

Silver Conductive Epoxy Adhesive, Moderate Cure / High Conductivity



RoHS
Compliant

Description

This is a two-part, smooth, silver paste adhesive that cures to form a hard, durable polymer. In its cured state, it is highly electrically and thermally conductive. It adheres strongly to metals and glass, and it adheres well to most plastics used in electronic assemblies.

It has a convenient 1-to-1 mix ratio and a 10-minute working life. It achieves an operational cure in five hours at room temperature and full cure in a day. At 65°C, it cures in only 15 minutes.

Applications and Usages

The MC002966 can be used as a solder replacement for bonding heat-sensitive electronic components and for making conductive bonds where solder is not an option, such as when bonding to glass, plastics, or soft metals. It allows for quick, cold soldering repairs of electronic devices. Furthermore, it makes excellent thermal connections, provides excellent EMI/RFI shielding, and is very effective at filling in seams between metal plates. It is especially useful in repairing rear window defrosters on automobiles.

Its primary applications are in the repair and assembly of electronic devices. It is used in the automobile, aerospace, marine, communication, instrumentation, and industrial control equipment industries. It is also widely used by hobbyists and makers.

Benefits and Features

- Electrical resistivity: 0.007 $\Omega \cdot \text{cm}$
- Thermal conductivity: 0.90 W/(m·K)
- 1:1 mix ratio by volume
- Working life: 10 minutes
- Cure time: 24 hours at room temperature or 15 minutes at 65°C
- Good adhesive strength
- Strong resistance to water, brine, acids, bases, and aliphatic hydrocarbons
- Room temperature storage
- Shelf life greater than three years

Usage Parameters

| Properties | Value |
|----------------------------|----------|
| Working Time ^{a)} | 10 min |
| Shelf Life | ≥ 3 year |
| Service Cure @ 22°C (72°F) | 5 hour |
| Full Cure @ 22°C (72°F) | 24 hour |
| Full Cure @ 65°C (149°F) | 15 min |
| Full Cure @ 90°C (194°F) | 12 min |
| Full Cure @ 125°C (257°F) | 7 min |
| Full Cure @ 150°C (302°F) | 5 min |

Temperature Ranges

| Properties | Value |
|--------------------------------------|----------------|
| Constant Service Temperature | -55 to 150°C |
| | (-67 to 302°F) |
| Storage Temperature of Unmixed Parts | 16 to 27°C |
| | (60 to 80°F) |

^{a)} Cure and life values 5 g and room temperature unless stated otherwise.

Principal Components

Part A: Bis-F Epoxide Resin
Metallic Silver

Part B: Aliphatic Amines
Metallic Silver

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Properties of Cured MC002966

| Physical Properties | Method | Value ^{a)} | |
|--|-------------------------------|------------------------|-----------------------------|
| Colour | Visual | Silver Grey | |
| Density @ 26°C (79°F) | ASTM D 1475 | 2.44 g/mL | |
| Hardness | Shore D durometer | 70D | |
| Tensile Strength | ASTM D 638 | 15 N/mm ² | (2200 lb/in ²) |
| Elongation | ASTM D 638 | 0.3% | |
| Compression Strength | ASTM D 695 | 39 N/mm ² | (5700 lb/in ²) |
| Shear Strength | ASTM D 732 | 1.6 N/mm ² | (230 lb/in ²) |
| Lap Shear Strength (Aluminium 5052) | ASTM D 1002 | 8.0 N/mm ² | (1 160 lb/in ²) |
| Izod Impact ^{b)} | ASTM D 256 | 1.7 kJ/mm ² | (0.80 ft * lb/in) |
| Flexural Strength | ASTM D 790 | 17 N/mm ² | (2500 lb/in ²) |
| Water Absorption | ASTM D 570 | 0.04% | |
| Outgassing (Total Mass Loss) @ 24 h | ASTM E 595 | 6.27% | |
| Water Vapor Release (WVR) | ASTM E 595 | 0.09% | |
| Collectable Volatile Condensable Material | ASTM E 595 | 0.16% | |
| Solderable | | No | |
| Electric Properties | Method | Value | |
| Volume Resistivity ^{c)} | Method 5011.5 in MIL-STD-883H | 0.007 × Ω * cm | |
| Thermal Properties | Method | Value | |
| Thermal Conductivity @ 25°C (77°F) | ASTM E 1461 | 0.903 W/(m*K) | |
| Thermal Conductivity @ 50°C (122°F) | ASTM E 1461 | 0.893 W/(m*K) | |
| Thermal Conductivity @ 100°C (212°F) | ASTM E 1461 | 0.813 W/(m*K) | |
| Glass Transition Temperature (T _g) | ASTM D 3418 | 50°C (122°F) | |
| Heat Deflection Temperature | ASTM D 648 | 48°C | |
| CTE ^{d)} Prior T _g | ASTM E 831 | 54 ppm/°C | |
| CTE ^{d)} After T _g | ASTM E 831 | 169 ppm/°C | |

