

## Multi-Cure® 9-20351-UR Flexible Light-Cure Conformal Coating

### APPLICATIONS

- Conformal Coating

### FEATURES

- UV/Visible Light Cure
- Secondary Heat Cure
- Low VOC
- High Viscosity for Selective Application of Thick Coating
- Suitable for Spraying

### OTHER FEATURES

- Ultra-Red® Fluorescing
- Isocyanate Free
- One Part, No Mixing Required
- Optimized for Wetting High-Profile Leads

Dymax Multi-Cure® 9-20351-UR cures upon exposure to light and is designed for rapid conformal coating of printed circuit boards and other electronic assemblies. This coating has been engineered for application thicknesses between 50 mic [0.002 in] and 0.51 mm [0.020 in]. The low modulus of 9-20351-UR allows it to excel in thick coating applications where thermal shock performance is critical. When exposed to black light, Ultra-Red® fluorescing emits a bright red color, providing a vivid contrast on components and solder masks. Dymax 9-20351-UR is a Multi-Cure® material specially formulated to cure with heat in applications where shadowed areas exist. Dymax Multi-Cure® materials contain no nonreactive solvents and cure upon exposure to light. Their ability to cure in seconds enables faster processing, greater output, and lower processing costs. When cured with Dymax light-curing spot lamps, focused-beam lamps, or flood lamps, they deliver optimum speed and performance for conformal coating. Dymax lamps offer the ideal balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with RoHS directives 2015/863/EU.

| UNCURED PROPERTIES *   |                           |             |
|------------------------|---------------------------|-------------|
| Property               | Value                     | Test Method |
| Solvent Content        | No Nonreactive Solvents   | N/A         |
| Chemical Class         | Acrylated Urethane        | N/A         |
| Appearance             | Colorless Translucent Gel | N/A         |
| Soluble in             | Organic Solvents          | N/A         |
| Density, g/ml          | 1.05                      | ASTM D1875  |
| Viscosity, cP (20 rpm) | 13,500                    | ASTM D2556  |

| CURED MECHANICAL PROPERTIES *    |              |                       |
|----------------------------------|--------------|-----------------------|
| Property                         | Value        | Test Method           |
| Durometer Hardness               | D60          | ASTM D2240            |
| Tensile at Break, MPa [psi]      | 13.7 [2000]  | ASTM D638             |
| Elongation at Break, %           | 200          | ASTM D638             |
| Modulus of Elasticity, MPa [psi] | 30.3 [4,400] | ASTM D638             |
| Glass Transition, T <sub>g</sub> | 43           | DSTM 256 <sup>‡</sup> |
| CTE <sub>α1</sub> , μm/m/°C      | 82           | DSTM 610              |
| CTE <sub>α2</sub> , μm/m/°C      | 221          | DSTM 610              |

| OTHER CURED PROPERTIES *           |       |             |
|------------------------------------|-------|-------------|
| Property                           | Value | Test Method |
| Refractive Index (20°C)            | 1.49  | ASTM D542   |
| Boiling Water Absorption, % (2 hr) | 2.5   | ASTM D570   |
| Water Absorption, % (25°C, 24 hr)  | 0.8   | ASTM D570   |
| Linear Shrinkage, %                | 1.8   | ASTM D2566  |

\* No Specifications  
N/A Not Applicable  
‡ DSTM Refers to Dymax Standard Test Method

### ELECTRICAL PROPERTIES \*

| Property                           | Value                  | Test Method |
|------------------------------------|------------------------|-------------|
| Dielectric Constant, 1 MHz         | 4.90                   | ASTM D-1304 |
| Dissipation Factor, 1 MHz          | 0.04                   | ASTM D-1304 |
| Dielectric Strength, kV/mm [V/mil] | 200[500]               | ASTM D-1304 |
| Volume Resistivity, ohm-cm         | 500x10 <sup>12</sup>   | ASTM D-1304 |
| Surface Resistivity, ohm-cm        | 6,000x10 <sup>12</sup> | ASTM D-1304 |

| ADHESION   |                |
|------------|----------------|
| Substrate  | Recommendation |
| Lead Frame | ✓              |
| Ceramic    | ✓              |
| PCB        | ✓              |
| Flex       | ✓              |
| Silicon    | ✓              |

✓ Recommended      o Limited Applications  
st Requires Surface Treatment (e.g. plasma, corona treatment, etc.)  
nm Not measured



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**Dymax Corporation**  
+1.860.482.1010 | info@dymax.com | [www.dymax.com](http://www.dymax.com)

**Dymax Europe GmbH**  
+49 611.962.7900 | info\_de@dymax.com | [www.dymax.de](http://www.dymax.de)

**Dymax Engineering Adhesives Ireland Ltd.**  
+353 21.237.3016 | info\_ie@dymax.com | [www.dymax.ie](http://www.dymax.ie)

