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ISO 9001 Registered Quality System.
Burlington, Ontario, Canada QMI File # 004008

Flame Retardant Epoxy Encapsulating & Potting Compound 834FRB Technical Data Sheet

834FRB

Description

The 834FRB *Flame Retardant Epoxy Encapsulating and Potting Compound* is a UL 94V-0 recognized electric grade epoxy in the QMFZ2 category. This two-part, self-extinguishing epoxy provides a black finish with great insulation and protection value.

It protects against static discharges, shocks, vibrations, and mechanical impacts. As well as insulating against electrical conductivity, it insulates against heat. It is extremely resistant to environmental humidity, salt water, and many harsh chemicals.

Applications & Usages

The 834FRB epoxy is used to pot or encapsulate printed circuit assemblies in a protective block. The cured epoxy improves reliability, operational range, and lengthens the life of electrical and electronic parts. It also helps hide and restrict access to intellectual property.

Its primary applications are in the automobile, marine, aerospace, aviation, communication, instrumentation, and industrial control equipment.

Benefits and Features

- **Certified *UL 94V-0*** (File # [E334302](#))
- **Specification Verified as per *UL 746A***
- **Mix ratio 2A:1B** compatible with most dispensing equipment
- **Excellent Comparative Tracking Index** (>600 V, *PLC = 0*)
- **Extreme resistance to water and humidity** allowing submersion if needed
- **Protects electronics from** moisture, corrosion, fungus, thermal shock, and static discharges
- **Strong Chemical Resistance** to brine, acids, bases, and aliphatic hydrocarbons
- **Free of solvents**

ENVIRONMENT

- ✓ RoHS
- ✓ REACH compliant



Curing & Work Schedule

<i>Properties</i>	<i>Value</i>
Working Life ^{a)}	60 min
Shelf Life	≥3 y
Full Cure @20 °C [68 °F]	24 h
Full Cure @65 °C [149 °F]	60 min
Full Cure @80 °C [176 °F]	45 min
Full Cure @100 °C [212 °F]	35 min
Storage Temperature of Unmixed Parts	16 to 27 °C [60 to 80 °F]

a) Working life assumes room temperature. A 10 °C increase can decrease the pot life by half.

Temperature Service Ranges

<i>Properties</i>	<i>Value</i>
Constant Service Temperature	-30 to +175 °C [-22 to +347 °F]
Max Intermittent Temperature ^{b)}	+200 °C [392 °F]

b) Maximum tolerable short-term temperature exposure limit—not recommended as a sustained or repeated operation condition



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Principal Components

Name	CAS Number
Part A: Epoxide Resin	28064-14-4 + 25068-38-6
Part B: Curing Amide	68410-23-1
1,1-(ethane-1,2-diyl)bis(pentabromobenzene)	84852-53-9
Antimony Trioxide	1309-64-4
Alkyl glycidyl ether	68609-97-2

Properties of Cured 834FRB

<i>Physical Properties</i>	<i>Method</i>	<i>Value</i> ^{a)}
Color	Visual	Black
Flammability	94V	94V-0
Density @23 °C [73.4 °F]	ASTM D 792	1.39 g/mL
Hardness	Shore D	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]
Lap Shear Strength (Stainless Steel)	ASTM D 1002	24 N/mm ² [3 500 lb/in ²]
Lap Shear Strength (Aluminum)	"	25 N/mm ² [3 600 lb/in ²]
Lap Shear Strength (Copper)	"	20 N/mm ² [2 900 lb/in ²]
Lap Shear Strength (Brass)	"	21 N/mm ² [3 000 lb/in ²]
Lap Shear Strength (ABS)	"	1.8 N/mm ² [260 lb/in ²]
Lap Shear Strength (Polycarbonate)	"	2.3 N/mm ² [340 lb/in ²]
Izod Impact	ASTM D 256	2.39 kJ/m ² [1.14 ft·lb/in ²]
Outgassing (Total Mass Loss) @24 h	ASTM E 595	1.88%
Water vapor release	"	0.33%
Collectable Volatile Condensable Material	"	0.06%
<i>Electric Properties</i>	<i>Method</i>	<i>Value</i>
Breakdown Voltage	ASTM D 149	27.4 kV @ avg. of 1.289 mm
Dielectric Strength	"	21.3 kV/mm [540 V/mil]
Breakdown Voltage @3.175 mm [1/8"]	Reference fit ^{b)}	43.0 kV
Dielectric Strength	"	13.7 kV/mm [344 V/mil]
Volume Resistivity	ASTM D 257	1.4 x10 ¹⁵ Ω·cm
Comparative Tracking Index	ASTM D 3628	>600 V
Hot Wire Ignition (HWI)		45.24 s
High-Current Arc Ignition (HAI)		139.40 arc
High Voltage Arc Tracking Rate (HVTR)		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

