

## LIGHT-CURABLE MATERIALS FOR ELECTRONICS ASSEMBLY

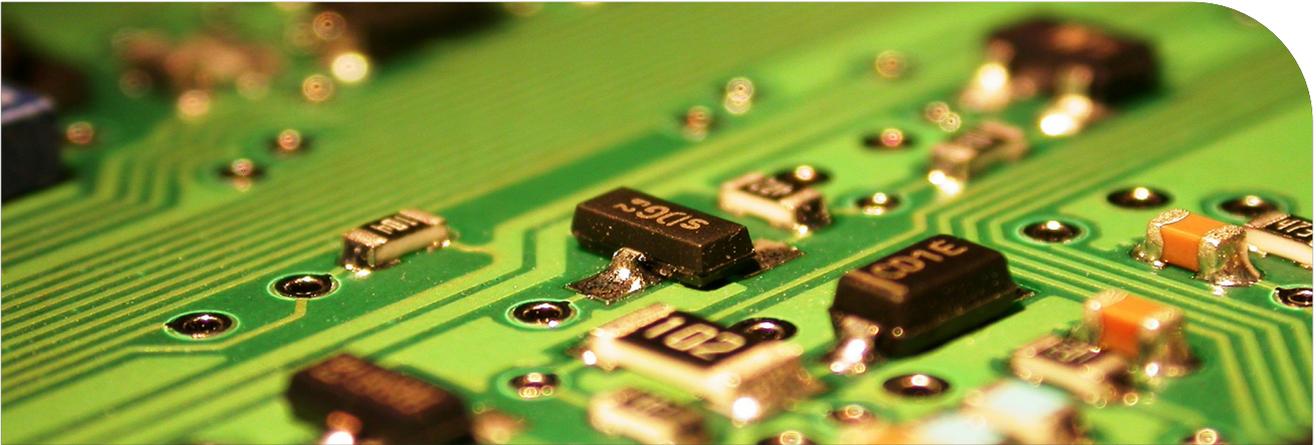


Only Dymax offers expert knowledge of light-cure technology, along with a full array of light-cure products. Dymax is committed to developing a true collaborative partnership — applying our extensive process knowledge to your specific application challenges.

We create custom solutions to ensure that chemistry and equipment work seamlessly together with maximum efficiency. 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.

# Dymax Light-Curable Materials for Electronics Assembly

Dymax offers a broad range of light-curable materials for use in circuit protection and electronic assembly applications. These materials cure in seconds for faster processing and higher throughput and are available with many innovative and patented technologies that turn problems like shadow areas, cure confirmation, and difficult inspection into non-issues. The materials are electrically insulating, making them a perfect fit for conformal coating, encapsulation, bonding, thermal management, masking, and many other electronic assembly processes. Dymax light-curable materials contain no added solvents and are one-part, requiring no mixing or prep before application. Most products are available in multiple-viscosity grades, so the material flow may be tailored to the individual application. IPC approved, MIL-I-46058C and UL listed self-extinguishing grades are available.



## Environmental Benefits of Light-Curing Materials

Dymax understands that safe, ecologically friendly products benefit our customers, the environment, and us. We have created materials that minimize ecological impact. These attributes include:

