

Dow Corning LED

Lighting the way *to advanced materials and solutions*

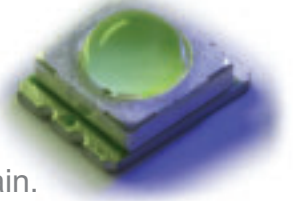
SOLUTIONS

Electronics
Solutions

DOW CORNING



As a global leader in silicone technology, Dow Corning LED solutions help enable customers to illuminate with reliability and innovation across the entire LED value-chain.



Dow Corning is a global materials and service innovator of highly advanced silicone technology and equipment integration services providing excellent properties for LED applications ranging from automotive to general illumination.

Our comprehensive product lines for LED applications include optical-grade silicone encapsulants and resins, thermal management, adhesives and conformal coatings. These materials help meet your material needs for the right thermal management and environmental protection from individual LED chip packaging protection to environmental protection in outdoor sign screens.



Silicone Materials

Application Technology

Equipment Integration



AV10591

AV10592

LED Packaging

Advanced silicone technology for LED applications

Dow Corning silicone solutions for LED packages are designed to meet the challenging needs of the LED market. Silicone products offer good compatibility with standard LED substrates and processing techniques. The Dow Corning product line contains gels, elastomers and resins.

Features

- High optical transparency
- Excellent UV resistance
- Excellent thermal stability
- Low moisture up-take
- Low ionic content

Benefits

- Well-suited for IR, visible or UV optical applications
- Lead-free solder reflow temperatures
- Flexibility in manufacturing
- Good adhesion to various lead frames

1. Encapsulants: Gel, Elastomer and Resin

Dow Corning provides both High RI and Normal RI OE Series silicone encapsulants, which have outstanding light transmittance across the application wavelengths of LEDs. These encapsulants provide excellent stress relief, moisture protection and UV resistance for LED chip sealing and protection.

Physical Form: Low- to medium-viscosity liquid; cures to a flexible gel or elastomer.

Special Properties: Transparent with refractive index range of 1.41 to 1.53.

2. Lens Molding: Elastomer and Resin

Dow Corning provides the high RI resin material needed for optical lens fabrication. These products are designed with excellent injection and compression molding characteristics.

3. Overmolding: Elastomer and Resin

Dow Corning® OE Series silicone encapsulants are excellent candidates for the overmolding process, the leading-edge process technology.

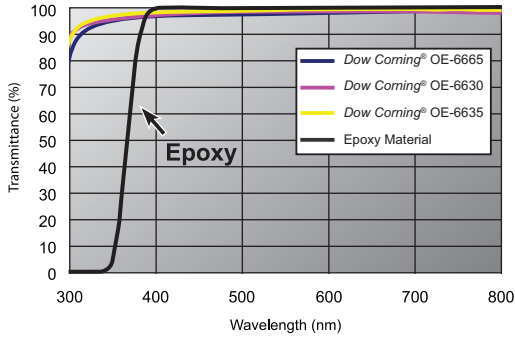
Material Properties of HRI Encapsulants

HRI Encapsulants	Gel		Elastomers		Resins	
	Dow Corning® OE-6450	Dow Corning® OE-6520	Dow Corning® OE-6550	Dow Corning® OE-6630	Dow Corning® OE-6635	Dow Corning® OE-6665
As Supplied						
Component	2-part	2-part	2-part	2-part	2-part	2-part
Mixing Ratio	1:1	1:1	1:1	1:4	1:3	1:20
Viscosity, Pa·s	1.8	2	4	2.5	5	2.2
Cure Condition, °C/hr	100/1	150/1	150/1	150/2	150/2	150/2
After Cure						
Hardness	—	26 (JIS A)	62 (JIS A)	41 (shore D)	33 (shore D)	68 (shore D)
Refractive Index	1.54	1.54	1.54	1.53	1.53	1.53
Transmittance, % @ 450 nm, 1 mm	100	100	100	100	100	99.5
CTE	—	230	210	—	—	—

*NOTE: Please check with your local Dow Corning office for a full product range and availability in your area.

