Medium Cure Thermally Conductive Adhesive, Flowable

RoHS Compliant

Description

The MC002976 Medium Cure Thermal Conductive Adhesive, Flowable is a two-part, smooth, dark grey, flowable paste that cures to form a hard and durable polymer that is extremely thermally conductive, yet electrically insulating. It is filled with thermally conductive ceramic powders for excellent 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 cure rate. It can be cured in 24 hours at room temperature or 90 minutes at 80°C.

This product comes packaged in a 25 mL manual dual syringe or a 50 mL industrial, dual-cartridge for use with a dispensing gun and static mixing tips.

Applications and Usages

The MC002976 epoxy is used for bonding heat sinks, LED's, and other heat generating components in electronic assemblies. It is suitable for use in manufacturing operations including automatic dispensing applications. It is also useful in the maintenance, repair, and hobbyist sectors. Use it when a flowable adhesive with excellent thermal conductivity and a moderate working life is required

Benefits and Features

- Thermal conductivity: 1.14 W/(m·K)
- 1:1 mix ratio
- Working life of 45 minutes
- Cure time of 150 minutes at 65 °C or 24 hours at room temperature
- Good adhesive strength
- Strong water and chemical resistance to brine, acids, bases, and aliphatic hydrocarbons
- Suitable for automatic dispensing
- Room temperature storage

Usage Parameters

Properties	Value
Working Time [a)]	45 min
Full Cure @25°C (77°F)	24 hour
Full Cure @65°C (149°F)	150 min
Full Cure @80°C (176°F)	60 min
Full Cure @100°C (212 °F)	30 min

[a)] Working time for 100g and room temperature.

Temperature Ranges

Properties	Value
Constant Service Temperature	-40 to +150°C
	(-40°F to 302°F)
Intermittent Temp. Limits [c)]	-50 to +175°C
	(-58°F to +347°F)
Storage Temperature of Unmixed Parts	22°C to 27°C
	(72°F to 81°F)

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

Properties of Cured MC002976

Physical Properties	Method	Value [a)]	
Colour	Visual	Black	
Density	ASTM D 1475	2.18 g/mL	
Hardness	Shore D durometer	72D	
Tensile Strength	ASTM D 638	4.5 N/mm^2	(650 lb/in^2)
Young's Modulus	ASTM D 638	0.238 GPa	(34500 lb/in^2)

Medium Cure Thermally Conductive Adhesive, Flowable

Physical Properties	Method	Value [a]	
Compression Strength	ASTM D 695	44 N/mm^2	(6400 lb/in^2)
Lap Shear Strength (Stainless Steel)	ASTM D 1002	9 N/mm^2	(1300 lb/in^2)
Lap Shear Strength (Aluminium)	ASTM D 1002	6.6 N/mm^2	(950 lb/in^2)
Lap Shear Strength (Copper)	ASTM D 1002	8.0 N/mm^2	(1100 lb/in^2)
Lap Shear Strength (Brass)	ASTM D 1002	7.8 N/mm^2	(1100 lb/in^2)
Lap Shear Strength (ABS)	ASTM D 1002	2.1 N/mm^2	(300 lb/in^2)
Lap Shear Strength (Polycarbonate)	ASTM D 1002	0.75 N/mm^2	(110 lb/in^2)
Electric Properties	**Method**	**Value**	
Breakdown Voltage @ 3.967mm	ASTM D 149	16500V	
Dielectric Strength @ 3.967mm	ASTM D 149	180 V/mil	(7.3 kV/mm)
Breakdown Voltage @ 3.175mm (1/8”)	Reference fit [a]	19500 V	
Dielectric Strength @ 3.175mm (1/8”)		(160 V/mil)	(6.1 kV/mm)
Volume Resistivity	ASTM D 257	9 x 10^{12} Ω*cm	
Surface Resistivity	ASTM D 257	Not Applicable	
Dielectric Dissipation & Constant		dissipation, D constant, k’	
Dissipation & Constant	ASTM D 150-98	Not Applicable	Not Applicable
Insulating		Yes	
Conductive		No	
Thermal Properties	**Method**	**Value**	
Thermal Conductivity @ 25°C (77°F)	ASTM E 1461	1.14 W/(m.K)	
Thermal Conductivity @ 50°C (122°F)	ASTM E 1461	1.13 W/(m.K)	
Thermal Conductivity @ 100°C (212°F)	ASTM E 1461	1.03 W/(m.K)	
Thermal Diffusivity @ 25°C (77°F)	ASTM E 1461	0.49 mm2/s	
Specific Heat @ 25°C (77°F)	ASTM E 1461	1.06 J/(g·K)	
Specific Heat @ 50°C (122°F)	ASTM E 1461	1.24 J/(g·K)	
Specific Heat @ 100°C (212°F)	ASTM E 1461	1.27 J/(g·K)	
Glass Transition Temperature (T_g)	ASTM D 3418	76 °C (170°F)	
CTE [c] Prior T_g	ASTM E 831	67 ppm/°C	
CTE [c] After Tg	ASTM E 831	125 ppm/°C	

Note: Specifications are for epoxy samples that were cured at 65 °C for 150 minutes. Additional curing time at room temperature was given to allow for optimum curing.

[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 MC002976

Physical Property	Mixture (1A:1B)	
Colour	Black	
Density	2.19 g/mL	
Mix Ratio by Volume (A:B)	1:00:1.00	
Mix Ratio by Weight (A:B)	1:00:0.96	
Solids Content (w/w)	100%	
Physical Properties	**Part A**	**Part B**
Colour	Black	Dark Grey
Density	2.23 g/mL	2.18 g/mL
Flash Point	>149°C (300°F)	>43°C [109°F]
Viscosity	Thixotropic Paste	Thixotropic Paste

Principal Components

Part A: Epoxy Resin
Aluminium Oxide
Zinc Oxide

Part B: Aluminium Oxide
Zinc Oxide
Nonylphenol

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 MC002976 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: 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 MC002976 epoxy

Put in oven at 65°C (149°F) for 150 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 MC002976 epoxy

Let stand for 24 hours.

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

Packaging	Net Volume		Net Weight	
Dual Syringe	25mL	0.8 fl oz	55g	1.9 oz

Part Number Table

Description	Part Number
Medium Cure Thermally Conductive Adhesive, Flowable, 25mL, Dual Syringe	MC002976