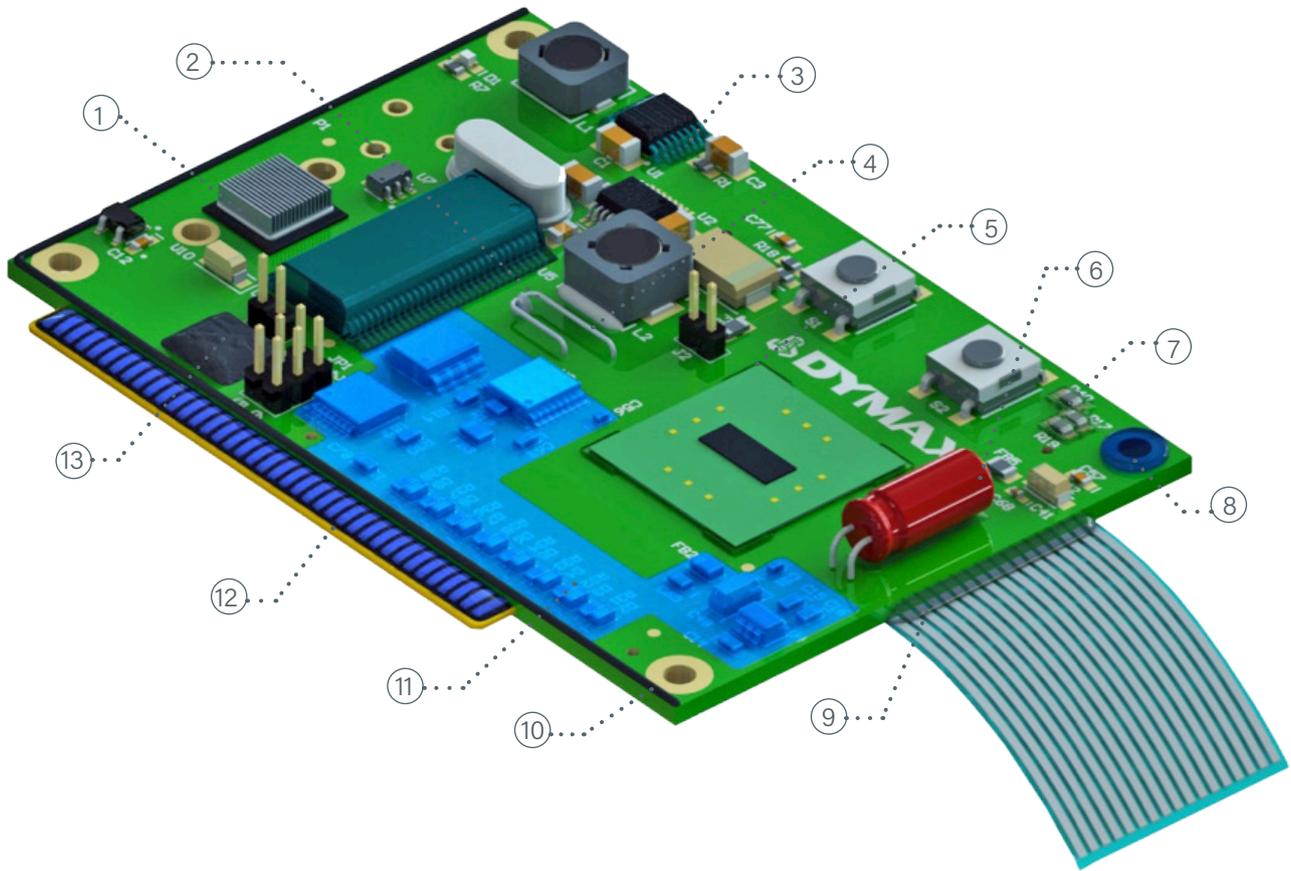
- Materials with no added solvents
- Halogen-free materials
- RoHS compliance
- Eco-friendly, one-component materials

Dymax halogen-free conformal coatings, encapsulants, and adhesives are documented by an independent laboratory to meet or exceed standards set forth in IEC 61249-2-21. This international directive defines halogen-free as <900 ppm for chlorine, <900 ppm for bromine and <1,500 ppm total level of both combined. The current test method used for certification is BS EN 14582:2007.

## REACH

Dymax endorses the outcome of the REACH program. We are pleased to report that we have registered all affected substances used at Dymax with the centralized database maintained by the European Chemical Agency (ECHA) in Helsinki.

# Typical Applications for Printed Circuit Boards



- |                             |                          |                          |
|-----------------------------|--------------------------|--------------------------|
| 1. Thermal Interface        | 6. Reinforcement         | 11. Conformal Coating    |
| 2. Wire Tacking             | 7. Encapsulation         | 12. Peelable Mask        |
| 3. Encapsulation            | 8. Masking               | 13. Glob Top Encapsulant |
| 4. Staking                  | 9. Strain Relief         |                          |
| 5. Ruggedization/Cornerbond | 10. Cure-In-Place Gasket |                          |

