LOCTITE

Technical Data Sheet

LOCTITE ABLESTIK QMI2569

September 2018

PRODUCT DESCRIPTION

LOCTITE ABLESTIK QMI2569 provides the following product characteristics:

Technology	Silver Glass
Appearance	Silver paste
Cure	Firing
Product Benefits	• Void-free bondline • Maximum thermal dissipation
Application	Semiconductor, Conductive adhesive
Typical Package Application	• Hermetic packages

LOCTITE ABLESTIK QMI2569 is a silver glass die attach adhesive used for attachment of integrated circuits in both solder seal glass seal hermetic packages. The material allows for simultaneous processing of die attach and leadframe embedding, while producing a void-free bondline for maximum thermal dissipation. Excellent RGA moisture results are acquired through the use of lead borate glass.

The LOCTITE ABLESTIK QMI2569 also offers improved processability by allowing in-line drying during the firing process on die as large as 0.800" x 0.800". Either multi-needle or starfish can be used to apply the material.

LOCTITE ABLESTIK QMI2569 can only be used in hermetic packaging applications.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Viscosity @ 25 °C, mPa·s (cP):	
Speed 10 rpm	35,800
Thixotropic Index (1/20 rpm)	8.0
Percent Silver, by weight in fired film, %	70
Metal to Glass Ratio, by weight in fired film	4:1
Shelf Life @ 25 °C, days	365

RECOMMENDED FIRING PROFILE

The firing process for Ag-glass involves the vehicle removal and sintering of the silver-glass composite into a dense, fired film. These steps are conveniently accomplished in a multi-zone belt furnace with an oxidizing atmosphere (clean dry air). Optimal temperature ramp rates for solvent removal during organic burnout and densification during sintering of the solids can be obtained through proper temperature programming of each zone and belt speed.

The following data presents target ramp rates for temperature ranges between 40 to 280° C and for die sizes between 5x5 to 20x20 mm. For rectangular die, the largest dimension is typically used to determine the range, and recommended ramp rates decrease as die sizes increase. Ramp rates become significantly faster as the devices progress on the belt to sequentially higher temperature zones in the furnace. Small die can be ran on a large die profile. For example, some customers fire 5 mm die with the 15 mm die profile. Ramp rate is not critical for temperature above 280°C.

Maximum Ramp Rates (ºC/minute):

≤ 5 x 5 mm die size:	
@ 40 to 120 °C	<30
@ 120 to 200 °C	<40
@ 200 to 280 °C	<65
≤ 7 x 7 mm die size:	
@ 40 to 120 °C	<20
@ 120 to 200 °C	<36
@ 200 to 280 °C	<60
≤ 10 x 10 mm die size:	
@ 40 to 120 °C	<16
@ 120 to 200 °C	<33
@ 200 to 280 °C	<55
≤ 12 x 12 mm die size:	
@ 40 to 120 °C	<12
@ 120 to 200 °C	<26
@ 200 to 280 °C	<40
≤ 15 x 15 mm die size:	
@ 40 to 120 °C	<9
@ 120 to 200 °C	<20
@ 200 to 280 °C	<28
≤ 17 x 17 mm die size:	
@ 40 to 120 °C	<7
@ 120 to 200 °C	<16
@ 200 to 280 °C	<24
≤ 20 x 20 mm die size:	
@ 40 to 120 °C	<4
@ 120 to 200 °C	<10
@ 200 to 280 °C	<18

Minimum Dwell Time

≤ 7 x 7 mm die size	7 minutes @ >380°C
> 7 x 7 to 15 x 15 mm die size	8 minutes @ >390°C
> 15 x 15 mm die size	9 minutes @ >390°C

The uppermost temperature of the furnace profile is an isothermal zone designated as the “dwell temperature.” This temperature varies from 380 to 440°C depending on the die size and package type used. The length of the “dwell” zone varies with die size and “dwell temperature.”

Following die attach, devices may be placed directly into the belt furnace and fired. This sequence is suitable for high volume, continuous assembly operations. The result will be a cost effective and highly reliable fired film.

The versatile QMI pastes also allows parts to be staged for up to eight hours under ambient conditions or to be dried at 45 to 60°C. Drying time is dependent on die size. The negative aspects of pre-drying are increased production costs and a possible decrease in process reproducibility. Both staging and

drying result in the removal of varying quantities of solvent prior to firing. Therefore, ramp rates may be increased. For specific recommendations regarding staging, drying or ramp rates contact your LOCTITE Technical Service Representative.

