

Smart Connected Device Assembly

UV Light-Curable Materials for the Assembly of Mobile Phones, Tablets, Portable Computers, Laptops, Readers, and Other Smart Connected Devices

OUR TECHNOLOGY. YOUR ADVANTAGE.®



Light-Curable Materials.

Dispensing Systems.

Light-Curing Equipment.

Technical Expertise.

At Dymax, we combine our product offering with our expert knowledge of light-cure technology. Where others only supply products, we are committed to developing a true collaborative partnership, bringing our unsurpassed expertise in light-cure technology and total process knowledge to our customers' specific application challenges.

Because we understand the process as a whole, we can offer our customers a solution where chemistry and equipment work seamlessly together with maximum efficiency. Our [application engineering team](#) works side-by-side with our customers, providing assistance with product and process design, equipment selection and integration, testing, evaluation, and pre-production trials throughout the life of the assembly process. Our laboratory is fully equipped to deliver mechanical or electrical testing, as well as specialty testing such as flowers of sulfur, salt spray, or thermal shock to ASTM standards. The lab also has a variety of curing equipment and manual and automated dispensing systems for evaluation.

Our assembly solutions and expertise give manufacturers the knowledge and tools to increase productivity, lower costs, increase safety, and achieve a more efficient manufacturing process. That's a competitive advantage they can't get anywhere else.

Dymax Light-Curable Materials

for Smart Connected Device Assembly

The smart connected device industry is rapidly evolving at a faster rate than ever before. Today's complex designs, innovative materials, and increased focus on the environment can present challenges to many manufacturers. Whatever demands or challenges you face, Dymax is here to work with you to design a more efficient process for a higher quality end product.

From conformal coatings to encapsulants to edgebond materials to adhesives for camera lens assembly, Dymax provides innovative, solvent-free, UV light-curing technology solutions. We offer many cost-reducing solutions that turn problems like shadowed areas, cure confirmation, and production throughput into non-issues. IPC approved, MIL-I-46058C and UL listed self-extinguishing grades are available.

Dymax is dedicated to reducing environmental impact. Our products replace technologies that contain hazardous ingredients, produce waste, or require higher amounts of energy to process. We understand that safe, ecologically friendly products benefit our customers, the environment, and us. We have created materials with attributes that lower product costs, life-cycle costs, and ecological impact. Many of our materials for smart connected device assembly are certified as halogen free and meet or exceed standards set forth in IEC 61249-2-21.



Typical Applications



1. Camera Module Assembly

2. Micro Speaker Assembly

3. LED Coating

4. LCD Laminating

5. LCD - Form-In-Place Gasket

6. Hard Coating for Screen Protection

7. Flex Circuit Bonding

8. IC- Ruggedization (Underfill Alternative)

9. Masking for Protection During Processing

10. Tamper Proofing

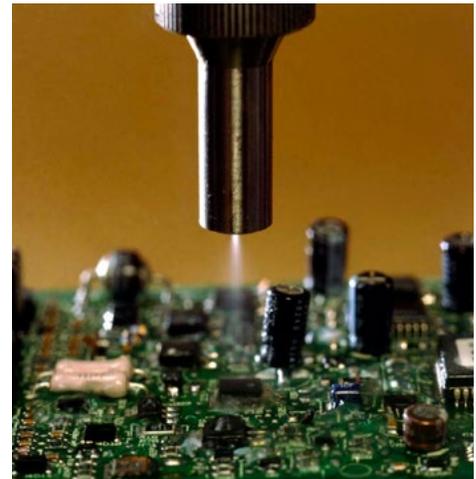
11. PCB - Conformal Coating

12. PCB - Masking

Conformal Coatings

Dymax conformal coatings for printed circuit boards cure tack free in seconds upon exposure to UV/Visible light to help streamline manufacturing assembly processes. Apply, cure, and ship immediately and eliminate the time-consuming steps of traditional thermal-cure and room temperature-cure conformal coatings. Each conformal coating is one part (no mixing required) for easy dispensing and is electrically insulated so it can be applied over the entire PCB surface or in select areas to provide protection from service environments. Dymax conformal coatings are available for tin whisker mitigation, humid environments, and are also available with Dual-Cure technology. Dual-Cure products cure over time in shadowed areas with moisture, eliminating the need for a second process step and concerns of component life degradation due to temperature exposure.