# Camera Module Assembly Materials

Product Number	Features	Viscosity, cP	Durometer Hardness	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]	Halogen Free?
<b>Fixturing the Camera Lens Barrel to the Lens Holder   Typical requirement: Tack-free surface</b>						
3094-T-REV-A	UV/Visible light cure; fast curing; low shrinkage and stress	11.750	D65	12,4 [1.800]	179 [26.000]	
9801	Low shrink epoxy; LED curable; UV/Visible light cure and/or low temp. (80-85°C) heat cure; moisture and thermal cycle resistant; cold storage/ship	60.000	D90	45 [6.600]	1.600 [230.600]	Not Tested
3094-GEL-REV-A	UV/Visible light cure; fast curing; low shrinkage	30.000	D67	14 [2.000]	698 [101.300]	
3094-T-TF*	UV/Visible light cure with secondary heat cure; fast curing; low shrinkage and stress	6.500	D67	13,8 [2.000]	650 [94.317]	
9202-W	IBOA-free positioning adhesive for wearable devices; designed for optical alignment; low shrinkage; low CTE; heat cycle stable	260,000	D88	35.9 [5,200]	4,214 [611,150]	
9211-W	IBOA-free adhesive for wearable devices; low stress; adheres to a wide range of plastics	20,000	D63	16.4 [2,378]	700 [101,540]	
9803	Very low shrink epoxy; LED curable; UV/Visible light cure and/or low temp. (80-85°C) heat cure; moisture and thermal cycle resistant; cold storage/ship	86.000	D94	36,7 [5.328]	3.983 [578.000]	Not Tested
<b>Flexible PCB Reinforcement   Typical requirement: Flexibility; bend resistance</b>						
9008	UV/Visible light cure; remains flexible to -40°C; moisture resistant	4.500	D35	10 [1,500]	45 [6,500]	
9101	UV/Visible light cure with secondary moisture cure; flexible; moisture and thermal resistant	7.000	D30-D50	5.06 [735]	175 [2,550]	
<b>Other Applications</b>						
9309-SC	UV/Visible light cure; adhesion to various PCB substrates; formulated with See-Cure color-change technology	45.000	D57	22 [3.200]	163 [23.800]	
6-621-GEL	UV/Visible light cure with secondary heat cure; activator cure; hard, clear bonds	25.000	D80	28 [4.000]	730 [106.000]	
6-621-VT		14.000				
6-621-T	UV/Visible light cure with secondary heat cure; activator cure; hard, clear bonds	3.500	D80	28 [4.000]	730 [106.000]	
9001-E-V3.0	UV/Visible light cure; low ionic; good electrical properties	400	D45	5,17 [750]	17,2 [2.500]	

Featured Product

\* This product is not available for sale in Europe.



## Key Attributes

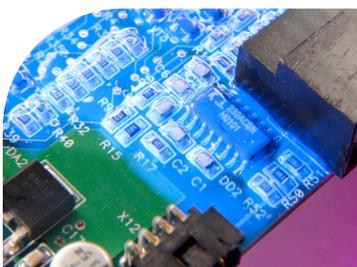
- UV/Visible light cures in seconds
- Good resistance to moisture and shock
- Low shrinkage
- Secondary heat or moisture cure available

# Conformal Coatings

Product Number*	Description	Nominal Viscosity (cP)	Durometer Hardness	Modulus of Elasticity, MPa [psi]	Dielectric Strength, Volts/mil	Approvals	Halogen Free?
9483	Room-temperature secondary moisture cure for shadow areas; blue fluorescing; temperature/humidity performance; corrosion and thermal shock resistance	750	D60	276 [40,000]	1.500	MIL-I-46058C IPC-CC-830 UL 94V-0 UL 746E	
9-20557	Medium viscosity for wetting components; low modulus for thermal cycling; performance; blue fluorescing; secondary heat cure for shadow areas	2.300	D60	37,9 [5,500]	>1.500	MIL-I-46058C IPC-CC-830 UL 94V-1 UL 746	
9451	True black coating ideal for covering sensitive information; secondary heat cure for shadow areas; optimized for single pass coating	6.000	D80	717 [104,000]	1.200	UL 94V-0	
9-20557-LV	Low viscosity; low modulus for thermal cycling; performance; blue fluorescing; secondary heat cure for shadow areas	850	D70	310 [45,000]	>1.500	MIL-I-46058C IPC-CC-830	
9-20558-REV-A	Thixotropic; secondary heat cure; flexible	24.000	D35	2,3 [340]	1,100	UL 94V-0	
984-LVUF	Rigid for high chemical and abrasion resistance; secondary heat cure for shadow areas	160	D85	724 [105,100]	1.800	MIL-I-46058 IPC-CC-830 UL 94V-0	
9452-FC	Extremely low viscosity for film/flow coating applications; very good thermal shock resistance; LED curable; secondary heat cure for shadow areas; blue fluorescing	20	D60	1.137 [165,000]	1.000	UL 94V-0*	
9481-E	Room-temperature secondary moisture cure for shadow areas; highest chemical and abrasion resistance; low viscosity for thin coatings	125	D75	150 [21,800]	>1.500	MIL-I-46058 IPC-CC-830 UL 94V-0 UL 746E	
9482	Room-temperature secondary moisture; cure for shadow areas; superior re-workability; chemical and thermal shock resistance	1.100	D70	275 [40,000]	1.100	MIL-I-46058 IPC-CC-830 UL 94V-0 UL 746E	
9771	Low ionic content ; low outgassing; corrosion and temperature/humidity resistance; blue fluorescing	780	D72	910.3 [132,026]	665	MIL-STD-883 Method 5011 ASTM-E595 Low Outgas MIL-I-46058C IPC-CC-830-B UL 746E UL 94V-0 NASA MAPTIS material number 09841	