QMI pastes form fired films that give high adhesive strengths to both ceramic and gold plated ceramic packages. Bare backed die are preferred for optimum adhesion. QMI tests show that many Au backed die achieve adhesion strengths as high as bare backed die at these temperatures, but Au backing processes vary and in some cases inferior adhesion results are obtained.

TYPICAL PROPERTIES OF CURED MATERIAL

Physical Properties

Glass Transition Temperature (Tg), °C		250
Coefficient of Thermal Expansion, TMA, ppm/°C:		
alpha 1		16
DMA Modulus:		
@ 25°C	GPa	15.1
	(N/mm²)	(15,100)
	(psi)	(2.19×10^{06})
Thermal Conductivity, W/(m-K)		>60
Extractable Ionic Content, :		
Sodium (Na+)		≤20
Potassium (K+)		≤20
Chloride (Cl-)		≤10
Fluoride (F-)		≤10
Package cavity headspace moisture concentration, Residual Glass Analysis (RGA), ppm H2O		<2,000

Electrical Properties

Volume Resistivity, µΩ-cm	≤15

TYPICAL PERFORMANCE OF CURED MATERIAL

Miscellaneous

Tensile Adhesion:	
500 mil X 500 mil die at 25°C:	
Si die to Au plated ceramic, lbs-f	>100

GENERAL INFORMATION

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

DIRECTIONS FOR USE

The rheology of QMI pastes provides for excellent dispensability through single, multi-needle or starfish heads.

- High viscosity at low shear prevents dripping, die movement or sinking after placement.
- Thixotropic index greater than 7 prevents excessive fillet spread which can crack or reach the side walls of the package.
- Low viscosity at shear to reduce tailing and yield the best pattern definition.

Although the dispense pattern depends on the aspect ratio of the die, some general rules should be followed. The material should be dispensed onto the substrate so that the central region of the dispense pattern is thicker than the periphery. This condition allows the material to flow outward during the die placement without entrapment of air under the die (round voids).

Following die placement, a bead or “fillet” should be observable along the entire perimeter of the die. Corner coverage is important to assure that spurious bending stresses are not imparted to the device upon cool down from the firing temperature. Yhe “fillet” should be made as large as possible within the geometric constraints of the package cavity since the outer surface of the paste acts as an evaporative site for the vehicle system which must be removed during organic burnout.

The wet bond line thickness obtained following die placement is an important factor in determining the overall integrity of the die attach. Table 1 presents wet bond line guidelines for die sizes ranging between 5x5 to 20x20 mm. For each range, the resulting fired bond line is given in column 3. Note that these thicknesses increase, as the die size becomes larger.

Observance of these guidelines will result in minimal stress transfer from the substrate to the die. The target-wet bond line should be held within plus or minus 0.025 mm. Bond lines that are too thin, results in both voiding and poor adhesion to the die. Bond lines that exceed the recommended guideline will require a slower ramp rate during organic burnout to remove the increased amount of organics. Failure to make this adjustment may result in sub-optimum adhesion and voiding, or both.

Reproducibility can enhanced through the use of QMI pastes that contain spacers. These spacers can be obtained in a range of sizes depending on the customer’s needs. Spacers assure precise bond line control and planarity of the die after firing. Since the spacers collapse during firing, they in no way change the properties of the fired film.

Minimum Recommended Bondline Thickness

Die Size (mm)	Target & Wet Bond line (um)	Approx Fired* Bond line (um)	Approx wt. of Wet Paste (mg)
5 x 5	88.9	71	30
7 x 7	102	81	50
10 x 10	114	91	85
12 x 12	127	102	130
15 x 15	152	122	200
17 x 17	178	135	300
20 x 20	203	163	425

*This is an approximate number. Depending on the starting solids content, approximately 25% shrinkage can be expected from solvent removal and sintering.

Data Ranges

The data contained herein may be reported as a typical value and/or range values based on actual test data and are verified on a periodic basis.

Storage

LOCTITE ABLESTIK QMI2569is supplied in sealed containers and should be stored on jar rollers (1 to 4 rpm) at temperatures between 15 to 28°C. (Upon receipt, the paste must be immediately placed on a jar roller and continuously rolled for a minimum of 16 hours before opening of the jar).

Conversions

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

mPa·s = cP

Disclaimer

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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