Our solvent-free conformal coatings contain very low VOCs, eliminating the need for solvent handling, while enhancing worker safety and minimizing environmental impact.

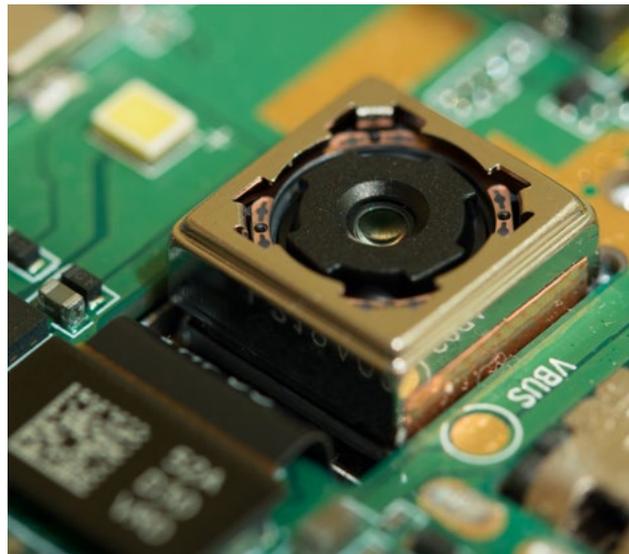


| Product Number* | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Approvals | Halogen Free? |
|----------------------------|---|---------------|--------------------|-----------------------------|----------------------------------|--|---------------|
| 9-20351-UR | Ultra-Red® fluorescing; flexible; high viscosity for thick selective coating; solvent free; isocyanate free | 13,500 | D60 | 13.7 [2,000] | 30.3 [4,400] | — | |
| 9-20557 | Flexible; medium-viscosity coating for thin coating applications; solvent free; isocyanate free; blue fluorescing | 2,300 | D60 | 15.8 [2,300] | 37.9 [5,500] | MIL-I-46058C IPC-CC-830-B UL 94V-1 UL 746 | |
| 9451 | Matte black finish; secondary heat cure for shadow areas; optimized for single pass coating up to 0.004" | 6,000 | — | 42.7 [6,200] | 717 [104,000] | UL 94V-0 | |
| 9452-FC | Low viscosity; LED curable; secondary heat cure; blue fluorescing | 20 | D60 | 34 [4,950] | 1,137 [165,000] | UL 94V-0 | |
| 9481-E | Secondary moisture cure for shadow areas; solvent free; blue fluorescing | 125 | D75 | 11 [1,600] | 150 [21,800] | MIL-I-46058C IPC-CC-830B UL 94V-0 UL 746E | |
| 9482 | Secondary moisture cure for shadow areas; solvent free; blue fluorescing | 1,100 | D70 | 15.8 [2,300] | 275 [40,000] | MIL-I-46058C IPC-CC-830B UL 94V-0 UL 746E | |

Materials for Camera Module Assembly

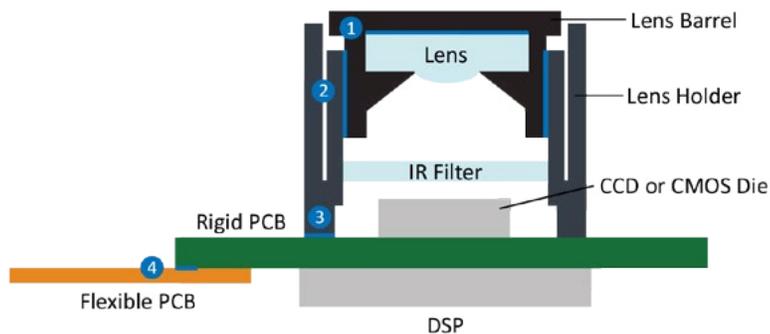
Dymax light-curable adhesives are ideal for use in the assembly of camera modules used in smart connected devices, automobiles, and industrial camera systems. Our adhesives cure in seconds, providing greater product yields in a much shorter assembly time. They provide excellent adhesion to substrates typically used in the manufacture of electronic device housings and camera modules, and can withstand harsh conditions like the moisture and shock which electronic devices are often exposed to.