Featured Product

\* Testing performed internally at Dymax



## Key Attributes

- No added solvents
- Adhesion to flex circuit substrates
- Tack-free UV cures in seconds
- Low stress under thermal cycling
- Excellent environmental resistance
- Rigid and flexible coatings available

# Chip Encapsulants and Wire Bonders

## Superior Protection on Flexible and Rigid Platforms

Product	Description	Applications	Durometer Hardness	Nominal Viscosity, cP	Elongation at Break, %	Modulus of Elasticity, MPa [psi]	Halogen Free?
9014	UV/Visible light cure with secondary moisture cure for shadow areas; flexible; room temperature stable	Chip-on-board; Chip-on-flex; Chip-on-glass; Wire bonding	A70	12.500	63	119 [17,300]	
9037-F	UV/Visible light cure with secondary heat cure for shadow areas; moisture and thermal resistance; blue fluorescing	Chip-on-board; Chip-on-flex; Chip-on-glass; Wire bonding	D40	50.000	173	10,7 [1,554]	
9-20558-REV-A	UV/Visible light cure with secondary heat cure for shadow areas; High viscosity, thixotropic coating; UL V0 flammability rating	Conformal coating; Chip encapsulation; Wire bonding	D35	24.000	160	2,3 [340]	
9001-E-V3.1	UV/Visible light cure with secondary heat cure for shadow areas; low modulus for wire bonding	Chip-on-board; Chip-on-flex; Chip-on-glass; Wire bonding; Bare-die encapsulation	D45	4.500	150	17 [2,500]	
9008	Flexible; highly moisture-resistant bonds to diverse surfaces such as polyimide, DAP, glass, epoxy board, metal, PET; high adhesion, even at -40°C	Chip-on-flex; Flex circuit bonding and attachment to PCB and glass	D35	4.500	270	45 [6,500]	
9101	UV/Visible light cure with secondary moisture cure for shadow areas; flexible; moisture and thermal resistance	Chip-on-board; Chip-on-flex; Chip-on-glass; Wire bonding	D30-D50	7.000	38	17,5 [2,550]	
9102				17.000	34	18,4 [2,670]	
9103				25.000	36	17,6 [2,560]	
9201-W	IBOA free for wearable devices; UV/Visible light cure with secondary moisture cures; LED optimized; high viscosity; moisture, thermal, and impact resistance; excellent protection against chemical or environmental exposure	Chip-on-board; Chip-on-flex; Wire bond encapsulation	D20-D40	32,000	178	322 [46,790]	
9210-W	IBOA-free for wearable devices; UV/Visible light cure with secondary moisture cure; moisture resistance; great reliability testing performance	Component encapsulation; FPC reinforcement; Selective protection	D55-D75	29,000	28.2	561 [81,369]	

Featured Product



### Key Attributes

- No added solvents
- Low stress under thermal cycling
- Instant UV/Visible cures
- Electrically insulating
- High ionic purity
- Room-temperature storage
- Tenacious adhesion to flex circuit substrates (polyimide and PET)
- Thermal shock and moisture resistance

## Display Bonding and Laminating

Product	Description	Applications	Volumetric Shrinkage, %	Nominal Viscosity, cP	Halogen Free?
9701	Excellent re-workability; good thermal shock resistance; low shrinkage; non-yellowing	Optical display lamination and touch screen bonding	4,9	200	
9702	Excellent re-workability; good thermal shock resistance; low shrinkage; non-yellowing	Optical display lamination and touch screen bonding	4,2	950	
9703	Excellent re-workability; good thermal shock resistance; low shrinkage; non-yellowing	Optical display lamination and touch screen bonding	4,2	30.000	

