Dual-Cure 9103
Light/Moisture-Cure Clear Encapsulant

APPLICATIONS

- Chip on Board
- Chip on Flex
- Chip on Glass
- Wire Bonding

FEATURES

- UV/visible Light Cure
- Secondary Moisture Cure
- Flexible Encapsulant
- Shadowed Area Performance
- Moisture and Thermal Resistance

SUBSTRATES

- FR4
- Kapton
- Glass

Dymax Dual-Cure 9103 is an improved, resilient, chip-encapsulant material designed with a UV/visible light and secondary ambient moisture-cure system, making it ideal for encapsulation applications where shadowed areas are present. Dymax 9103 is specially formulated to cure in shadowed areas over time with ambient moisture. Dymax Dual-Cure materials contain no nonreactive solvents and cure upon exposure to light and moisture. Their ability to UV cure tack free 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, supplemented by a secondary moisture cure, they deliver high performance for encapsulation requirements. 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	Translucent Light Straw Liquid	N/A
Soluble in	Organic Solvents	N/A
Density, g/ml	1.09	ASTM D1875
Viscosity, cP (20 rpm)	25,000 (nominal)	DSTM 502‡

CURED MECHANICAL PROPERTIES* (after UV cure + 10 days @ 25˚C/75% RH)

Property	Value	Test Method
Durometer Hardness	D30-D50	ASTM D2240
Tensile at Break, MPa [psi]	4.9 [718]	ASTM D638
Elongation at Break, %	36	ASTM D638
Modulus of Elasticity, MPa [psi]	17.6 [2,560]	ASTM D638
Glass Transition T_g, ˚C	58	DSTM 256‡
CTEα_1, µm/m/˚C	81	DSTM 610‡
CTEα_2, µm/m/˚C	152	DSTM 610‡

OTHER CURED PROPERTIES* ¥

Property	Value	Test Method
Refractive Index (20˚C)	1.50	ASTM D542
Boiling Water Absorption, % (2 h)	0.4	ASTM D570
Linear Shrinkage, %	2.0	ASTM D2566

ELECTRICAL PROPERTIES *

Property	Value	Test Method
Dielectric Constant (1 MHz)	2.80	ASTM D150
Dissipation Factor (1 MHz)	0.06	ASTM D150
Dielectric Breakdown Voltage, kV/mm [V/mil]	24.17 [614]	ASTM D149
Volume Resistivity, ohm-cm	2.62E+13	ASTM D257
Surface Resistivity, ohm	3.53+12	ASTM D257

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

ADHESION

Substrate	Recommendation
FR4	✓
Kapton	✓
Glass	✓

✓ Recommended o Limited Applications
st Requires Surface Treatment (e.g. plasma, corona treatment, etc.)

RoHS Compliant

Technical Data collected 2012

REV. 12/21/2018

DCR# C17-0232 DC439 REV: B ISSUE DATE: September, 2017

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CURING GUIDELINES

Light Cure

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. No moisture cure time was allowed for this evaluation.

Dymax Curing System (Intensity)	Fixture Time or Belt Speed [A]
5000-EC (200 mW/cm^2)[B]	2 s
BlueWave® 200 (10 W/cm^2)[B]	0.4 s

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.*

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.

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.

SECONDARY MOISTURE CURE

A combination of light and moisture cure is required to achieve full cured mechanical properties. Moisture is also used as a secondary cure mechanism for shadowed areas that cannot be cured with light. While moisture cure time in shadowed areas is typically 2-3 days at 25˚C [77˚F], 50% RH, actual moisture cure time is application specific and may vary. For adhesive that has been light cured, typical full property development is after 7 days at 25°C [77°F], 50% RH. Cure time for both light cured and shadow areas depends on humidity level, amount of coating in shadowed areas, and proximity of shadowed coating to humidity. Coating entrapped under large components may have a prolonged cure time. Exposure to heat (typically 65˚C-80˚C) and higher relative humidity will accelerate cure. Accelerated moisture cure time is also dependent on the variables listed above.

