Multi-Cure® 9001-E-V3.5
Resilient, Clear Encapsulant

APPLICATIONS
- Encapsulation

FEATURES & BENEFITS
- UV/Visible Light Cure
- Secondary Heat Cure
- Flexible, Light-Curable Encapsulant
- Moisture and Thermal Cycle Resistance

SUBSTRATES
- FR4
- Flex Circuit
- Glass
- Kapton

Dymax Multi-Cure® 9001-E-V3.5 encapsulant is a performance upgrade of the flexible "instant curing" Dymax 9001 UV/Visible light-curable encapsulant, with improved moisture and thermal cycle resistance, and adhesion to various component substrates. Curing completely in as little as five seconds upon exposure to longwave UV and visible light, this material is environmentally resistant with good ionic and electrical properties. Multi-Cure® 9001-E-V3.5 encapsulant displays excellent adhesion to printed circuit boards and electronic components and is especially well suited for chip-on-board, chip-on-flex, and multi-chip modules. Dymax 9001-E-V3.5 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 encapsulation. Dymax lamps offer the optimum balance of UV and visible light for the fastest, deepest cures. This product is in full compliance with the RoHS Directives 2002/95/EC and 2003/11/EC.

UNCURED PROPERTIES *

Property	Value	Test Method
Solvent Content	No Nonreactive Solvents	N/A
Chemical Class	Acrylated Urethane	N/A
Appearance	Clear Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.06	ASTM D1875
Viscosity, cP (20 rpm)	17,000 (nominal)	ASTM D2556

CURED MECHANICAL PROPERTIES *

Property	Value	Test Method
Durometer Hardness	D45	ASTM D2240
Tensile at Break, MPa [psi]	5 [750]	ASTM D638
Elongation at Break, %	150	ASTM D638
Modulus of Elasticity, MPa [psi]	17 [2,500]	ASTM D638
Glass Transition T_g, ˚C	45	DSTM 256‡
CTEα_1, µm/m/˚C	95	ASTM E831
CTEα_2, µm/m/˚C	180	ASTM E831

OTHER CURED PROPERTIES *

Property	Value	Test Method
Refractive Index (20˚C)	1.51	ASTM D542
Boiling Water Absorption, % (2 h)	2.6	ASTM D570
Water Absorption, % (25˚C, 24 h)	1.0	ASTM D570
Linear Shrinkage, %	2	ASTM D2566

ELECTRICAL PROPERTIES *

Property	Value	Test Method
Dielectric Constant (1 MHz)	3.27	ASTM D150
Dissipation Factor (1 MHz)	0.046	ASTM D150
Dielectric Breakdown Voltage, kV/mm [V/mil]	500	ASTM D149
Volume Resistivity, 10^{12} ohm-cm	555	ASTM D257
Surface Resistivity, 10^{12} ohm	6,300	ASTM D257

* Not Specifications
N/A Not Applicable
‡ DSTM Refers to Dymax Standard Test Method

Technical Data Collection Prior to 2009
Rev. 02/08/2012

CURING GUIDELINES

Fixture time is defined as the time to develop a shear strength of 0.1 N/mm^2 [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 [A]
2000-EC (50 mW/cm^2)[B]	3 s
5000-EC (200 mW/cm^2)[B]	2 s
BlueWave® LED Prime UVA (10 W/cm^2)[C]	2 s
BlueWave® 75 (5.0 W/cm^2)[B]	1.4 s
BlueWave® 200 (10 W/cm^2)[B]	1.2 s
UVCS Conveyor with one 5000-EC (200 mW/cm^2)[D]	4.9 m/min [13 ft/min]
UVCS Conveyor with Fusion F300S (2.5 W/cm^2)[D]	8.2 m/min [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 *Intensity was measured over the UVA/Visible range (350-450 nm) using a Dymax ACCU-CAL™ 50-LED Radiometer.*

D *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™ 150 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:

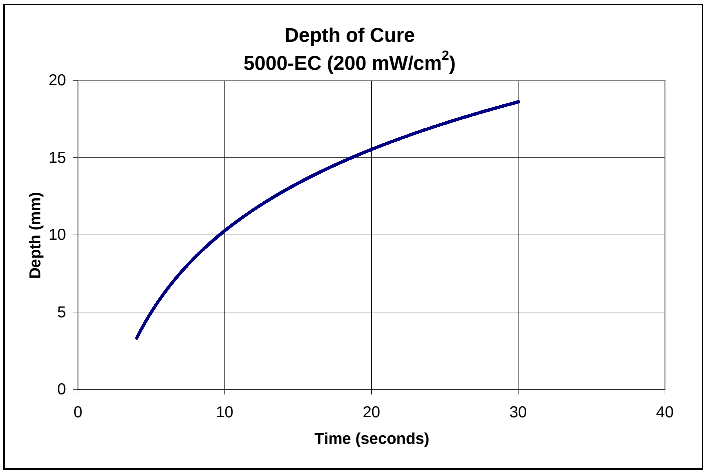
Temperature	Time*
110˚C [230˚F]	60 minutes
120˚C [250˚F]	30 minutes
150˚C [300˚F]	15 minutes

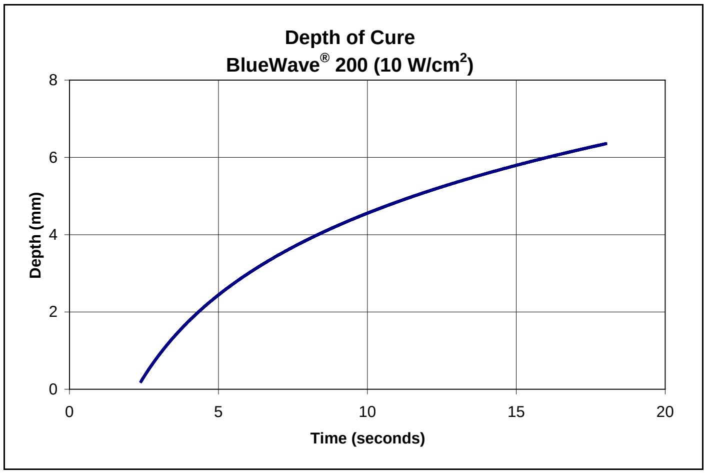
*Note: Actual heat-cure time may vary due to part configuration, volume of adhesive applied, and oven efficiency.

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^2) 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.

DISPENSING THE MATERIAL

This material may be dispensed with a variety of manual and automatic applicators or other equipment as required. Questions relating to dispensing and curing systems for specific applications should be referred to Dymax Application Engineering.

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. Clean up of cured material may require mechanical methods of removal.

PERFORMANCE AFTER TEMPERATURE EXPOSURE

Dymax light-curable 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 shipment, unless otherwise specified, when stored between 10˚C [50˚F] and 32˚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 Material Safety Data Sheet before use.

RECOMMENDED DYMAX LITERATURE

LIT010A	Guide to Selecting and Using UV Light-Curing Systems
LIT019	Light-Curable Materials for Electronic Assembly
LIT051A	UVCS UV Light-Curing Conveyor Systems
LIT077	Chemical Safety
LIT133	UV Light-Curing System Safety Considerations
LIT159	ACCU-CAL™ 50 Radiometer
LIT206	Flood and Focused-Beam UV Light-Curing Systems
LIT218	BlueWave® 200 UV Light-Curing Spot Lamp
LIT238	BlueWave® 75 UV Light-Curing Spot Lamp
LIT267	BlueWave® LED Prime UVA Spot-Curing System
LIT276	ACCU-CAL™ 50-LED Radiometer
LIT290	ACCU-CAL™ 150 Radiometer

Literature is available through our website, www.dymax.com, or by calling any Dymax location.