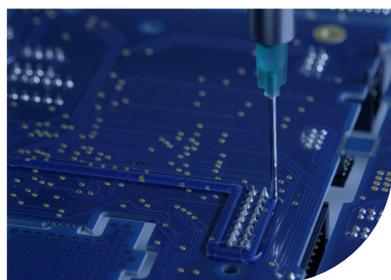


### Key Attributes

- One component, no mixing required
- Flexible
- Fast cure
- Bonds various substrates
- Resistant to yellowing
- High optical clarity

## Form-In-Place/Cure-In-Place Gaskets

Product	Description	Duraometer Hardness	Nominal Viscosity, mPas	Tensile at Break, MPa [psi]	Modulus of Elasticity, MPa [psi]
GA-140	Moisture and chemical resistant; cures soft and tack free; low outgassing; excellent tear resistance	A35	39.000	1,5 [211]	0,71 [104]
GA-201	Tack-free after proper cure; moisture and chemical resistant; soft and durable; UL 157 certified	A35	65.000	0,93 [135]	0,75 [110]

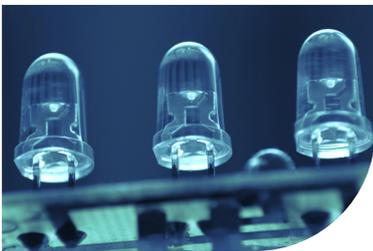


### Key Attributes

- Designed for automated dispense
- Conform to complex and intricate channels
- Silicone free
- Accommodates engineering changes without expensive tooling investments

# LED Encapsulating

Product	Description	Applications	Linear Shrinkage	Nominal Viscosity, cP	Halogen Free?
Light Cap® 9622	UV/Visible light cure in seconds; no mixing required; heat resistant to 100°C; resistant to long-term UV exposure; high light transmittance; durometer between silicone and epoxy	Instant casting of LEDs; Rapid forming of protective optical lens	1,6 %	12.000	
Light Cap® 9624	UV light cure in seconds; no mixing or refrigeration required; heat resistant to 100°C; resistant to long-term UV exposure; low viscosity for thin coatings	Conformal coating for LED arrays; Colorless encapsulation of COB LEDs; Instant forming of protective lens for high-intensity LEDs	1,0%	120	



## Key Attributes

- One component - no mixing required
- Enhances light transmittance
- Fast cure
- No added solvents
- Resistant to heat-induced yellowing
- Optically clear

# Potting and Sealing Materials

For Shallow Potting in 10-30 Seconds or Less – Highest Adhesion to Substrates

Product	Description and Applications	Recommended Substrates	UV Cure* Speed (sec)/ Depth (mm [in])	Durometer Hardness	Nominal Viscosity, cP	Halogen Free?
921-T	Translucent bonds with high adhesion; applications: tamper proofing, connectors, and thermal switches	ABS, filled nylon, metal, glass	30/6,4 [0,25]	D75	3,500	
921-VT					11.000	
921-GEL					25.000	
9001-E V3.1	Excellent adhesion to engineering plastics; flexible; applications: sensors	ABS, PC, PVC, FR-4, metals	15/6,4 [0,25]	D45	4,500	

\*UV cure speed depends on the intensity reaching the surface of the resin. Cure speed was measured at an intensity of 175 mW/cm².



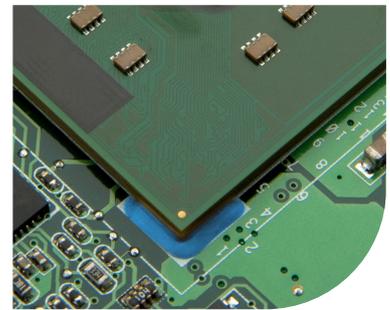
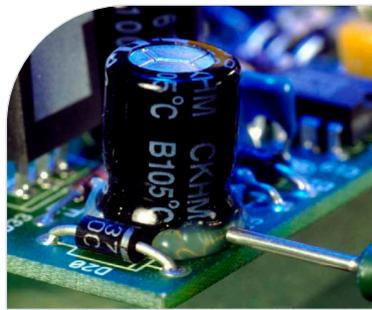
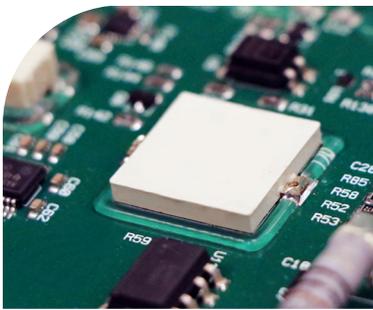
## Key Attributes