Note: Specifications are for epoxy samples cured at 65 °C for 1 hour, with additional curing time at room temperature for optimal results. For most tests, samples were conditioned at 23 °C and 50% RH.


a) N/mm² = mPa; lb/in² = psi;

b) To allow comparison between products, the Tautschter equation was fitted to 5 experimental dielectric strengths and extrapolated to a standard reference thickness of 1/8" (3.175 mm).

Properties of Cured 834FRB (Continued)

<i>Thermal Properties</i>	<i>Method</i>	<i>Value</i>
Coefficient of Thermal Expansion (CTE) ^{a)}	ASTM E 831	
Before T _g	"	50 ppm/°C
After T _g	"	178 ppm/°C
Thermal Conductivity @25 °C [77 °F]	ASTM E 1461	0.283 W/(m·K)
@50 °C [122 °F]	"	0.326 W/(m·K)
@100 °C [212 °F]	"	0.309 W/(m·K)
Glass Transition Temperature (T _g)	ASTM D 3418	39 °C [102 °F]
Heat Deflection Temperature	ASTM D 648	TBD

Properties of Uncured 834FRB

<i>Physical Property</i>	<i>Mixture (2A:1B)</i>	
Color	Black	
Viscosity ^{a)} @20 °C [68 °F]	2 600 cP [2.6 Pa·s]	
Density	1.32 g/mL	
Mix Ratio by weight (A:B)	2.4:1.0	
Mix Ratio by volume (A:B)	2.0:1.0	
Solids Content (w/w)	~96%	
		
<i>Physical Property</i>	<i>Part A</i>	<i>Part B</i>
Color	Dark Grey	Black
Viscosity @24 °C [75 °F]	1 900 cP [1.9 Pa·s] ^{a)}	4 800 cP [4.8 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

a) Brookfield viscometer 60 RPM with spindle LV s63

a) Brookfield viscometer 100 RPM with spindle LV s64



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Compatibility

Adhesion—As seen in the substrate adhesion table, the 834FRB epoxy adheres to most materials found on printed circuit assemblies; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present, clean the printed circuit assembly with electronic cleaner such as MG Chemicals 4050 Safety Wash, 406B Superwash, or 824 Isopropyl Alcohol.

Substrate Adhesion in Decreasing Order

<i>Physical Properties</i>	<i>Adhesion</i>
Steel	Stronger  Weaker
Aluminum	
Fiberglass	
Wood	
Glass	
Polycarbonate	
Acrylic	
Polypropylene ^a	

a) Does not bond to polypropylene

Chemical Resistance—*Integrity Testing Laboratories, Inc.* performed water absorbance and chemical resistance estimation of the 834FRB using the IPC-TM-650 method. The chemical solvent resistance table presents the percent weight change and effect notes after this 7 day test. The results show low water absorption and a high chemical resistance to salt water and most ionic species including low concentration of sulfuric and citric acids; and sodium hydroxide base. Softening and swelling occurs for aggressive organic solvents.

Chemical Solvent Resistance (IPC-TM-650)

<i>Physical Properties</i>	<i>Weight Change</i>	<i>Note</i>
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%	7.60%	Softened and Swelled
Carbon Tetrachloride	16.50%	Swelled
Acetone	17.67%	Softened and Swelled
Ethyl Acetate	18.70%	Softened and Swelled
Toluene	26.74%	Softened and Swelled
Ethylene Dichloride	Ruptured	Softened and Swelled

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.

Health, Safety, and Environmental Awareness

Please see the 834FRB **Safety Data Sheet** (SDS) parts A and B for more details on transportation, storage, handling and other security guidelines.

Health and Safety: The 834FRB parts can ignite if the liquid is exposed to flames, but once it is cured it is a self-extinguishing epoxy solid. Do not breathe in fumes of a cured epoxy block that is exposed to an external flames source because the flame retardant releases bromine to extinguish the flame.

