Black Flame Retardant Epoxy, Encapsulating & Potting Compound

Description

834FRB *potting and encapsulating compound* is a black, flame retardant, low viscosity two-part epoxy that offers extreme environmental, mechanical and physical protection for printed circuit boards and electronic assemblies.

This product is designed for applications where mechanical strength and self-extinguishing are required. Due to its low mixed viscosity, it can easily penetrate small gaps and cavities. It also provides excellent electrical insulation and protects components from static discharges, vibration, abrasion, thermal shock, environmental humidity, salt water, fungus, and many harsh chemicals.

This epoxy has a convenient 2:1 volume mix ratio, making it compatible with most dispensing equipment. 834FRB can be cured at room temperature or higher.

Features and Benefits

- *Certified UL 94V-0 (File # E334302)*
- *Compliant with UL 746A*
- *Convenient 2A:1B volume mix ratio*
- *Low mixed viscosity of 2 600 cP*
- *Very high compressive and tensile strength*
- *Excellent adhesion to a wide variety of substrates including metals, composites, glass, ceramics, and many plastics*
- *High Comparative Tracking Index (>600 V, PLC=0)*
- *Excellent electrical insulating characteristics*
- *Solvent-free*

Usage Parameters

Properties	Value
Working life @22 °C [72 °F]	1 h
Shelf life	5 y
Full cure @22 °C [72 °F]	24 h
Full cure @65 °C [149 °F]	1 h
Full cure @80 °C [176 °F]	To be determined
Full cure @100 °C [212 °F]	To be determined

Temperature Ranges

Properties	Value
Constant service temperature	-40 to 175 °C [-40 to 347 °F]
Maximum intermittent temperature [a)]	200 °C [392 °F]
Storage temperature of unmixed parts	16 to 27 °C [61 to 81 °F]

a) *Temperature that can be withstood for short periods without sustaining damage.*

Cured Properties

Physical Properties	Method	Value [a)]
Color	Visual	Black
Flammability	94 V	94 V-0
Density @23 °C [73 °F]	ASTM D 792	1.39 g/mL
Hardness	Shore D Durometer	83D
Flexural strength	ASTM D 790	65 N/mm^2 [9 500 lb/in^2]
Tensile strength	ASTM D 638	23 N/mm^2 [3 400 lb/in^2]
Tensile impact	ASTM D 1822	16 kJ/m^2 [7.8 ft·lb/in^2]
Izod impact	ASTM D 256	2.39 kJ/m^2 [1.14 ft·lb/in^2]
Compressive strength	ASTM D 695	140 N/mm^2 [20 000 lb/in^2]
Lap shear strength (stainless steel)	ASTM D 1002	24 N/mm^2 [3 500 lb/in^2]
Lap shear strength (aluminum)	ASTM D 1002	25 N/mm^2 [3 600 lb/in^2]
Lap shear strength (copper)	ASTM D 1002	20 N/mm^2 [2 900 lb/in^2]
Lap shear strength (brass)	ASTM D 1002	21 N/mm^2 [3 000 lb/in^2]
Lap shear strength (ABS)	ASTM D 1002	1.8 N/mm^2 [260 lb/in^2]
Lap shear strength (polycarbonate)	ASTM D 1002	2.3 N/mm^2 [340 lb/in^2]

Note: Specifications are for epoxy samples cured at 65 °C for 1 hour and conditioned at ambient temperature and humidity.

a) N/mm^2 = mPa; lb/in^2 = psi

Cured Properties

Physical Properties	Method	Value
Outgassing (total mass loss) @24 h	ASTM D 595	1.88%
Water vapor release	ASTM D 595	0.33%
Collectable volatile condensable material	ASTM D 595	0.06%
Electrical Properties	**Method**	**Value**
Breakdown voltage @1.29 mm	ASTM D 149	27 400 V [27.4 kV]
Dielectric strength @1.29 mm	ASTM D 149	540 V/mil [21.3 kV/mm]
Breakdown voltage @3.175 mm [1/8"]	Reference fit [a)]	43 000 V [43 kV]
Dielectric strength @3.175 mm [1/8"]	Reference fit [a)]	344 V/mil [13.7 kV/mm]
Volume resistivity	ASTM D 257	1.4×10^{15} Ω·cm
Volume conductivity	ASTM D 257	7.1×10^{-16} S/cm
Dielectric dissipation, D @1 MHz	ASTM D 150-11	0.011
Dielectric constant, k´ @1 MHz	ASTM D 150-11	2.80

Note: Specifications are for epoxy samples cured at 65 °C for 1 hour and conditioned at ambient temperature and humidity.

a) To allow comparison between products, the dielectric strength was recalculated with the Tautscher equation fitted to 5 experimental values and extrapolated to a standard thickness of 1/8" (3.175 mm).

Cured Properties

Electrical Properties	Method	Value
Comparative Tracking Index (CTI) Performance Level Class (PLC) = 1	ASTM D 3628	>600 V
Hot Wire Ignition (HWI)	ASTM D 3874, IEC 60695-2-20	45.24 s
High-Current Arc Ignition (HAI)	UL 746A	139.40 arc
High Voltage Arc Tracking Rate (HVTR)	UL 746A	24.58 mm/min
High Voltage, Low Current, Dry Arc Resistance	ASTM D 495	69.24 s
High Voltage Arc Resist. to Ignition (HVAR)	ASTM D 495	27.33 s
Thermal Properties	**Method**	**Value**
Glass transition temperature (T_g)	ASTM D 3418	39 °C [102 °F]
CTE [a] prior T_g after T_g	ASTM E 831 ASTM E 831	50 ppm/°C [122 ppm/°F] 178 ppm/°C [352 ppm/°F]
Thermal conductivity @25 °C [77 °F] @50 °C [122 °F] @100 °C [212 °F]	ASTM E 1461 ASTM E 1461 ASTM E 1461	0.28 W/(m·K) 0.33 W/(m·K) 0.31 W/(m·K)
Thermal diffusivity @25 °C [77 °F]	ASTM E 1461	1.43 mm^2/s
Specific heat capacity @25 °C [77 °F]	ASTM E 1461	0.14 J/(g·K)

Note: Specifications are for epoxy samples cured at 65 °C for 1 hour and conditioned at ambient temperature and humidity.

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

Uncured Properties

Physical Properties	Mixture (A:B)
Color	Black
Viscosity @20 °C [68 °F]	2 600 cP [2.6 Pa·s] a)
Density	1.32 g/mL
Mix ratio by volume	2:1
Mix ratio by weight	2.4:1
Solids content (w/w)	~96%

a) Brookfield viscometer at 60 rpm with spindle LV S63

Physical Properties	Part A	Part B
Color	Dark grey	Black
Viscosity @24 °C [75 °F]	1 900 cP [1.9 Pa·s] a)	4 800 cP [4.81 Pa·s] b)
Density	1.39 g/mL	1.17 g/mL
Flash point	150 °C [302 °F]	148 °C [221 °F]
Odor	Musty	Mild

b) Brookfield viscometer at 100 rpm with spindle LV S64

Compatibility

Adhesion—As seen in the substrate adhesion table, 834FRB epoxy adheres to most plastics and metals used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, or greasy flux residues that may affect adhesion. If contamination is present, first clean the surface to be coated with MG Chemicals 824 Isopropyl Alcohol.

Chemical Resistance— The water absorbency and chemical resistance was tested for seven days using the IPC-TM-650 method. The results show low water absorption and a high chemical resistance to salt water and most ionic species. Softening and swelling occurs for aggressive organic solvents.

Substrate Adhesion (In Decreasing Order)

Physical Properties	Adhesion
Aluminum	Stronger
Steel	
Fiberglass	
Wood	
Glass	
Rubber	
Polycarbonate	
Acrylic	Weaker
Polypropylene	Does not bond

Chemical Solvent Resistance (IPC-TM-650)

Physical Properties	Weight Change
Water	0.23%
Heptane	0.25%
Salted water (NaCl), 10%	0.40%
Sodium hydroxide, 10%	0.42%
Citric acid, 10%	0.70%
Ammonium carbonate, 2%	0.70%
Sulfuric acid, 3%	0.75%
Sulfuric acid, 30%	0.74%
Ethanol	2.00%
Hydrochloric acid, 5%	1.40%
Nitric acid, 10%	1.80%
Phenol, 5% [a)]	7.60%
Carbon tetrachloride [b)]	16.50%
Acetone [a)]	17.67%
Ethyl acetate [a)]	18.70%
Toluene [a)]	26.74%
Ethylene dichloride [a)]	Ruptured

a) Softened and swelled
b) Swelled

Storage

Store between 16 and 27 °C [61 and 81 °F] in a dry area, away from sunlight. Storage below 16 °C [61 °F] can result in crystallization.

If crystallization occurs, reconstitute the product to its original state by temporarily warming it to between 50 and 60 °C [122 and 140 °F]. To ensure full homogeneity, stir the warm product thoroughly. Make sure to reincorporate all settled material, close the lid, and then let cool before use.

Health and Safety

Please see the 834FRB Safety Data Sheet (SDS) parts A and B for further details on transportation, storage, handling, safety guidelines, and regulatory compliance.

Application Instructions

For best results, follow the procedure below.

Manual mixing:

1. Scrape settled material free from the bottom and sides of the part A container; stir contents until homogenous.
2. Scrape settled material free from the bottom and sides of the part B container; stir contents until homogenous.
3. Measure 2 parts by volume of the pre-stirred part A, and pour into the mixing container. Ensure all contents are transferred by scraping the container.
4. Measure 1 part by volume of the pre-stirred part B, and pour slowly into the mixing container while stirring. Ensure all contents are transferred by scraping the container.
5. Thoroughly mix parts A and B together.
6. Let sit for 15 minutes to de-air.
   —OR—
   Put in a vacuum chamber at 25 inHg for 2 minutes to de-air.
7. If bubbles are present at the top, break and stir them gently with the mixing paddle.
8. Pour the mixture into a container holding the components to be protected.
9. Close the part A and B containers tightly between uses to prevent skinning.

Attention!

Mixing >500 g at a time decreases working life and can lead to a flash cure. Limit the size of hand-mixed batches. For large production volumes, contact MG Chemicals Technical Support for assistance.

Cure Instructions

Room temperature cure:

- Let cure at room temperature for 24 hours.

Heat cure:

- Put in oven at 65 °C [149 °F] for 1 hour.

Attention!

Due to exothermic reaction, heat cure temperatures should be at least 25% below the maximum temperature the most fragile PCB component can tolerate. For larger potting blocks, reduce heat cure temperature by greater margins.

Packaging and Support Products

Cat. No.	Packaging	Net Volume	Packaged Weight
834FRB-375ML	2 Bottle kit	375 mL [12.7 fl oz]	0.6 kg [1.3 lb]
834FRB-3L	3 Can kit	2.55 L [0.68 gal]	4.5 kg [10 lb]
834FRB-60L	3 Pail kit	60 L [16 gal]	85 kg [187 lb]

Technical Support

Please contact us regarding any questions, suggestions for improvements, or problems with this product. Application notes, instructions and FAQs are located at www.mgchemicals.com.

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