- Excellent adhesion to commonly used substrates in camera module assemblies
- Materials cure in seconds allowing faster processing and higher throughput
- Materials available for a variety of applications including active alignment, barrel fixturing, and FPC reinforcement
- Good resistance to moisture and shock



TYPICAL CAMERA MODULE APPLICATIONS

1. Bonding the camera lenses
2. Fixturing the lens barrel to lens holder
3. Bonding the lens holder to the PCB (active alignment)
4. Flexible PCB reinforcement



| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Halogen Free? |
|----------------|--|---------------|--------------------|-----------------------------|----------------------------------|---|
| 3069-T | UV/Visible light cure; adhesion to various substrates including LCP and TPU materials; different viscosities available | 6,000 | D55 | 17 [2,400] | 170 [25,000] |  |
| 3094-T | UV/Visible light cure; adhesion to various substrates including PC and lens materials; different viscosities available; low shrinkage and stress | 9,000 | D62 | 14 [2,100] | 240 [35,000] |  |
| 3-20686 | UV/Visible light cure; adhesion to various substrates including PC and lens materials; low outgassing | 4,000 | D85 | 48 [6,900] | 760 [110,000] |  |

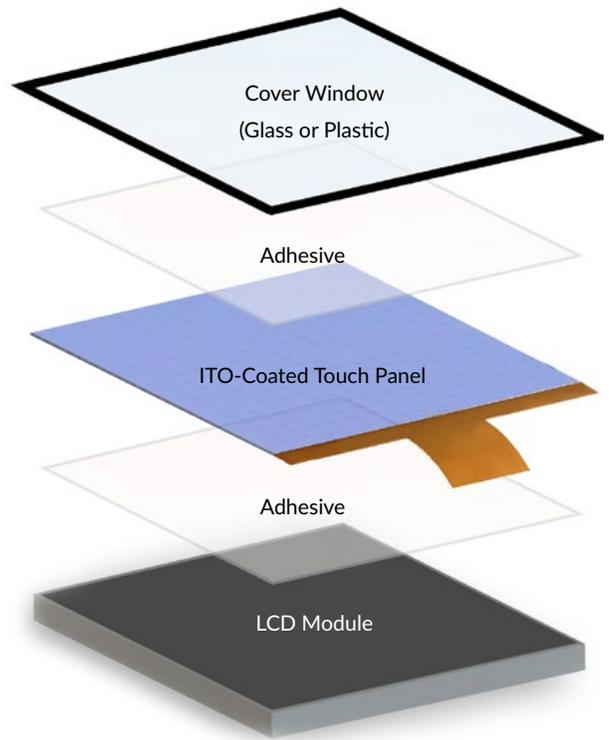
Materials for Display Lamination and Assembly

Dymax light-curable adhesives for display lamination and bonding are specifically formulated for applications where durable, crystal-clear, invisible bonds are required. Their fast, on-demand cure allows substrates to be repositioned precisely until parts are ready to be cured. One-part LCD adhesives are ideal for bonding flat panel displays, touch screens, LCD screens, liquid crystal displays, mobile phones, and many other electronic devices.

Benefits of Dymax display lamination adhesives include:

- Very low yellowing for increased light transmission, enhanced brightness, optical clarity, and better contrast ratios
- Excellent bond strength
- Superior re-workability for easy removal or repair
- Easy flow characteristics for flat panel lamination
- Excellent thermal shock resistance
- Low shrinkage minimizes visible distortion after cure

LCD adhesives also help reduce air entrapment and bubbles to create strong, ripple-free bonds that help increase panel strength. They also act as a barrier against stressing, significantly improving product reliability and minimizing warranty costs.