**Dymax Oligomers & Coatings**  
+1.860.626.7006 | info\_oc@dymax.com | [www.dymax-oc.com](http://www.dymax-oc.com)

**Dymax UV Adhesives & Equipment (Shanghai) Co. Ltd.**  
+86.21.37285759 | dymaxasia@dymax.com | [www.dymax.com.cn](http://www.dymax.com.cn)

**Dymax UV Adhesives & Equipment (Shenzhen) Co. Ltd.**  
+86.755.83485759 | dymaxasia@dymax.com | [www.dymax.com.cn](http://www.dymax.com.cn)

**Dymax Asia (H.K.) Limited**  
+852.2460.7038 | dymaxasia@dymax.com | [www.dymax.com.cn](http://www.dymax.com.cn)

**Dymax Asia Pacific Pte. Ltd.**  
+65.6752.2887 | info\_ap@dymax.com | [www.dymax-ap.com](http://www.dymax-ap.com)

**Dymax Korea LLC**  
+82.2.784.3434 | info\_kr@dymax.com | [www.dymax.com/kr](http://www.dymax.com/kr)

### CURING GUIDELINES

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm<sup>2</sup> [10 psi] between glass slides. Actual cure time typically is 3 to 5 times fixture time.

| Dymax Curing System (Intensity)                                       | Fixture Time or Belt Speed <sup>A</sup> |
|---|---|
| 2000-EC (50 mW/cm <sup>2</sup> ) <sup>B</sup>                         | 1 sec                                   |
| 5000-EC (200 mW/cm <sup>2</sup> ) <sup>B</sup>                        | 1 sec                                   |
| BlueWave <sup>®</sup> 75 (5.0 W/cm <sup>2</sup> ) <sup>B</sup>        | 1 sec                                   |
| BlueWave <sup>®</sup> 200 (10 W/cm <sup>2</sup> ) <sup>B</sup>        | 1 sec                                   |
| UVCS Conveyor with one 5000-EC (200 mW/cm <sup>2</sup> ) <sup>C</sup> | 8.2 m/min<br>[27 ft/min]                |
| UVCS Conveyor with Fusion F300S (2.5 W/cm <sup>2</sup> ) <sup>C</sup> | 8.2 m/min<br>[27 ft/min]                |

**A** Curing through light-blocking substrates may require longer cure times if they obstruct wavelengths used for light curing (320-400 nm for UV light curing, 320-450 nm for UV/Visible light curing). These fixture times/belt speeds are typical for curing thin films through 100% light-transmitting substrates.

**B** Intensity was measured over the UVA range (320-395 nm) using a Dymax ACCU-CAL™ 50 Radiometer.

**C** At 53 mm [2.1 in] focal distance. Maximum speed of conveyor is 8.2 m/min [27 ft/min]. Intensity was measured over the UVA range (320-395 nm) using the Dymax ACCU-CAL™ 100 Radiometer.

Full cure is best determined empirically by curing at different times and intensities, and measuring the corresponding change in cured properties such as tackiness, adhesion, hardness, etc. Full cure is defined as the point at which more light exposure no longer improves cured properties. Higher intensities or longer cures (up to 5x) generally will not degrade Dymax light-curable materials.

### SECONDARY HEAT CURE

Heat can be used as a secondary cure mechanism where the adhesive cannot be cured with light. Light curing must be done prior to heat cure. The following heat-cure schedule may be used:

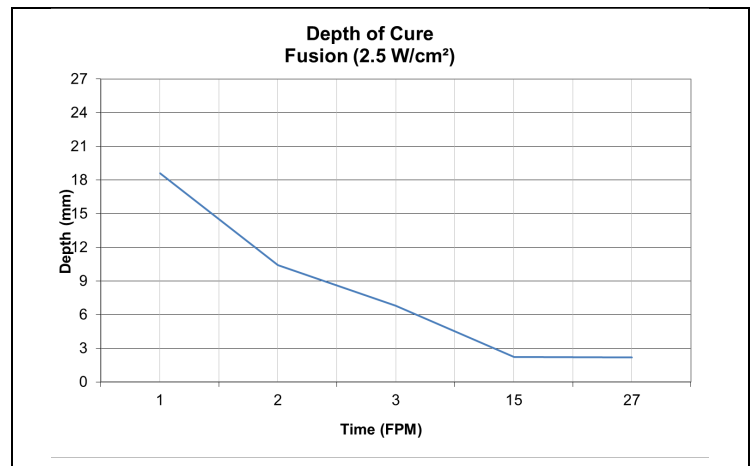
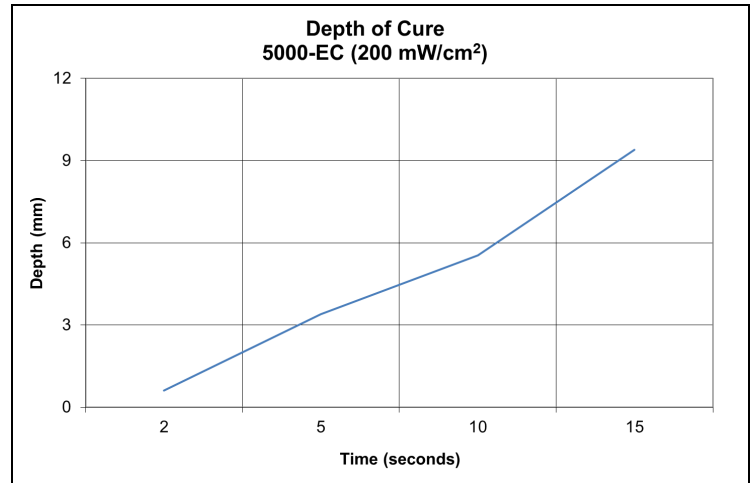
| Temperature   | Time*      |
|---------------|------------|
| 110°C [230°F] | 60 minutes |
| 120°C [250°F] | 30 minutes |
| 150°C [300°F] | 15 minutes |

