KM1612HK-JS Series

HIGH THERMAL CONDUCTIVITY SILVER EPOXY ADHESIVES KM1612HK-JS

PRODUCT DATA SHEET

I. DESCRIPTION

The KM1612HK-JS products are silver-loaded epoxy adhesives with high thermal and electrical conductivity. A unique, patented organic system enables high filler loading of Ag powder/flake combinations. This technology provides a highly conductive polymer matrix when cured, which yields excellent thermal transfer properties. Unlike typical epoxy systems, all KM1612HK-JS products can be shipped and stored at room temperature. All KM1612HK-JS products are lead (Pb) free and RoHS compliant.

The various family members have properties optimized specifically for different applications. With a k higher than most solders, KM1612HK-JS can replace metallic solder die attach.

II.KEY FEATURES

Unmatched thermal conductivity – 30 W/m°K
Replaces solder – eliminates Pb metal and plating requirements
Electrical resistivity as low as4Ω*cm
Slow drying – long staging time and stable viscosity
Excellent rheology for dispensing and screen printing
Minimal bleed-out
Room temperature shipping and storage in jars – no dry ice necessary

BI. APPLICATIONS

KM1612HK-JS Ag/epoxy adhesives are designed for attaching devices in high power density applications such as:

- Power semiconductors
- Laser diodes
- Power LEDs
- Power hybrids
- RF power devices
- GaAs devices
- MMICs
- Solder replacement

IV. TYPICAL PROPERTIES

Parameter	KM1612HK-JS	Unit	Note / Condition
PASTE PROPERTIES (before curing)			
Viscosity	30,000	cP	25 °C, 10 rpm, Brookfield RVT viscometer, T spindle
Thixotropic index	2.2	--	10/50 rpm, 25 °C
Shelf life	6	months	-15 °C
	12	months	-40 °C
Silver content	76	%	By weight
Total solids content	82	%	By weight
Density	5.3	g/cc	
CURED PROPERTIES (after 110°C, 60 minute pre-bake and 200°C, 30 minute cure)			
Thermal conductivity	30	W/m°K	
Electrical resistivity	4	μΩ-cm	
Adhesion	4500	PSI	250-mil silicon die shear, bare ceramic
Thermal expansion	29	ppm/°C	
Flexural modulus	720,000	PSI	
Ionic impurities	<15	ppm	Total of Cl-, F-, K+, and Na+
Silver content	82	%	By weight
Density	6.5	g/cc	

V. PACKAGING, STORAGE AND HANDLING

These materials are available in jars or syringes (see Ordering Information, below).

Jars are shipped without dry ice. Cold storage is not recommended. Storage on a jar roller, such as the Kmarked model 8010, at 1 to 5 rpm at room temperature is recommended. Failure to roll the jars adequately could result in non-homogeneity and inconsistent dispensing. If not jar-rolled, gentle and complete stirring with a square-bladed metal spatula (such as the Fisher Scientific 14-375-20) is recommended before use. If any material remains in the jar after use, return the jar to the jar roller or stir again before next use. If the paste is homogeneous (no solvent on top or thick solid felt in bottom of the jar), it can be poured into a syringe and used immediately. Please refer to the document “Manual Filling of Syringes”.

Syringes are packed in dry ice and shipped at –40°C to prevent separation of ingredients. For more information, please refer to the document “Syringe-Packaged Adhesive Pastes”.

VI. PROCESSING GUIDELINES

Application

The KM1612HK-JS rheology has been designed for use in automated high-speed dispensing equipment with minimal or no tailing or dripping. The KM1612HK-JS should be uniform and essentially free of air bubbles prior to use.

A 22 gage needle (16 mil or 0.41 mm ID) is recommended to dispense the KM1612HK-JS products. Needles smaller than 25 gage (10 mil or 0.25 mm ID) may not produce uniform dispense weights. The material should be dispensed in an “X” pattern with sufficient quantity to produce fillets halfway up the side of the attached component. Deposition weights will vary according to component size. Typical dispense quantities are 75 µL per square inch of die area (12 µL per square cm of die area).

The KM1612HK-JS products can also be screen printed. Squeegee pressure and speed will vary depending on the application. A 200 mesh screen (1.6 mil wire) with a 1 mil emulsion thickness is recommended. This will produce a deposition thickness of approximately 2-3 mils.

For all KM1612HK-JS types, components should be pressed into the material wet deposit with fillet formation around the perimeter. the wet bondline thickness should be in the range of 1.3 to 1.9 mils, The cured bondline should be 0.8 to 1.2 mils for all types.

Staging time (the time between component placement and start of cure or pre-bake) is not as critical as open time, but should also be limited. See Table 1, below.

Table 1: Maximum staging time for KM1612HK-JS (estimated; varies with ambient conditions)

Die length (shorter side)	KM1612HK-JS
<80 mils (2 mm)	30 minutes
250 mils (6 mm)	2 hours
>250 mils (6 mm)	3 hours

An exception to these guidelines is when the die is thin (less than 4 mils) *and* has gold-metallized bond pads. In this case, the resin can migrate from the bondline to the surface of the die, and staging time should be kept as short as possible.

Curing Profiles

The KM1612HK-JS family offers a range of curing temperatures to accommodate various process requirements. Higher temperatures allow shorter cure times as shown in Tables 3 and 4 below.

To cure KM1612HK-JS adhesives, simply place attached materials into a room temperature circulating oven and set your desired dwell temperature(s), time(s) and ramp rate(s). The oven or furnace must provide forced-air convection and ventilation (exhaust) to remove solvent and/or reaction byproducts and enable optimum curing.

Table 2 below shows that the standard curing profile “A” can be used with die size below 250 mils (6 mm) with all KM1612HK-JS types.

Table 2: Curing profile selection based on KM1612HK-JS type and die size

KM1612HK-JS	Die length on shorter side	
	0-250 mils	250-400 mils
	A	B

Figure 1: *Curing Profile "A": for die size up to 250 mils per side KM1612Hk-JS*

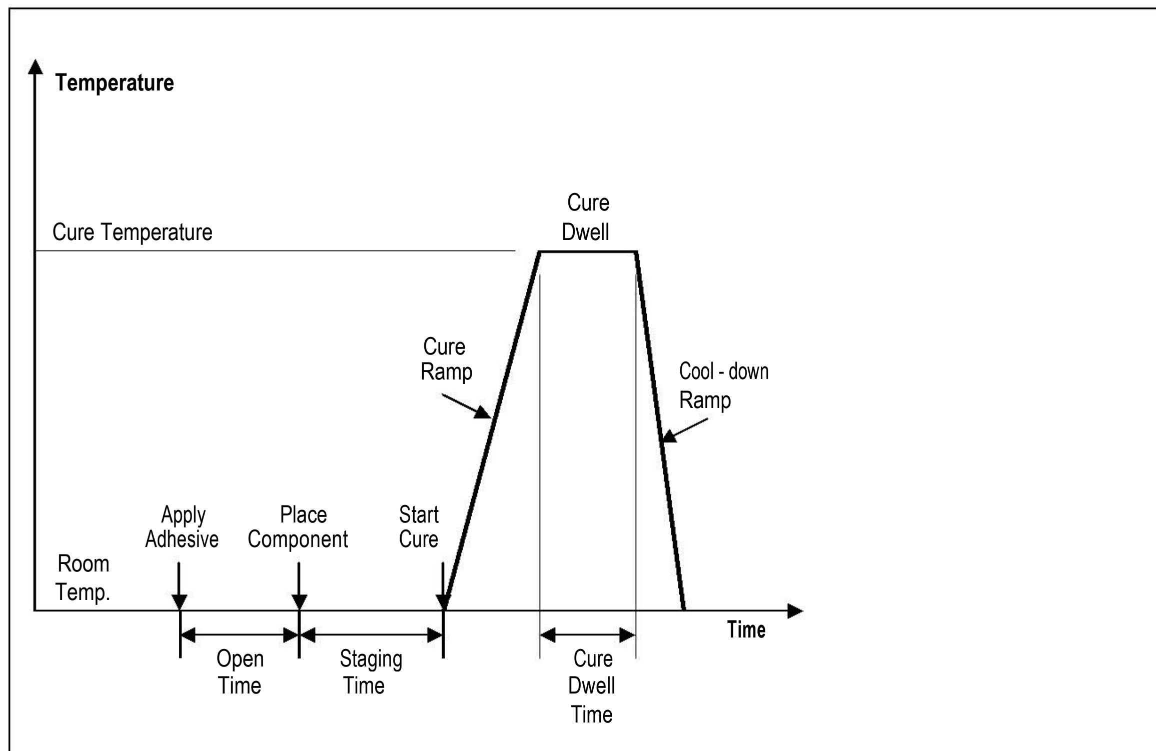

Table 3: *Parameters for Curing Profile "A"*

Ramp Rate	Cure Temp.	Dwell Time
5-10 °C / minute	175 °C	45 minutes
	200 °C	30 minutes
	225 °C	15 minutes
Note: Use only one cure temperature/time combination		