Typical Display Construction

| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Halogen Free? |
|----------------------|--|---------------|--------------------|-----------------------------|----------------------------------|---|
| 9701 | Excellent re-workability; very low yellowing; low shrinkage; good thermal shock resistance; bonds to a variety of surfaces | 200 | 00-70 | 0.49 [71] | 0.54 [79] |  |
| 9702 | Excellent re-workability; low shrinkage; very low yellowing; good thermal shock resistance; Bonds to a variety of surfaces | 950 | 00-70 | 0.89 [129] | 0.36 [52] |  |
| 9703 | High viscosity making it ideal for edge damming applications; low shrinkage; very low yellowing; good thermal shock resistance; excellent re-workability; bonds to a variety of surfaces | 30,000 | 00-80 | 1.85 [268] | 0.73 [106] |  |

Encapsulants for Printed Circuit Boards

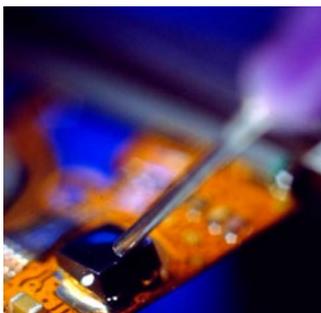
Dymax light-curable materials cure in seconds upon exposure to UV and/or visible light to produce tough, flexible encapsulants for bare die, wire bonds, or integrated circuits (IC). The encapsulants' fast cure helps reduce processing and energy costs associated with alternative technologies. The materials are all one part, so no mixing is required and viscosity is consistent. In addition, Dual-Cure light/moisture cure encapsulants are available to address shadowed area concerns.

Dymax encapsulating materials have high ionic purity, and resistance to humidity and thermal shock, which effectively

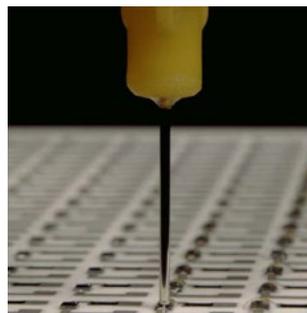
protect components. Our encapsulants contain no sharp, abrasive, mineral or glass fillers which may abrade fine wires. Their combination of low Tg and low modulus translates into low stress for bonded wires.

UV light-curing and UV/Moisture-cure resins are ideal for glob-top and chip-on-board applications. They may also be used on flex circuits (FPC) for encapsulating ICs, coating the circuit, or attaching it to glass or PCB. A wide range of viscosities from thin wicking to non-flowing gel are available.

| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Halogen Free? |
|-------------------------------|---|---------------|--------------------|-----------------------------|----------------------------------|---|
| 9-20558-REV-A | UV/Visible light-curing with secondary heat cure; high viscosity; flexible; bonds well to FPCs | 20,000 | D50 | TBD | TBD |  |
| 9001-E-V3.1 | UV/Visible light cure with secondary heat cure; high viscosity; excellent adhesion to PCB & components | 4,500 | D45 | 5.2 [750] | 17 [2,500] |  |
| 9008 | UV/Visible light cure; flexible; excellent adhesion to polyimide | 4,500 | D35 | 10 [1,500] | 45 [6,500] |  |
| 9037-E | UV/Visible light cure with secondary heat cure; flexible; moisture and thermal resistance; blue fluorescing | 51,234 | D42 | 9.8 [1,426] | 10.7 [1,554] |  |
| 9101 | UV/Visible light cure with secondary moisture cure; flexible; moisture and thermal resistance | 7,000 | D30-D50 | 5.06 [735] | 17.5 [2,550] |  |
| 9102 | | 17,000 | | 4.8 [703] | 18.4 [2,670] | |
| 9103 | | 25,000 | | 4.9 [718] | 17.6 [2,560] | |