Wear safety glasses or goggles and disposable polyvinyl chloride, neoprene, or nitrile gloves while handling liquids. Part B in particular causes skin burns and may cause sensitization if exposed over a long period of time. The epoxy is black and will not wash off once cured: wear protective work clothing. Wash hands thoroughly after use or if skin contact occurs. Do not ingest.

While the product has low volatility and moderate odor, use in well-ventilated area.

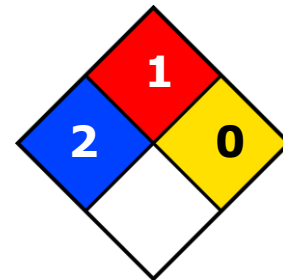
The cured epoxy resin presents no known hazard.

Part A

HMIS® RATING

HEALTH:	* 2
FLAMMABILITY:	1
PHYSICAL HAZARD:	0
PERSONAL PROTECTION:	

NFPA® 704 CODES

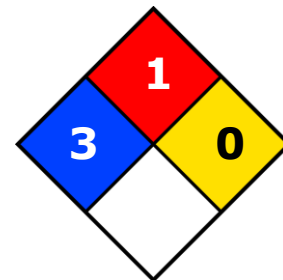


Part B

HMIS® RATING

HEALTH:	* 3
FLAMMABILITY:	1
PHYSICAL HAZARD:	0
PERSONAL PROTECTION:	

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:

0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Environment: The 1,1-(ethane-1,2-diyl)bis(pentabromobenzene) component bioaccumulates; therefore avoid environmental release of the uncured epoxy parts.

Application Instructions

Follow the procedure below for best results. If you have little or no experience with the 834FRB epoxy, please follow the long instructions instead. The short instructions provided here are not suitable for first time users.

To prepare 2:1 (A:B) epoxy mixture

1. Carefully scrape the settled material in the **Part A** container; and stir and fold material until fully homogenous.
2. Carefully scrape the settled material in the **Part B** container; and stir and fold material until fully homogenous.
3. Measure **two** parts by volume (or weight) of pre-stirred **A**, and pour in the mixing container.
4. Measure **one** part by volume (or weight) of pre-stirred **B**, and slowly pour in the mixing container while stirring.
5. Let sit for 30 minutes to de-air.
—OR—
Put in a vacuum chamber, bring to 25 inHg pressure, and wait for 2 minutes to de-air.
6. If bubbles are present at top, use the mixing paddle to gently break them.
7. Pour mixture into the mold or container containing the components to be encapsulated.

ATTENTION! Mixing >500 g [0.4 L] of Part **B** at a time into **A** decreases working life and promotes flash cure. Use of epoxy mixing machines with static stirrer recommended for large volumes. Limit size of hand-mixed batches.

To room temperature cure the 834FRB epoxy

Let stand for 24 hours.

To heat cure the 834FRB epoxy

Put in oven at 65 °C [149 °F] for 60 minutes.

—OR—

Put in oven at 80 °C [176 °F] for 45 minutes.

—OR—

Put in oven at 100 °C [212 °F] for 35 minutes.

ATTENTION!

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



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Packaging and Supporting Products

<i>Cat. No.</i>	<i>Form</i>	<i>Net Volume</i>		<i>Net Weight</i>		<i>Shipping Weight</i>	
834FRB-375ML	Liquid	375 mL	12.7 fl oz	494 g	1.09 lb	0.6 kg	1.3 lb
834FRB-3L	Liquid	2.55 L	0.681 gal	3.36 kg	7.41 lb	4.5 kg	10 lb
834FRB-60L	Liquid	60 L	16 gal	79.1 kg	295 lb	85.0 kg	187 lb

Supporting Products

- *Epoxy and Adhesive Cleaner*: Cat. No. 8328-500ML, 8328-20L
- *Epoxy Mold Release (for temperature cures ≤85 °C)*: Cat. No. 8329-350G

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

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Warranty

M.G. Chemicals Ltd. warrants this product for 12 months from the date of purchase by the end user. *M.G. Chemicals Ltd.* makes no claims as to shelf life of this product for the warranty. The liability of *M.G. Chemicals Ltd.* whether based on its warranty, contracts, or otherwise shall in no case include incidental or consequential damage.

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