- Full UV/Visible cure in seconds
- No added solvents
- High adhesion to substrates
- Flexible and rigid products available

# Ruggedizing/Edgebond Materials for BGAs & VGAs

Photocurable Technology Offers Lower Costs and Increased Productivity

Product Number	Description	Nominal Viscosity, cP	Durometer Hardness	Tensile at Break, MPa [psi]	Cure Depth, mm [in]	Halogen Free?
9309-SC	Highly thixotropic; formulated with See-Cure technology for easy visual confirmation of full cure	45,000	D57	22 [3,000]	6.5 [0,26]	
9-911-REV-B	UV/Visible light curing high-tensile strength adhesive with secondary heat cure; ideal for rapid tacking of repair wire on PCBs	25,000	D80	24 [3,500]		



## Key Attributes

- Fast dispense and cure
- Holds shape after dispense
- Simple visual inspection with See-Cure Technology
- Improved bond strength for die and pry testing
- Easy rework
- Reduce stress on interconnects during push, pull, shock, drop, and vibration
- Engineered bead shape for wetting both board surface and component edge without seeping into shadow area
- Jettable

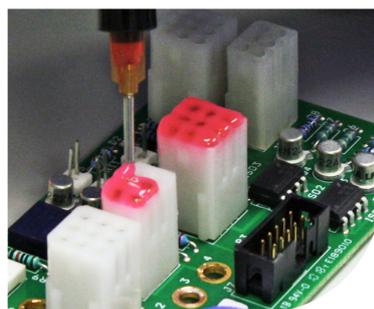
# SpeedMask® Peelable Masks

Product Number	Description and Applications	Cure Depth,** mm [in]	Durometer Hardness	Cure Speed,* sec	Viscosity, cP	Halogen Free?
9-20479-B-REV-A	Wave-solder resistant; blue color for easy visual inspection; highly thixotropic for manual or automated dispensing	4,90 [0,19]	A70	1	150.000	
9-7001	Wave-solder resistant; visible pink color in uncured state; lower shrinkage	8,36 [0,33]	A70	1	40.000	
9-318-F	Wave-solder resistant; fluoresces blue for easy inspection; very fast curing	6,40 [0,25]	A55	<4	50.000	

\* Cure speed depends on the intensity and distance from the light source. Cure speed was measured at an intensity of 175 mW/cm<sup>2</sup>.

\*\* 5 second cure

 Featured Product



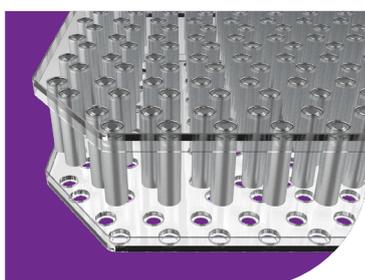
## Key Attributes

- No added solvents
- Fluorescing and blue grades
- UV/Visible cure in seconds
- One part - no mixing
- No ionic contamination

# Structural Adhesives

Product	Description	Applications	Durometer Hardness	Nominal Viscosity, mPas
9501-F	Excellent adhesion to metals and plastics; blue fluorescing; LED curable at 385 nm	Structural Bonding Battery Pack Assembly	D60	10.000

 Featured Product



## Key Attributes

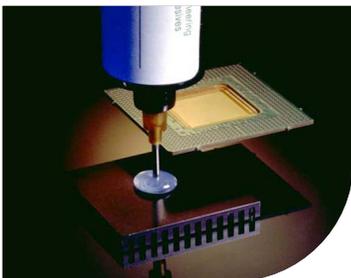
- Sets in seconds with light exposure
- High-strength bonds to metals and plastics
- Thermal shock resistant
- Retains strength in high temperature and high humidity environments

# Thermal Interface Adhesives

## Efficient Thermal Transfer Between Heat Sinks and Electronics

Product	Description	Applications	Thermal Conductivity	Nominal Viscosity, cP	Halogen Free?
<a href="#">9-20801</a>	Light cure in seconds; secondary activator or heat cure for shadow areas*; highly thixotropic for optimal placement	Mounting heat sinks on PCBs; LED heat dissipation	0,9 W/m*K	110.000	

