Slow Cure Thermally Conductive Adhesive

RoHS Compliant

Description

This is a two-part, smooth, dark grey paste that cures to form a hard, durable polymer that is extremely thermally conductive, yet electrically insulating. It is it very viscous because it is highly filled with thermally conductive ceramic powders for maximum thermal conductivity. It bonds well to metals, ceramics, glass, and most plastics used in electronic assemblies.

It has a convenient 1-to-1 mix ratio and a 4 hour working life. The mixed adhesive can essentially act like a one-part adhesive for the duration of a work shift. Unlike one-part adhesives, it does not require high curing temperatures or frozen storage, and it has a very long shelf life.

This product comes packaged in separate 3 mL graduated syringes that can be accurately dispensed.

Applications and Usages

This product is designed to bond heat sinks, LED's, and other heat generating components in electronic assemblies. It is suitable for the manufacturing, repair, and hobbyist sectors. Use it when a thixotropic adhesive paste with maximum thermal conductivity and a very long working life is required. For automatic dispensing applications, use the slow cure thermally conductive adhesive, which has a lower viscosity at the cost of slightly lower thermal conductivity

Benefits and Features

- Thermal conductivity: 1.44W/(m·K)
- 1:1 mix ratio by volume
- Working life: 4 hours
- Cure time: 1 hour at 80°C or 96 hours at room temperature
- Good adhesive strength
- Strong resistance to water, brine, acids, bases, and aliphatic hydrocarbons
- Room temperature storage

Usage Parameters

Properties	Value
Working Life[a)]	4 hour
Full Cure @ 25°C (77°F)	96 hour
Full Cure @ 65°C (176°F)	1 hour

[a)] Working life at room temperature.

Temperature Ranges

Properties	Value
Constant Service Temperature	-65 to 165°C
	(-85 to 329°F)
Intermittent Temperature Limits [C)]	-70 to 200°C
	(-40 to 302°F)
Storage Temperature of Unmixed Parts	22 to 27°C
	(72 to 81°F)

[c)] The temperature extremes that can be withstood for a short period of times.

Properties of Cured MC002964

Physical Properties	Method	Value [a)]
Colour	Visual	Dark Grey
Density @22°C (71°F)	ASTM D 1475	2.17 g/mL
Hardness	Shore D durometer	62D
Tensile Strength	ASTM D 638	11.4 N/mm^2 (1 650 lb/in^2)
Young's Modulus	"	310 N/mm^2 (45 000 lb/in^2)

Physical Properties	Method	Value [a]
Elongation	"	7.0%
Compressive Strength	ASTM D 695	43 N/mm^2 (6 200 lb/in^2)
Lap Shear Strength (Aluminium 5052)	"	7.7 N/mm^2 [1 100 lb/in^2]
Water Absorption	ASTM D 570	0.23%
Outgassing (Total Mass Loss) @ 24 h	ASTM E 595	0.80%
Water Vapor Release (WVR)	"	0.13%
Collectable Volatile Condensable Material	"	0.07%
Electric Properties	**Method**	**Value**
Breakdown Voltage @ 3.967mm	ASTM D 149	26.3 kV
Dielectric Strength @ 3.967mm	"	6.6 kV/mm (168 V/mil)
Breakdown Voltage @ 3.175mm (1/8")	Reference fit [b]	23.9 kV
Dielectric Strength @ 3.175mm (1/8")		7.5 kV/mm (165 V/mil)
Volume Resistivity	ASTM D 257	2 × 10^{13}Ω.cm
Dielectric Dissipation & Constant		dissipation, D, constant, k'
Dissipation & Constant @1 kHz	ASTM D 150-98	0.025 5.43
Insulating		Yes
Conductive		No
Thermal Properties	**Method**	**Value**
Thermal Conductivity @25°C (77 °F)	ASTM E 1461	1.44 W/(m.K)
@50°C (122 °F)	"	1.41 W/(m.K)
@100°C (212 °F)	"	1.27 W/(m.K)
Heat Deflection Temperature	ASTM D 648	30°C (86°F)
Glass Transition Temperature (Tg)	ASTM D 3418	20°C (68°F)
CTE [c] Prior Tg	ASTM E 831	53 ppm/°C
CTE [c] After Tg	ASTM E 831	137 ppm/°C
Specific Heat @25°C (77 °F)		0.922 J/(g·K)

Note: Specifications are for epoxy samples that were cured at 23°C for 75 minutes. Samples were conditioned at 23°C and 50% RH prior to most tests.