Note: Specifications are for epoxy samples that were cured at 65 °C for 15 minutes. 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/mm² = MPa; lb/in² = psi; ^{b)} Cantilever beam impact

^{d)} The uncured epoxy mixture does not conduct electricity well and can have high resistance. To attain stated resistivity, ensure that the mix ratio is followed and that the product is fully cured by heat curing. Room temperature cures may give higher resistivity.

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

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Properties of Uncured MC002966

| Physical Property | Mixture (1A:1B) | |
|---------------------------------|------------------------|------------------------|
| Colour | Silver Grey | |
| Density a) | 2.55 g/mL | |
| Mix Ratio by Volume (A:B) | 1.0:1.0 | |
| Mix Ratio by Weight (A:B) | 1.04:1.0 | |
| Solids Content (w/w) | 93% | |
| Physical Properties | Part A | Part B |
| Colour | Silver Grey | Silver Grey |
| Density | 2.46 g/mL | 2.37 g/mL |
| Flash Point | >150°C (302°F) | >93°C (199°F) |
| Resistivity of uncured material | Off-scale (no reading) | Off-scale (no reading) |

a) Calculated value based on measures densities of each part

Compatibility

Adhesion - As seen in the substrate adhesion table, the MC002966 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.

Substrate Adhesion in Decreasing Order

| Physical Properties | Adhesion |
|---------------------|----------|
| Aluminium | Stronger |
| Steel | |
| Fiberglass | |
| Wood | |
| Paper, Fiber | |
| Glass | |
| Rubber | |
| Polycarbonate | |
| Acrylic | |
| Polypropylene a) | Weaker |

a) Does not bond to polypropylene

Storage

Store between 16 and 27°C (60 and 80 °F) in dry area away from sunlight. Prolonged storage or storage at or near freezing temperatures can result in crystallization. If crystallization occurs, reconstitute the component to its original state by temporarily warming it to 50 to 60°C (122 to 140°F). To ensure full homogeneity, stir thoroughly the warm component, reincorporating all settled material. Re-secure container lid and let cool down before use.

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.

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

1. Remove syringe cap or jar cover.
2. For jars, stir each part individually to re-incorporate material that may have settled during storage.
3. Measure one part by volume of A.
4. Measure one part by volume of B.
5. Thoroughly mix the parts together with a stir stick until homogeneous.
6. 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 silver filler, you may preheat part A and part B to increase the flow and improve air release, but doing so will also reduce the working time by about half for each 10°C increments.

To heat cure the MC002966 epoxy

Put in oven at 65°C (149°F) for 15 minute

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

You can cure the epoxy faster by using higher temperatures of up to 150°C (302°F).

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 MC002966 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 | |
|-----------|------------|-----------|------------|---------|
| Syringe | 6mL | 0.2 fl oz | 14.4g | 0.51 oz |

Part Number Table

| Description | Part Number |
|---|-------------|
| Silver Conductive Epoxy Adhesive, Moderate Cure/High Conductivity, 6mL, Syringe | MC002966 |

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