moment the adhesive reaches cure temperature. In practice, total oven time may be longer to allow for heat up period. Strength is measured on 1206 capacitors @ 22 °C, tested according to IPC SM817, TM-650 Method 2.4.42.



## Isothermal DSC Conversion

5 minutes @ 125 °C, %

95 to 100<sup>LMS</sup>

## TYPICAL PROPERTIES OF CURED MATERIAL

Cured for 30 minutes @ 150 °C

### Physical Properties:

Coefficient of Thermal Expansion, ISO 11359-2, K <sup>-1</sup>	86×10 <sup>-6</sup>
Coefficient of Thermal Conductivity, ISO 8302, W/(m·K)	0.2
Specific Heat, kJ/(kg·K)	0.3
Density, BS 5350-B1 @ 25 °C, g/cm <sup>3</sup>	1.3
Glass Transition Temperature ISO 11359-2, °C	140

### Electrical Properties:

Dielectric Constant / Dissipation Factor, IEC 60250:	
1 kHz	2.8 / 0.003
10 kHz	2.8 / 0.012
1,000 kHz	2.7 / 0.014
10,000 kHz	2.7 / 0.017
Dielectric Breakdown Strength, IEC 60243-1, kV/mm	33.5
Volume Resistivity, IEC 60093, Ω·cm	4.6×10 <sup>15</sup>
Surface Resistivity, IEC 60093, Ω	28×10 <sup>15</sup>
Surface Insulation Resistance, Ω:	
SN 59651	0.245×10 <sup>12</sup>
Electrolytic Corrosion, DIN 53489	A - 1.2

## TYPICAL PERFORMANCE OF CURED MATERIAL

### Adhesive Properties

Cured for 30 minutes @ 150 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm <sup>2</sup> ≥15 <sup>LMS</sup>
	(psi) (≥2,175)

Cured for 5 minutes @ 125 °C

Pull-off Strength, Siemens norm SN59651:

C-1206 on bare FR4 board	N	46
	(lb)	(10.3)

Torque Strength, IPC SM817, TM-650 Method 2.4.42:

C-1206 on bare FR4 board	N·mm	54
	(in.oz)	(7.6)

Cured for 3 minutes @ 150 °C

Push-off Strength:

C-1206 on bare FR4 board	N	≥30 <sup>LMS</sup>
	(lb)	(≥6.7)

Bond strength achieved in practice will vary considerably depending on the SMD component type, adhesive dot size and the type, grade and degree of cure of the solder mask/resist.

### TYPICAL ENVIRONMENTAL RESISTANCE

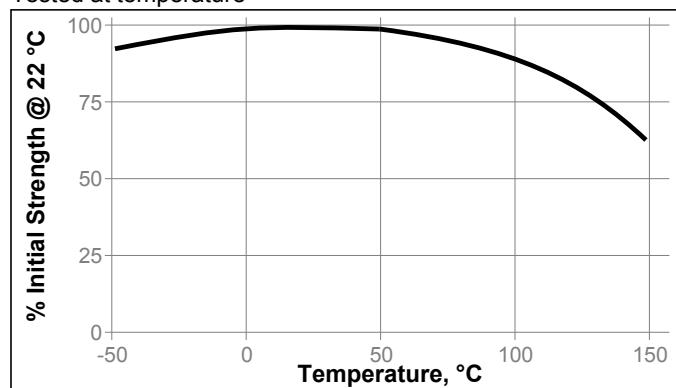
Cured for 30 minutes @ 150 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)

### Hot Strength

Tested at temperature



### Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

Environment	°C	% of initial strength		
		100 h	500 h	1000 h
Air	22	100	85	85
98% RH	40	90	80	80

### Resistance to Hot Solder Dip

Cured for 90 seconds @ 150 °C

Hot Solder Dip, IPC SM817, TM-650 Method 2.4.42.1, Pass/Fail:

R-1206 on bare FR4 board:

Supported 60 seconds above solder bath @ 260°C and dipped for 10 seconds Pass

### GENERAL INFORMATION

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

### Directions for use:

1. LOCTITE 3616 is suitable for all common open squeegee and

enclosed head stencil printing systems, such as ProFlow®, PumpPrint®, Varidot™. Loctite stencil print Chipbonders are suitable for print speeds of 20 mm/s up to 150 mm/s - this will vary with product selected and printer set-up.

2. After storage in a refrigerator the adhesive must be allowed to equilibrate to room temperature before use, typically 2 to 4 hours.
3. Printing conditions should be about 25°C, and RH less than 70 % for optimum results. Higher temperatures will decrease the viscosity and will effect the printing results. Higher humidity conditions may lead to moisture pick up and will reduce the "on stencil" life of the product: At 25°C, 55 % RH, the product will remain dispensable on the stencil for a maximum of 5 days of continuous operation. The quality of the print results will depend on board support, print gap, print speed, print pressure and separation speed.
4. Typical starting parameters (steel stencil/ steel squeegee/ single stroke mode\*):

Print Speed	60 mm/s
Squeegee Pressure	3 to 4 N/cm (just enough to clean the stencil)
Separation Speed	0.1 to 3 mm/s
Gap between Stencil and PCB	On contact

\*For higher dots Print and Flood Mode can be used. Set up pressure for front squeegee as described above. For flood printing, rear squeegee pressure should be set to 0 kg to leave a sufficient adhesive layer (1 to 2 mm) on the stencil. These parameters will vary depending on type of printing process and should be optimized accordingly.

5. Uncured adhesive should only be cleaned from the board with isopropanol, MEK or ester blends such as LOCTITE® 7360™. Alcohols (e.g. Isopropanol) can cure the adhesive and may lead to blocked apertures if left on the stencil for over 5 minutes. Automatic under-stencil-wipe is not recommended.
6. Cured adhesive can only be removed mechanically with the aid of heat.

### Loctite Material Specification<sup>LMS</sup>

LMS dated January 14, 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.

**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

$(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$   
 $\text{kV/mm} \times 25.4 = \text{V/mil}$   
 $\text{mm} / 25.4 = \text{inches}$   
 $\mu\text{m} / 25.4 = \text{mil}$   
 $\text{N} \times 0.225 = \text{lb}$   
 $\text{N/mm} \times 5.71 = \text{lb/in}$   
 $\text{N/mm}^2 \times 145 = \text{psi}$   
 $\text{MPa} \times 145 = \text{psi}$   
 $\text{N}\cdot\text{m} \times 8.851 = \text{lb}\cdot\text{in}$   
 $\text{N}\cdot\text{m} \times 0.738 = \text{lb}\cdot\text{ft}$   
 $\text{N}\cdot\text{mm} \times 0.142 = \text{oz}\cdot\text{in}$   
 $\text{mPa}\cdot\text{s} = \text{cP}$

**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.

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