[a] N/mm^2 = MPa; lb/in^2 = psi

[b] To allow comparison between products, the Tautscher equation was fitted to 3 experimental dielectric strengths and extrapolated to a standard reference thickness of 1/8″ (3.175 mm).

[C] Coefficient of Thermal Expansion (CTE) units are in ppm/°C = in/in/°C × 10^{-6} = unit/unit/°C × 10^{-6}

Properties of Uncured MC002964

Physical Property	Mixture (1A:1B)
Colour	Dark Grey
Density [a]	2.27 g/mL
Mix Ratio by Volume (A:B)	1:00:1.00
Mix Ratio by Weight (A:B)	0.95:1.00

Physical Property	Mixture (1A:1B)	
Solids Content (w/w)	100%	
Physical Property	**Part A**	**Part B**
Colour	Dark Grey	Medium Grey
Density	2.25 g/mL	2.28 g/mL
Flash Point	>149°C [300°F]	>148°C [298°F]

a) Calculated value based on measures densities of each part

Principal Components

Part A: Aluminum Oxide
Zinc Oxide
4.4'-Methylenebis[N,N-bis(2-oxiranylmethyl)aniline]
Epoxy Phenol Novalak Resin
Boron Nitride

Part B: Aluminum Oxide
Zinc Oxide
Fatty acids, C18-unsatd., dimer, polymers
Boron Nitride

Compatibility

Chemical - Once cured, the epoxy adhesive is inert under normal conditions. It will resist water and salt exposure. It is expected to resist short term exposures to fuels or similar non-polar organic solvents, but it is not suitable for prolonged exposures. Avoid use with strong acids, strong bases, or strong oxidizers.

Adhesion - As seen in the substrate adhesion table, the MC002964 epoxy adheres to many materials found on printed circuit assemblies; however, contaminants like water, oil, and greasy flux residues may affect adhesion. If contamination is present, clean the printed circuit assembly with electronic cleaner. For substrate substances with weak adhesion strengths, surface preparation such as sanding or precoating with a suitable primer may improve adhesion.

Substrate Adhesion in Decreasing Order

Physical Properties	Adhesion
Steel	Stronger
Aluminium	
Copper/Bronze	
Fiberglass	
Wood	
Paper, Fibre	
Glass	
Rubber	
Acrylic	
Polycarbonate	
Polypropylene a)	
PTFE a)	Weaker

a) Does not bond to polypropylene or PTFE

Storage

Store between 22 and 27°C (72 and 81°F) in dry area away from sunlight. Always recap firmly when not in use to maximize shelf life.

Application Instructions

Follow the procedure below for best results. For mixing quantities that are less than 1 mL in size or for stricter stoichiometry control, mix by weight ratio instead (requires a high precision balance). Heat cure is recommended to get the best possible conductivity.

To prepare 1:1 (A:B) epoxy mixture by volume

1. Remove cap or cover.
2. Measure one part by volume of A.
3. Measure one part by volume of B.
4. Thoroughly mix the parts together with a stir stick until homogeneous
5. Apply to with an appropriate sized stick for the application area.

NOTE: Remember to recap the syringe or container promptly after use.

TIP: Note that the material viscosity decreases with mixing, so stirring the material before use will ease application to the substrate.

To heat cure the MC002964 epoxy

Put in oven at 80°C (176°F) for 60 minutes.

TIP: Hair dryers are normally rated not to exceed 60°C, so they can generally be used to accelerate the cure.

ATTENTION: Keep the curing temperature well below temperature limit of heat sensitive components that may be present. As a guideline, remember that commercial grade devices normally can be safely operated up to 70°C, industrial grade up to 85°C, and military grade up to 175°C.

ATTENTION: Heat guns can easily exceed the temperature limits for your assembly: they should not be used.

To room temperature cure the MC002964 epoxy

Let stand for 96 hours.

TIP: While the product can be cured at room temperature, the better conductive performance is achieved with heat curing.

Packaging

Packaging	Net Volume		Net Weight	
Dual Syringe	6mL	0.2 fl oz	13.5g	0.47 oz

Part Number Table

Description	Part Number
Slow Cure Thermally Conductive Adhesive, 6mL, Dual Syringe	MC002964