Transmittance (after cure)

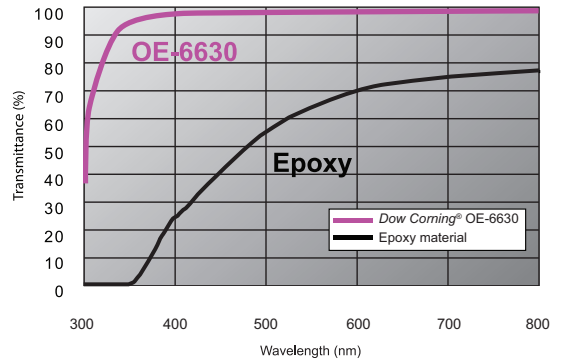
High transparency between 350 nm to 800 nm
Higher transparency between 300 nm to 400 nm than epoxy



Sample thickness = 4 mm
Epoxy = typical optical grade epoxy

Transmittance (after UV irradiation)

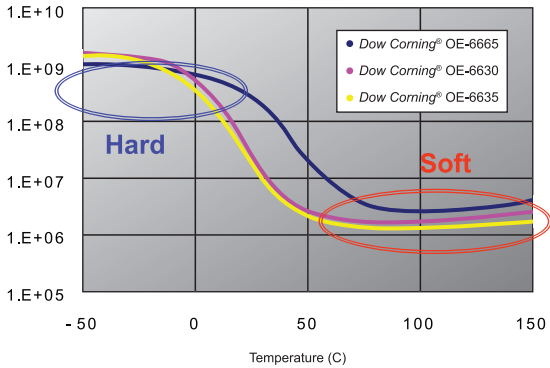
Higher UV stability than epoxy



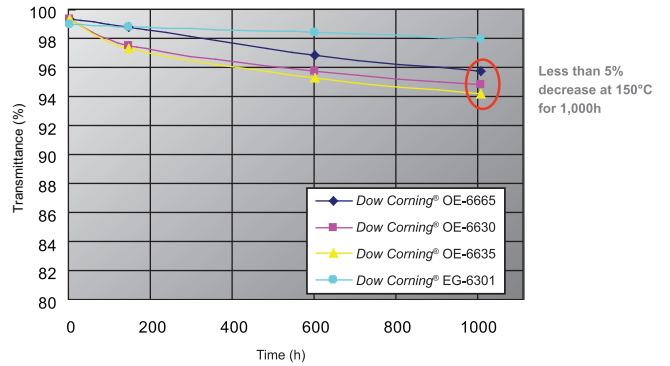
Test condition: UV = 365 nm, 19 m W/cm², 4 h

Storage Modulus

Hard material becomes softer at high temperature, therefore, stress in package can be minimized.



Transmittance (after thermal aging)



Thickness = 1 mm, Transmittance = 400 nm
Sample aging condition = 150°C, air

Less than 5% decrease at 150°C for 1,000h

Material Properties of NRI Encapsulants

NRI Encapsulants	Gels			Elastomers		
	Dow Corning® JCR 6110 A/B	HIPEC® Q1-4939	Dow Corning® OE-6250	Dow Corning® JCR 6122	Dow Corning® EG-6301	Dow Corning® OE-6336
As Supplied						
Component	2-part	2-part	2-part	2-part	2-part	2-part
Mixing Ratio	10:1	10:1	1:1	1:1	1:1	1:1
Cure Condition, °C/hr	150/1	125/0.5	80/1	150/1	150/1	150/1
Viscosity, Pa·s	2.1	5.4	0.5	0.35	3.4	1.5
After Cure						
Hardness, JIS A	—	—	—	35	71	65
Refractive Index	1.42	1.41	1.41	1.40	1.41	1.41
Transmittance, % @ 450 nm, 1 mm	99	91.5	100	99	97	98

Material Properties of HRI Silicone Lens Resin

HRI Lens Molding	Silicone Resin	
	Dow Corning® SR-7010	Dow Corning® OE-4705*
Application	Cavity Molding	Injection Molding
As Supplied		
Components	2-part	2-part
Mixing Ratio	1:1	1:2
Viscosity, Pa·s	14	44
Curing Condition	< 1 min@170°C	150 ~ 170°C/2 min (thickness dependent)
After Cure		
Hardness, Shore D	67	60
Refractive Index	1.53	1.53
Light Transmittance, % @ 450 nm	99	> 99

*NOTE: Please check with your local Dow Corning office to confirm the specification and for a full product range and availability in your area.