\*Note: Actual heat-cure time may vary due to part configuration, volume of adhesive applied, and oven efficiency.

Dymax recommends that customers employ a safety factor by curing longer and/or at higher intensities than required for full cure. Although Dymax Application Engineering can provide technical support and assist with process development, each customer ultimately must determine and qualify the appropriate curing parameters required for their unique application.

### DEPTH OF CURE

The graphs below show the increase in depth of cure as a function of exposure time with two different lamps at different intensities. A 9.5 mm [0.37 in] diameter specimen was cured in a polypropylene mold and cooled to room temperature. It was then released from the mold and the cure depth was measured.



### OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV and visible light. Exposure to ambient and artificial light should be kept to a minimum before curing. Dispensing components including needles and fluid lines should be 100% light blocking, not just UV blocking.
2. All surfaces in contact with the material should be clean and free from flux residue, grease, mold release, or other contaminants prior to dispensing the material.
3. Cure speed is dependent upon many variables, including lamp intensity, distance from the light source, required depth of cure, thickness, and percent light transmission of components between the material and light source.
4. Oxygen in the atmosphere may inhibit surface cure. Surfaces exposed to air may require high-intensity (>100 mW/cm<sup>2</sup>) UV light to produce a dry surface cure. Flooding the curing area with an inert gas, such as nitrogen, can also reduce the effects of oxygen inhibition.
5. Parts should be allowed to cool after cure before testing and subjecting to any loads or electrical testing.
6. In rare cases, stress cracking may occur in assembled parts. Three options may be explored to eliminate this problem. One option is to heat anneal the parts to remove molded-in stresses. A second option is to open any gap between mating parts to reduce stress caused by an interference fit. The third option is to minimize the amount of time the liquid material remains in contact with the substrate(s) prior to curing.
7. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
8. At the point of curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.
9. This product is known to thicken over time. For spraying or applications where air entrapment is not an issue, gentle stirring in the original container at room temperature will help restore the product to its original flow consistency. Stirring is recommended for bottles and pails only.

### DISPENSING THE MATERIAL

This material may be dispensed with a variety of manual, semi-automated and fully automated fluid delivery systems. Dymax has several dispensing systems that may be suitable for use with conformal coating materials such as our model 110 mountable atomizing needle valve or SG-100-RS handheld spray gun. Small area applications including beads and small dots can be achieved using hand-held dispensers such as our SD-100 syringe dispenser and our Model 400 needle valve systems. These valve systems can be used in a manual, semi-automated or fully automated application. Questions relating to and defining the best fluid delivery system and curing equipment for specific applications should be discussed with the Dymax Application Engineering Team.

### CLEAN UP

Uncured material may be removed from dispensing components and parts with organic solvents. Cured material will be impervious to many solvents and difficult to remove. Cleanup of cured material may require mechanical methods of removal.

### PERFORMANCE AFTER TEMPERATURE EXPOSURE

Dymax light-curing materials typically have a lower thermal limit of -54°C [-65°F] and an upper limit of 150°C [300°F]. Many Dymax products can withstand temperatures outside of this range for short periods of time, including typical wave solder processes and reflow profiles. Please contact Dymax Application Engineering for assistance.

### STORAGE AND SHELF LIFE

Store the material in a cool, dark place when not in use. Do not expose to light. This product may polymerize upon prolonged exposure to ambient and artificial light. Keep covered when not in use. This material has a 12-month shelf life from date of manufacture, unless otherwise specified, when stored between 10°C (50°F) and 35°C (90°F) in the original, unopened container.

### GENERAL INFORMATION

This product is intended for industrial use only. Keep out of the reach of children. Avoid breathing vapors. Avoid contact with skin, eyes, and clothing. Wear impervious gloves. Repeated or continuous skin contact with uncured material may cause irritation. Remove material from skin with soap and water. Never use organic solvents to remove material from skin and eyes. For more information on the safe handling of this material, please refer to the Safety Data Sheet before use.

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## **ELECTRONIC CIRCUIT BOARD MATERIALS**

### **9-20351-UR Product Data Sheet**

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