Encapsulants



FPC to Glass Strain Relief



Glob Top Encapsulants

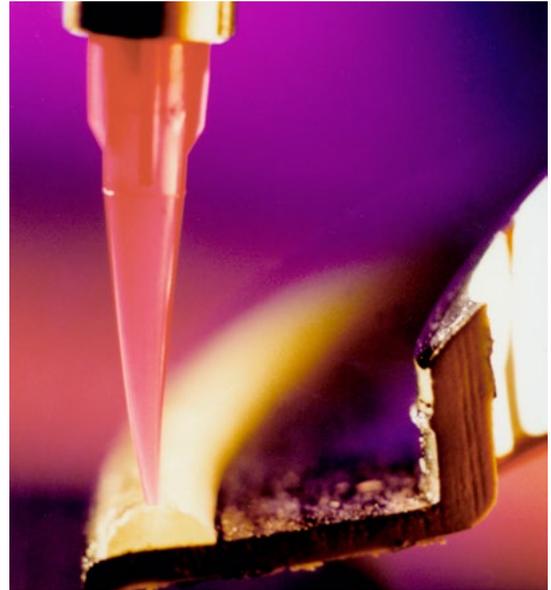


FPC to LCD Module

Form-in-Place/Cure-in-Place Gaskets

Light-curable form-in-place, cure-in-place gasket materials are designed for automated dispensing to support high-volume production and consistency in bead profile for single-wall, flat-surface, or channel configurations. The materials act as a barrier to prevent absorption or penetration of air, dust, noise, liquids, gaseous substances, or dirt for sound dampening, vibration dampening, moisture protection, chemical protection, and air sealing. The gaskets conform to complex and intricate channels, on both vertical and horizontal surfaces, with thixotropic formulations, and flow into channels with Newtonian formulations.

This technology accommodates engineering changes without high tooling investment, helping to reduce costs, and turning problems like production throughput into non-issues. Dymax is dedicated to reducing environmental impact. Our one-part, 100% solids gasket resins are silicone free and replace technologies that contain hazardous ingredients, produce waste, and require higher amounts of energy to process. We understand that safe, ecologically friendly products benefit our customers, the environment, and us. We have created materials with attributes that lower product costs, life-cycle costs, and ecological impact.



| Product Number | Features | Durometer Hardness | Nominal Viscosity, cP | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] |
|--------------------------|--|--------------------|-----------------------|-----------------------------|----------------------------------|
| GA-142-F | Soft, tacky gasket with good adhesion to nylons and metals; cures in seconds with UV/visible light; blue fluorescing for easy black-light inspection | 00-60 | 40,000 | 0.24 [36] | 0.01 [2] |



Formulas with See-Cure Technology Available



Compatible with Automated Dispensing Systems



Easily Conforms to Complex Shapes and Channels



Black Gaskets Available

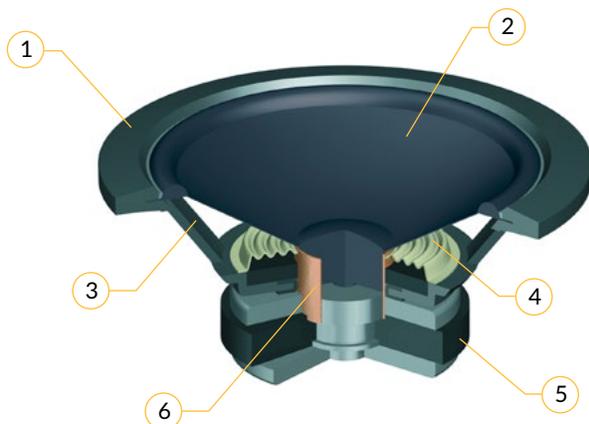
Materials for Micro Speaker Applications

With consumers increasingly turning to their phones and other smart devices for music and multimedia applications, the necessity for high-quality micro speakers has drastically increased. UV light-curable adhesives are ideal for micro speaker applications because they provide a strong bond to plastics and metals while providing enough flexibility that sound properties are not compromised.