\*Dymax [501-E-REV-A](#) is the recommended activator for shadowed areas

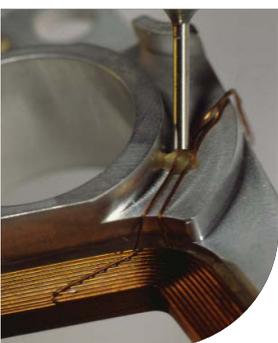


### Key Attributes

- Sets in seconds with light exposure
- Low stress for mismatched CTE's
- High-strength bonds
- Cure shadow areas with activator or heat
- Room-temperature storage and cure

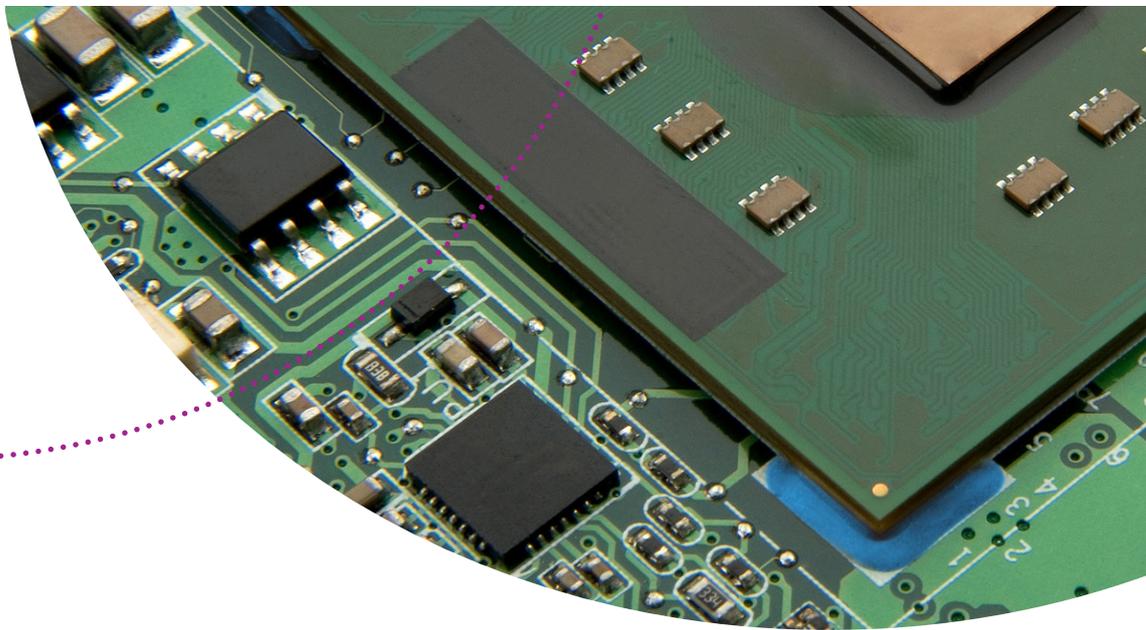
# Wire Tacking Adhesives

Product Number	Description	Nominal Viscosity, cP	Durometer Hardness	Tensile at Break, MPa [psi]	Halogen Free?
<a href="#">9-911-REV-B</a>	On-demand cure for optimal positioning; Exposed areas cure in seconds for immediate strength	25.000	D80	24 [3,500]	



### Key Attributes

- Instant UV cure
- No added solvents
- Fluorescing additive for in-line quality control
- One part - no mixing
- Excellent adhesion to solder masks and wires
- Thermal shock, solvent, and moisture resistance
- Unlimited pot life



## Innovative Technologies

As an innovator in the adhesive and coating industries, Dymax strives to create new technologies that help manufacturers increase process efficiency, productivity, and throughput while decreasing costs and inventory. Through the years, our dedication to innovation has resulted in over 30 oligomer, adhesive, and equipment patents and numerous awards for our innovative technologies and service.

Our R&D experts are always striving to create new technologies that will help manufacturers improve their processes and minimize risk. Our current portfolio of technologies provide a variety of benefits including easier bond line inspection and cure confirmation for better quality control, faster cures for quicker processing, and curing in shadowed areas to eliminate concerns about uncured material.

### See-Cure Technology

Light-curable adhesives formulated with Dymax patented See-Cure technology have a 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 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

Dymax's patented Ultra-Red® technology enhances bond-line inspection processes and product authentication. Adhesives formulated with Ultra-Red® 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.

### Multi-Cure® Light/Heat-Cure Technology

Multi-Cure® adhesives combine the high-speed cure of UV or UV/Visible light with secondary cure mechanisms that

enhance polymerization. Secondary cure mechanisms, which include thermal (heat) cure or activator cure, are useful when light can only reach a portion of the bond line, or when tacking a part prior to thermal cure to allow easier handling and transport during the manufacturing process.