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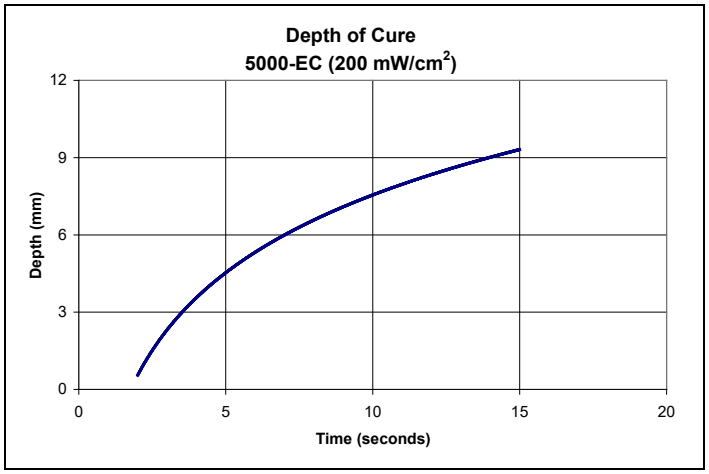
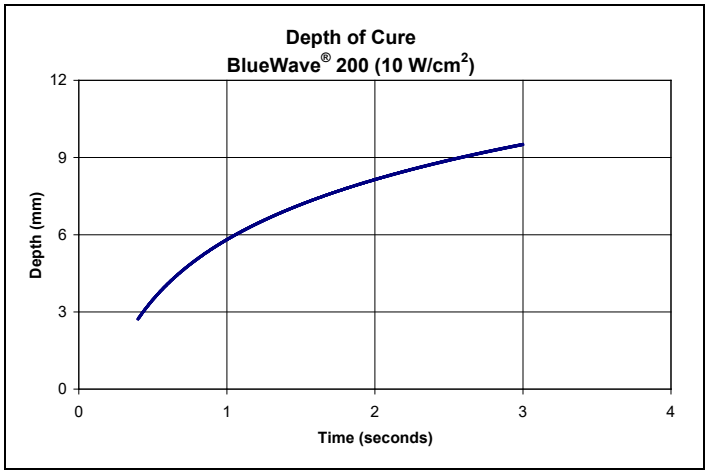
DEPTH OF CURE

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.





9103 Product Data Sheet

OPTIMIZING PERFORMANCE AND HANDLING

1. This product cures with exposure to UV/visible light and ambient moisture. Exposure to light and ambient moisture 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. Light curing generally produces some heat. If necessary, cooling fans can be placed in the curing area to reduce the heating effect on components.
7. At the point of light curing, an air exhaust system is recommended to dissipate any heat and vapors formed during the curing process.
8. Do not open the syringe before contents reach 25˚C [77˚F]. Typical warm-up time for a syringe is two hours. Remove any moisture collected on the warmed-up syringe before opening.
9. Light cure is recommended prior to moisture cure. Full cure develops after light and moisture cure.

DISPENSING THE MATERIAL

This material may be dispensed with a variety of manual, semi-automated and fully automated fluid delivery systems. Small area applications including beads and small dots can be achieved using hand-held Dymax dispensing systems like our SD-100 syringe dispenser and our Model 400 needle valve systems. The valve system can be used in a manual, semi-automated or fully automated application. Dymax has several other dispensing systems that may be suitable for use with our masking materials. 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 such as ultrasonic bath, water jet, vacuum tweezers, air knife and/ or warming to aid in the removal.

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 as well as atmospheric moisture. Keep covered when not in use. This material has a 10-month shelf life from date of manufacture, unless otherwise specified, when stored between 1°C [34°F] and 5°C [41°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.

The data provided in this document are based on historical testing that Dymax performed under laboratory conditions as they existed at that time, and are for informational purposes only. The data are neither specifications nor guarantees of future performance in a particular application. Dymax does not guarantee that this product's properties are suitable for the user's intended purpose.

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