Dymax adhesives for speaker assembly cure in seconds for optimal performance in speaker applications and can be used in a number of applications including bonding speaker magnets, cones, speaker membranes, and voice coils.



| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Halogen Free? |
|-------------------------|---|---------------|--------------------|-----------------------------|----------------------------------|---|
| 9-20763 | UV/Visible light cure; black color; high adhesion to voice coil and membranes | 13,000 | D60 | 37 [5,300] | 14 [21,000] | |
| 9671 | UV/Visible light cure; bright red color; high adhesion to LCP, voice coil; thick viscosity for easy application | 45,000 | D55 | 15.8 [2,100] | 193 [26,000] |  |



TYPICAL SPEAKER COMPONENTS

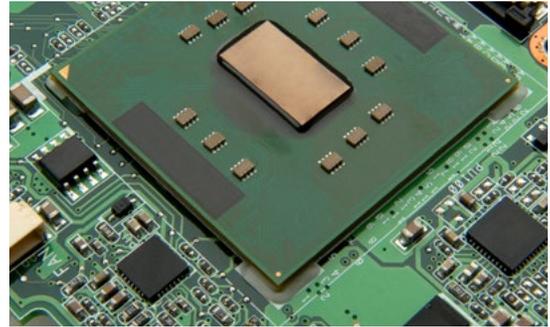
1. Suspension
2. Cone
3. Basket
4. Spider
5. Magnet
6. Voice Coil

Ruggedizing/Edgebond Materials for BGAs & VGAs

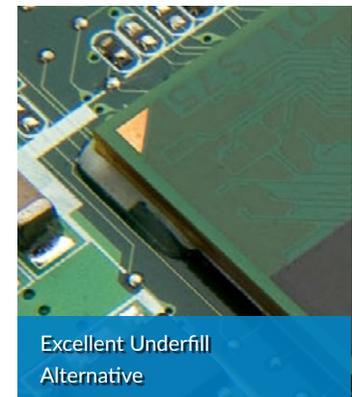
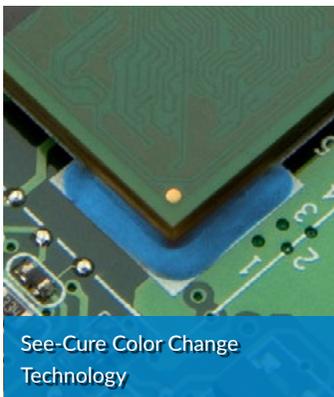
Dymax component ruggedizing and staking materials are engineered to hold critical components, such as Ball Grid Arrays (BGA) and Video Graphics Arrays (VGA), for secondary processes or long-term reliability. Should one ball-grid interconnect fail, an entire device could be compromised. UV light-curable ruggedizing materials help enhance the shock and vibration resistance of electronic assemblies.

As an alternative to underfill or heat-cured epoxies, light-curable adhesives offer a range of benefits including:

- Fast, ambient dispense and cure in seconds
- Easy rework – adhesive leaves no residue on solder pads or between solder balls
- Reduced stress on interconnects during push, pull, shock, drop, and vibration
- Enhance PCB life span
- Eliminate leadless component (BGA/VGA) interconnect cracking due to CTE mismatch
- Post reflow application
- Simple visual inspection



| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Halogen Free? |
|-------------------------|---|---------------|--------------------|-----------------------------|----------------------------------|---|
| 9309-SC | UV/Visible light cure; formulated with See-Cure technology; high viscosity; highly thixotropic material | 45,000 | D57 | 22 [3,000] | 90 [13,000] |  |
| 9422-SC | UV/Visible light cure; formulated with See-Cure technology; high viscosity; Reduces stress on board components; highly thixotropic material for minimal movement after dispense | 38,000 | D50 | 16 [2,300] | 98 [14,000] |  |



SpeedMask® Temporary Masking Resins

Superior Protection of Printed Circuit Board Components During Processing

Protect connectors and board-level areas during processing with SpeedMask® masking resins. The masks provide reliable, one-layer protection during wave solder and reflow processes, as well as during conformal coating with both solvent-based and light-cure coatings. The masks cure in seconds and are easily removed by peeling.



| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] | Halogen Free? |
|---------------------------------|---|---------------|--------------------|-----------------------------|----------------------------------|---|
| 9-7001 | Ideal for masking PCB keep-out areas and connectors; pink color in uncured state; compatible with gold and copper pins; resistant to solvent-based conformal coatings and primers | 40,000 | A55 | 3.8 [560] | 40,000 |  |
| 9-20479-B-REV-A | Ideal for masking board pins and connectors; compatible with gold and copper pins; blue color; thixotropic for manual or automated dispense | 150,000 | A70 | 3.37 [490] | 150,000 |  |

Protection of Parts During Handling and Surface Treatments

SpeedMask® masking resins are ideal for protecting delicate surfaces from scratching or other damage during handling or protecting parts during more aggressive surface treatments like anodizing, machining, and polishing. The masks are available in highly visible colors, making it easy to confirm placement. They cure in seconds, allowing the part to be processed immediately. After processing, the masks are easily removed from non-porous surfaces, leaving no residue behind.



| Product Number | Features | Viscosity, cP | Durometer Hardness | Tensile at Break, MPa [psi] | Modulus of Elasticity, MPa [psi] |
|--------------------------|---|---------------|--------------------|-----------------------------|----------------------------------|
| 708-SR | Ideal for part handling processes; high-visibility red color; easy peel off; medium viscosity gel; sprayable | 30,000 | A65 | 15 [2,200] | 69 [10,000] |
| 728-G-LV | Ideal for machining and polishing processes; high-visibility green color; easy peel off after hot water soak; spray or dip dispense options; acid resistant | 2,500 | D50 | 23.4 [3,400] | 293 [42,500] |
| 730-BT | Excellent surface protection and chemical resistance during anodizing; moderate adhesion; spray or dip; trimmable after cure; high-visibility blue color | 20,000 | D35 | 3.4 [500] | 3.4 [500] |

Innovative Technologies

SEE-CURE TECHNOLOGY

Dymax light-curable adhesives with patented See-Cure technology have built-in cure validation that makes it easy for operators or simple automated inspection equipment to confirm cure without investing in additional specialized equipment. See-Cure technology is an indicator of cure that intentionally transitions the color of the adhesive after it has cured and builds a visible safety factor into the assembly process.

ULTRA-RED® FLUORESCING TECHNOLOGY

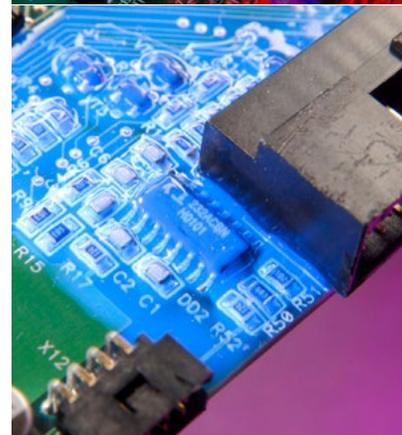
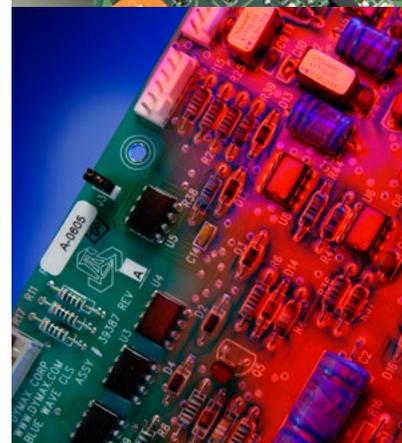
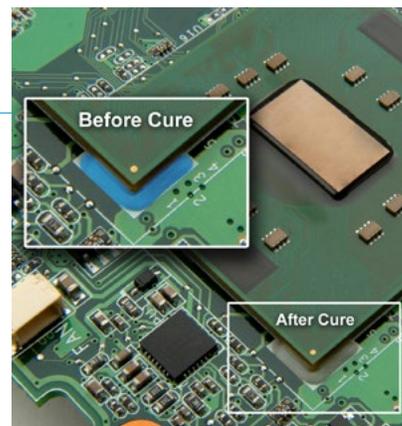
Ultra-Red® fluorescing technology, formulated into Dymax adhesives, enhances bond-line inspection processes and product authentication. The adhesives remain clear until exposed to low-intensity UV light at which point they fluoresce bright red. This is particularly effective while bonding plastics that naturally fluoresce blue, such as PVC and PET. Ultra-Red technology also produces a unique spectral signature that can be used by manufacturers for product authentication.