### Dual-Cure Light/Moisture-Cure Technology

Dual-Cure coatings are formulated to ensure complete cure in applications where shadow areas on high-density circuit boards are a concern. Previously, areas shadowed from light were managed by selective coating – eliminating the need to cure in shadow areas – or a secondary heat-cure process. 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 and coatings 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 electronic assembly needs.

# Dispensing Equipment

Dymax has developed high-quality, field-proven dispense systems to fit many types of adhesive and fluid dispensing applications. These systems include various automated and manual dispensing valves, spray valves and guns, controllers, material reservoirs, and related components for seamless integration into assembly processes. The systems provide accurate, consistent dispense for a range of low- to high-viscosity fluids. Dispensing systems with adjustable suck-back control and dispensing valves that offer contaminate-free dispensing are available.



## SD-200 Digital Syringe Dispenser

This dispensing system is ideal for use as an operator work station and can also be integrated into an automated process if needed. It provides an accurate way to dispense low-to-high viscosity materials from a syringe. The system is easy to set up and operate.

## eco-PEN450 Dosing System

The eco-PEN 450 is ideally suited for dispensing very precise volumes of low- to medium-viscosity materials. It offers maximum volumetric precision for both dot and bead applications, making it an excellent choice for masking components on PCB boards or other small-area applications.

## eco-SPRAY Precision Micro-Spray System

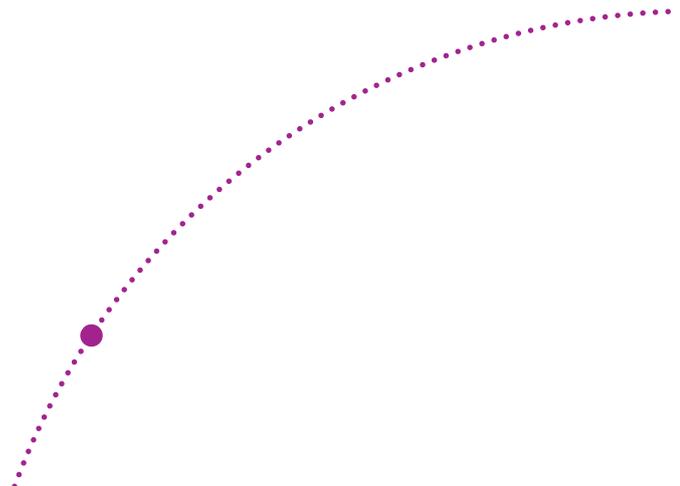
This micro-spray system is excellent for a wide range of applications and for use with a variety of low- to high-viscosity spray media. Users can achieve a variety of spray volumes, from dot to endless spraying.

## SG-200 Super-Flow Spray Gun System

Dymax SG-200 super-flow spray gun systems are designed for masking and coating applications where a significantly higher flow rate is required. The systems are ideal for dispensing fluids with viscosities up to 80,000 cP. If you are manually masking a large area, this is a great option.

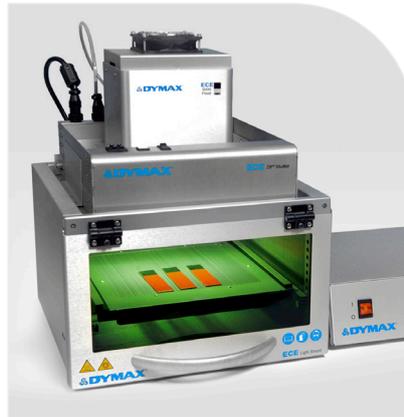
## Model 400 Hand-Held Needle Valve System

The Model 400 needle valve is designed for dispensing very precise dots or fine beads of low- to medium-viscosity materials. The valve is hand-held but is compact and lightweight, making it easy and comfortable to handle.



# Light-Cure Systems

Dymax designs and manufactures a wide range of [curing equipment](#) including spot lamps, flood lamps, and conveyor systems, as well as radiometers and other accessories. Dymax systems are optimized to work with light-curable 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.



## Spot Lamps

Spot lamps provide a 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. Dymax offers UV models which use moderate- to high-intensity, multi-spectrum UV/Visible light and LED models that use light-emitting diodes for fast curing. Dymax 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 above or on each side for rapid 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), visible bulbs, or LED flood arrays. 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.



[www.dymax.com](http://www.dymax.com)

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