Figure 2: Curing Profile “B” with pre-bake step for die size from 250 to 400 mils per side (KM1612HK-JS)

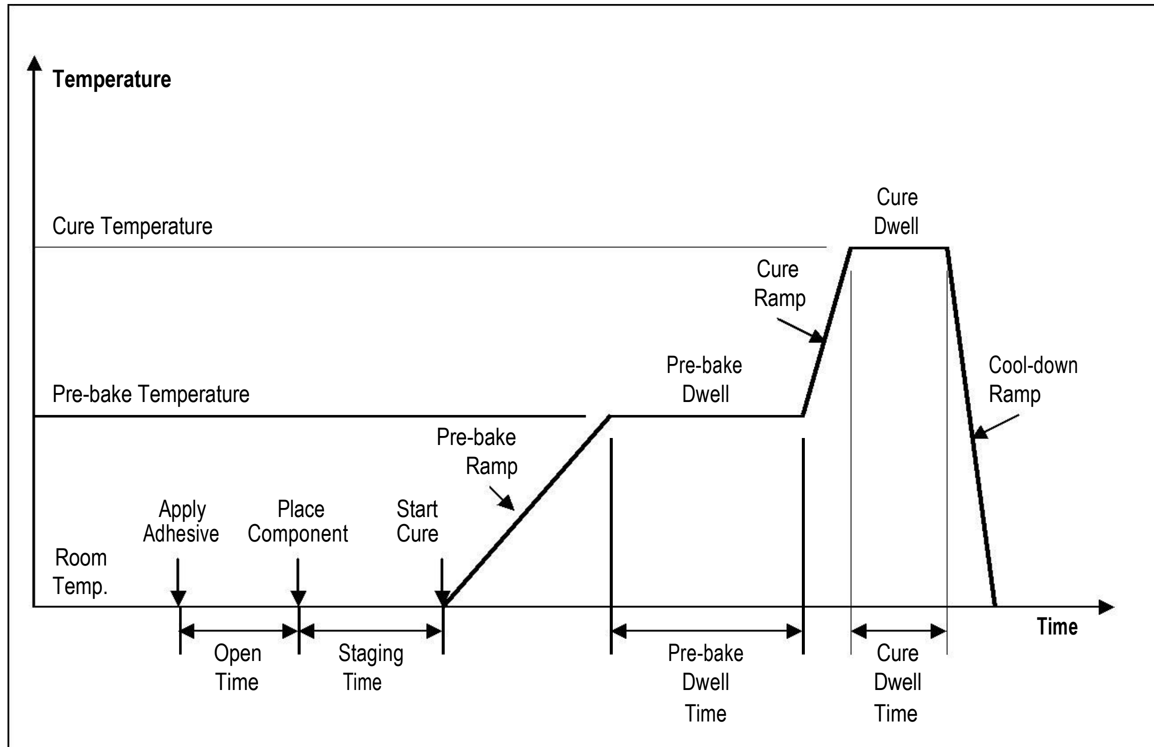

Table 4: Parameters for Curing Profile “B”

Pre-bake Ramp Rate	Pre-bake Temp.	Pre-bake Dwell Time	Cure Ramp Rate	Cure Temp.	Cure Dwell Time
5 – 10 °C/minute	100 °C	75 minutes	5 – 10 °C/minute	175 °C	45 minutes
	110 °C	60 minutes		200 °C	30 minutes
	125 °C	30 minutes		225 °C	15 minutes
Note: Use only one pre-bake temperature/time combination and one cure temperature/time combination					

Due to their relatively high flexural modulus, KM1612HK-JS types require special consideration for attaching components larger than 400 mils. Please consult Kmarked for recommendations. Note that for attaching large components, Kmarked offers a range of optimized adhesives.