DUAL-CURE LIGHT/MOISTURE-CURE TECHNOLOGY

Dual-Cure coatings are formulated to ensure complete cure in applications where shadowed areas on high-density circuit boards are a concern. Previously, areas shadowed from light were managed by selective coating or a secondary heat-cure process. Dual-Cure coatings ensure shadowed areas cure over time with moisture, eliminating the need for that second process step or concerns of component life degradation due to temperature exposure.

LED LIGHT-CURABLE ADHESIVES & COATINGS

Dymax offers specially formulated LED light-curable adhesives for use with Dymax LED UV/Visible light-curing systems. The adhesives range from fast to ultra-fast cure speeds in order to accommodate specific medical device, electronic, and industrial assembly needs.



Dispensing & Curing Equipment

Dymax offers a wide range of curing equipment including various spot lamps, flood lamps, and conveyor systems, as well as radiometers and other accessories. Since Dymax designs and manufactures its own lamp systems, the lamps are optimized to work with the adhesives to gain process efficiencies by targeting rapid surface curing, depth of cure, and speed of cure, all while delivering light in a rapid and economical way. CE marked equipment is available.

DISPENSING SYSTEMS

Our Application Engineering lab can assist manufacturers with integrating the appropriate manual and robotic dispensing systems into their production lines.

SPOT LAMPS

Spot lamps provide a wide variety of methods to deliver light to a very precise location. They can be used manually by an operator or incorporated into a high-speed automated assembly line. Dymax offers multi-spectrum light-emitting lamps which use high-pressure mercury vapor bulbs, as well as light-emitting diode spot lamps, which use an array of surface-mounted LEDs instead of traditional metal halide or mercury bulbs.

FLOOD LAMPS

Static flood lamp systems are suited for area curing or for curing multiple assemblies. They use moderate- to high-intensity, multi-spectrum UV/Visible light for fast curing. Light-curing flood lamps can be easily integrated into existing manufacturing processes by mounting the lamps above high-speed assembly lines to achieve rapid cures. Shutter assemblies, mounting stands, and shields are available to create a custom curing system.

CONVEYOR SYSTEMS

Conveyor systems consist of a moving belt that passes through a curing tunnel with multi-spectrum lamps mounted from above or on each side for fast curing of parts. These conveyor systems are designed to offer consistent, fast, and safe curing. They can be outfitted with standard metal halide (longwave UV), mercury (shortwave UV), or visible bulbs. Consistent line speed, lamp height, and intensity provide a consistent light-curing process for high throughput.

RADIOMETERS

Measurement of the lamp intensity and dosage is critical to the successful implementation of light-curing technology. Dymax radiometers allow operators to monitor and document a light-curing process.

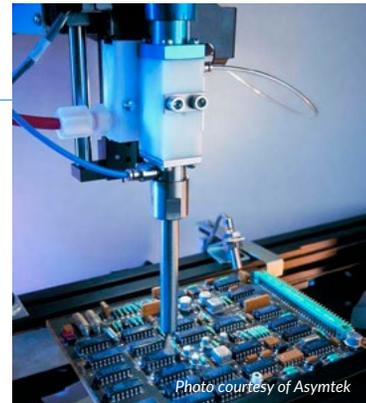


Photo courtesy of Asymtek





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SG007 8/18/2017

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