Medium 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, a 45 minutes working life, and a moderate curing rate. At room temperature, it may achieve a minimal service cure in seven hours.

This product comes packaged in separate 3 mL 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 moderate working life is required. For automatic dispensing applications, use the medium cure thermally conductive adhesive, which offers a lower viscosity at the cost of slightly lower thermal conductivity.

Benefits and Features

- Thermal conductivity: 1.36W/(m·K)
- 1:1 mix ratio by volume
- Working life: 45 minutes
- Cure time: 1 hour at 65°C or 24 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)]	45 min
Min. Service Cure[b)]	7 hour
Full Cure @ 25°C (77°F)	24 hour
Full Cure @ 65°C (149°F)	1 hour

[a)] Pot life for 100 g and room temperature.

[b)] Minimal service cure at 25 °C (77 °F).

Temperature Ranges

Properties	Value
Constant Service Temperature	-65 to 165°C
	(-85 to 329°F)
Intermittent Temperature Limits [C)]	-70 to 200°C
	(-94 to 392°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 MC002963

Physical Properties	Method	Value [a)]
Colour	Visual	Dark Grey
Density @26°C (79°F)	ASTM D 1475	2.30 g/mL
Hardness	Shore D durometer	76–77D
Tensile Strength	ASTM D 638	10 N/mm^2 (1400 lb/in^2)
Elongation	"	1.8%

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Physical Properties	Method	Value [a]
Compression Strength	ASTM D 695	34 N/mm^2 (4900 lb/in^2)
Lap Shear Strength (Aluminium 5052)	″	8.2 N/mm^2 (1200 lb/in^2)
Water Absorption	ASTM D 570	0.35%
Outgassing (Total Mass Loss) @ 24 h	ASTM E 595	3.54%
Water Vapour Release (WVR)	″	0.15%
Collectable Volatile Condensable Material	″	0.18%
Electric Properties	**Method**	**Value**
Breakdown Voltage @ 4.491mm	ASTM D 149	29.0 kV
Dielectric Strength @ 4.491mm	″	6.5 kV/mm (164 V/mil)
Breakdown Voltage @ 3.175mm (1/8”)	Reference fit b)	24.3kV
Dielectric Strength @ 3.175mm (1/8”)		7.7kV/mm (195 V/mil)
Volume Resistivity	ASTM D 257	$9 \times 10^{12}\Omega.cm$
Surface Resistivity	″	$3 \times 10^{13}\Omega$
Dielectric Dissipation & Constant @1kHz	ASTM D 150-98	dissipation, 0.025 D constant, k’ 5.43
Insulating	-	Yes
Conductive	-	No
Thermal Properties	**Method**	**Value**
Thermal Conductivity @25°C	ASTM E 1461	1.36 W/(m.K)
@50°C	"	1.34 W/(m.K)
@100°C	"	1.28 W/(m.K)
Heat Deflection Temperature	ASTM D 648	42°C (115°F)
Glass Transition Temperature (Tg)	ASTM D 3418	46°C (108°F)
CTE [c] Prior Tg	ASTM E 831	71 ppm/°C
CTE [c] After Tg	ASTM E 831	131 ppm/°C
Specific Heat @25°C (77 °F)		0.907 J/(g·K)

Note: Specifications are for epoxy samples that were cured at 65 °C for 1 hour. Additional curing time at room temperature was given to allow for optimum curing. 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}

Physical Property	Mixture (1A:1B)
Colour	Dark Grey
Density [a]	2.47 g/mL
Mix Ratio by Volume (A:B)	1:00:1.00
Mix Ratio by Weight (A:B)	0.93:1.00

Physical Property	Mixture (1A:1B)	
Solids Content (w/w)	100%	
Physical Property	**Part A**	**Part B**
Colour	Dark Grey	Dark Grey
Density	2.51 g/mL	2.43 g/mL
Flash Point	>149°C (300°F)	>148°C (298°F)
Viscosity	Thixotropic paste	Thixotropic paste

[a] Calculated value based on measures densities of each part

[b] Brookfield viscometer at 3 rpm for part A and 0.6 rpm for part B with spindle 7

Principal Components

Part A: Bis-A Epoxide Resin
Aluminium Oxide
Zinc Oxide
Boron Nitride

Part B: tris-2,4,6-(dimethylaminomethyl) phenol
Mercaptan mixture
Aluminium Oxide
Zinc Oxide
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 MC002963 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, Fiber	
Glass	
Rubber	
Acrylic	
Polycarbonate	
Polypropylene [a]	
PTFE [a]	Weaker

[a] Does not bond to polypropylene or PTFE

Storage

Store between 22 and 45°C (72 and 113°F) in dry area away from sunlight. Because some of the components are sensitive to air, 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: Due to the high viscosity and abrasiveness of the filler, you may preheat part A and part B to increase the flow and improve air release, but this will decrease pot life. Note that the viscosities of the parts also decreases with mixing, so they will be most liquid-like and easily dispensed with constant mixing.

To heat cure the MC002963 epoxy

Put in oven at 65°C (149°F) for 1 hour.

You can cure the epoxy faster by using higher temperatures of up to 160°C (302°F), which will provide a faster cure time of 7min and optimum conductivity values.

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 MC002963 epoxy

Let stand for 5 to 24 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	14.8g	0.52 oz

Part Number Table

Description	Part Number
Medium Cure Thermally Conductive Adhesive, 6mL, Dual Syringe	MC002963