Global Connection

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North America

Corporate Headquarters

Midland, MI USA

TEL: +1 989 496 6000

FAX: +1 989 496 8026

South America

Dow Corning do Brasil Limitada, Sao Paulo, Brasil

TEL: +55 11 2759 4300

FAX: +55 11 3758 5727

Europe

Area Headquarters

Seneffe, Belgium

TEL: +32 64 88 8000

FAX: +32 64 66 8401

Asia

Tokyo, Japan

TEL: +81 3 3287 8300

FAX: +81 3 3287 8311

Seoul, Korea

TEL: +82 2 551 7600

FAX: +82 2 551 6400

Shanghai, China

TEL: +86 21 2306 5500

FAX: +86 21 6351 2600

Taipei, Taiwan

TEL: +886 2 6600 3100

FAX: +886 2 6600 3199

Kuala Lumpur, Malaysia

TEL: +60 3 5032 2128

FAX: +60 3 5032 2138

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LED Thermal Management

Advanced silicone technology for LED applications

Dow Corning is a global technology innovator for the LED marketplace, delivering high-performance solutions developed to meet the unique demands of LED assembly, from general illumination to specific automotive applications.

We deliver a comprehensive line of wet dispensed and fabricated thermal management material.

Features

- Excellent thermal transfer
- Good thermal and aging stability
- Flexible, stress relieving
- Outstanding gap fill

Benefits

- Easy application (heat cured or screen printing)
- Pre-cured materials can be cold applied
- Good dielectric properties
- Available in various forms: adhesive, gels, grease, thermal pad

Thermal Interface Materials – Wet Dispensed: Dispensable, printable and curable materials effective as heat transfer media.

Product Family	Material	Description/Color	Cure Conditions		Thermal Conductivity at 25°C (77°F), Watt/meter-K	Viscosity (cP)
			Room Temperature Cure, Time	Heat Cure, Time		
Adhesive/Sealant	Dow Corning® SE 4486 CV Thermally Conductive Adhesive	Flowable; one-part moisture cure; white	120 hr	—	1.53	19,000
	Dow Corning® SE 9184 CV Thermally Conductive Adhesive	One-part; non-flow; moisture cure; white	48 hr	—	0.84	non-flowing
	Dow Corning® 1-4173 Thermally Conductive Adhesive	One-part; low-flow; rapid-heat cure; grey	—	90 min@100°C 30 min@125°C 20 min@150°C	1.9	58,000
	Dow Corning® Q1-9226 Thermally Conductive Adhesive	Two-part; semi-flowable; self-priming; grey	—	60 min@100°C 30 min@150°C	0.74	50,000
Compound	Dow Corning® SC 102 Thermally Conductive Compound	One-part; gap fill material; white	—	—	0.8	non-flowing
	Dow Corning® TC-5625 Thermally Conductive Compound	One-part; silicone paste; grey	—	—	2.5	127,725
Gel	Dow Corning® SE 4445 CV Thermally Conductive Gel	Two-part; UL 94 V-0 rating; grey	—	45 min@125°C	1.26	14,000
Encapsulant	Sylgard® Q3-3600 A&B Thermally Conductive Encapsulant	Two-part encapsulant; grey	—	60 min@100°C 30 min@150°C	0.77	4,700

NOTE: Please check with your local Dow Corning office for a full product range and availability in your area.

Thermal Interface Materials – Fabricated: Cold applied pre-cured, easy to die cut, highly compressible from both sides to improve thermal resistance.

Product Family	Description	Thermal Conductivity (W/mK)	Thickness (mm)
TP-15XX	Fiberglass reinforced; one or two side tacky; stress relieving; electrically insulating; UL recognized	1.10 – 1.30	0.25/0.5/0.75/1.0/2.0
TP-21XX	Foam reinforced; alumina filled system; both sides compressible; UL recognized	0.73	2.2/3.0/3.8/4.6
TP-22XX	Fiberglass reinforced; reworkable; compressible; electrically insulating	1.64	0.25/0.5/0.75/1.0/1.5
TP-23XX	Ultra compressible; excellent handling and ease of assembly; UL recognized	1.4	2.2/3.0/3.8/4.6
TP-35XX	Fiberglass reinforced; soft; reworkable; high compressibility; electrically insulating	3.50	0.5/0.75/1.0/1.5

NOTE: Please check with your local Dow Corning office for a full product range and availability in your area.

Typical applications:

- Architectural lighting
- Automotive lighting
- Displays
- Indicators, switches, keypads
- LCD backlighting
- Mobile devices
- Projector light sources
- Traffic lights and guidance

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Asia

Tokyo, Japan
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FAX: +81 3 3287 8311
Seoul, Korea
TEL: +82 2 551 7600
FAX: +82 2 551 6400
Shanghai, China
TEL: +86 21 2306 5500
FAX: +86 21 6351 2600
Taipei, