MacDermid Alpha ELECTRONICS SOLUTIONS

TECHNICAL DATA SHEET

Electrolube® UVFLEX

UV Cure High Flexibility Conformal Coating

DESCRIPTION

Electrolube® UVFlex is a single-component, radiation-curing conformal coating designed to protect electronic circuitry. Representing the next generation of coating technology, the chemistry combines fast curing, high technical performance, and improved sustainability.

Dual-cure technology ensures rapid, full cure in both line-of-sight and shadowed areas of printed circuit boards and circuit board assemblies. A highly flexible, soft yet robust conformal coating, UVFlex maintains all original physical and mechanical properties after thermal ageing and when subjected to thermal shock testing. Exceptional resistance to elevated temperature and humidity delivers high surface insulation resistance values across a wide range of test conditions, enabling compliance with the toughest specifications. Excellent chemical resistance, typical of radiation-curing conformal coatings, is retained in UVFlex, allowing for use in corrosive atmospheres and in applications where contact with chemicals such as fuels and lubricants is expected.

Formulated with bio-based raw materials, the coating contains 25 to 30% renewable carbon on a mass basis, helping customers and downstream users reduce their carbon footprint and increase the sustainability of their products, all without compromising quality or performance.

READ ENTIRE TECHNICAL DATA SHEET BEFORE USING THIS PRODUCT

FEATURES AND BENEFITS

- **Energy-efficient UV curing** and UV LED cure capability with a secondary moisture curing system
- **Highly elastic**, yet tough conformal coating with excellent thermal cycling / shock properties
- **Exceptional electrical performance** under harsh conditions, particularly condensing and corrosive gas environments
- **Adjustable coating thickness** within the spraying process depending on requirements
- **Bio-based conformal coating** material with 25 to 30% renewable carbon content, containing no SVHCs or VOCs

APPROVALS

Standard	Status
RoHS Compliant (2015/863/EU)	Yes
IPC-CC-830	Meets Requirements
IEC-61086	Meets Requirements
Flammability	Meets UL94 V-0 (approval pending)

PHYSICAL PROPERTIES

Category	Typical Results
Liquid Properties	
Material Chemistry	Urethane Acrylate (with biobased content)
Appearance	Clear, pale yellow, viscous liquid
VOC Content	None
Minimum Solids Content (%)	98.5
Flash Point (°C)	95
Viscosity @ 20 °C (mPas)	1,000 to 10,000 (shear dependent)
Density @ 20 °C (g/mL)	0.93
Approximate Coverage @ 100µm thickness (m^2/L)	9.85

Category	Typical Results
Dry Film Coating	
Recommended Coating Thickness (µm)	50 to 500
Color	Clear, Colorless film, Fluorescent under UV light
Hardness (ASTM D2240)	A30

Category	Typical Results
Operating Temperature Range (°C)	-65 to +150
Thermal Shock Performance IPC-CC-830 (-65 to +135 °C) Electrolube Internal (-40 to +125 °C)	 100 cycles - Pass 1500 cycles - Pass
Tensile Properties (ASTM D638) Elongation at Break (%) @ -40 °C @ +25 °C @ +130 °C Elastic Modulus (MPa) @ -40 °C @ +25 °C @ +130 °C Tensile Strength (MPa) @ -40 °C @ +25 °C @ +130 °C	 15 to 25 60 to 70 25 to 30 350 to 400 1.5 to 2.0 1.6 to 1.8 9 to 11 1.5 to 2 0.3 to 0.5
Glass Transition Temperature, DMA (°C) (ISO 6721-11:2019)	< -48
Coefficient of (Linear) Thermal Expansion (ppm / °C) (ASTM E831-25) CTE 1 CTE 2	 264 313
Adhesion (FR4) (ISO 2409)	Pass

ELECTRICAL PROPERTIES

Category	Typical Results
Dry Film Coating	
Moisture Insulation Resistance (IPC TM 2.6.3.3, B24, 150µm, 85 °C/85% RH, GΩ)	10 GΩ
Surface Insulation Resistance - Coating Only	10 GΩ

Category	Typical Results
(85 °C 85% RH, 1000 hr, >1 GΩ)	
Surface Insulation Resistance - Coating / Solder Paste (85 °C 85% RH, 1000 hr, >1 GΩ)	1 GΩ
Condensation Resistance – Coating / Solder Paste (40 °C 80% RH, DP-2 °C, 36 hr, >0.1 GΩ)	1 GΩ
Dielectric Strength (kV/mm) (3mm thickness) (ASTM D149-20)	14
Dielectric Withstanding Voltage (TM-650 2.5.7.1)	Pass at 1500V
Dielectric Constant (ASTM D150-22)	2.67
Dissipation Factor, 1MHz (ASTM D150-22)	0.04
Comparative Tracking Index (IEC 60112:2000)	600

APPLICATION GUIDELINES

Substrate Preparation

Substrates should be thoroughly cleaned before coating them with **UVFlex** to ensure satisfactory adhesion. All flux residues should be removed as they may become corrosive or interfere with the coating if left on the PCB. Electrolube manufactures a range of cleaning products that can be used for this purpose, both solvent and aqueous based.

Selective Spraying

UVFlex has been designed with a viscosity/rheology profile that is highly tailored for application by selective spraying. Other (manual) spraying techniques may also be employed.

As a result of the dual curing capability of **UVFlex**, it is advised that all storage tanks are kept sealed to protect the product from light and moisture, thereby ensuring product quality.

A range of application thicknesses are possible with **UVFlex**, depending on the spray equipment and parameters employed. Suitable coating thickness should be determined by the user, for each application, ensuring the required levels of protection for the PCB are met.

However, typical thicknesses of 50 to 500µm are regularly used within the industry, providing high levels of resistance to moisture, chemicals, and particles, whilst possessing a good balance between surface hardness and bulk flexibility.

Brushing

As it is a manual process with many variables, brush coating is only advised for touch-up applications. Brushes should be clean and dry prior to use, and exposure to UV light should be minimized to avoid premature curing.

Additional information about setting up processing equipment is available in our equipment guides for different equipment manufacturers. Please ask our Product Specialist Team for information and support.

CURING CONDITIONS

The speed of UV cure depends on several factors, namely the wavelength, the intensity and the dosage of UV light used for curing, the applied coating thickness, and the height of the various components on the PCB. Once **UVFlex** has been exposed to the recommended UV curing regime (detailed herein), a fully touch-dry coating that is suitable for downstream processing will be obtained. Shadow areas, not exposed to UV light, are cured via a secondary moisture cure mechanism. The time for full cure of the whole coating therefore also depends on the environmental conditions of relative humidity and temperature.

Conventional UV Curing

For effective UV curing of **UVFlex**, MacDermid Alpha recommends the use of standard mercury bulbs (H' type) with typical conveyor speeds in the region of 1.0 to 1.5m/min. The minimum and maximum values for intensity (peak irradiance) and dosage (energy density) that should be used are as follows.

UV Lamp Output	Dosage/Energy Density, mJ/cm^2				Intensity (Peak Irradiance), mW/cm^2			
Wavelength Range	UVA	UVB	UVC	UVV	UVA	UVB	UVC	UVV
Minimum	1800	1500	400	1500	350	300	90	275
Maximum	2800	2500	600	2500	500	400	110	375

All values measured using an EIT 'Power Puck II' radiometer.

It is essential that the correct wavelength, intensity, and dosage of UV light are determined for each application on a case-by-case basis, prior to commencement of production runs using **UVFlex**. Appropriate process parameters for effective curing should be established at implementation of any UV curing system and monitored regularly to ensure continued compliance with those parameters. A portable, calibrated radiometer should be used for this purpose.

UV LED Curing

UVFlex can be cured with specific UV LED cure equipment that provides suitable curing parameters. Please consult the relevant equipment guide for additional details. Further information is available on request from our Product Specialist Team.

INSPECTION

UVFlex contains fluorescent dye, which allows 'blacklight' inspection of the PCB after coating, to ensure complete and uniform coverage. The stronger the reflected UV light, the thicker the coating layer is. UV light in the region of 375nm should be used for inspection.

PACKAGING AND STORAGE INFORMATION

Package sizes of UVFlex is 4L in a metal pail. Other packages can be available upon request. Further information can be obtained from your Electrolube Product Specialist Team.

The product cures under UV light and humidity and should be stored in its original, tightly sealed container, and should be protected from light and humidity. Recommended storage conditions are from 15 to 35 °C.

SAFETY & WARNING

It is recommended that the company/operator read and review the Safety Data Sheets for the appropriate health and safety warnings before use. **Safety Data Sheets are available.**

CONTACT INFORMATION

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Also read carefully warning and safety information on the Safety Data Sheet. This data sheet contains technical information required for the safe and economical operation of this product. READ IT THOROUGHLY PRIOR TO PRODUCT USE. Emergency safety directory assistance: US 1 202 464 2554, Europe + 44 1235 239 670, Asia + 65 3158 1074, Brazil 0800 707 7022 and 0800 172 020, Mexico 01800 002 1400 and (55) 5559 1588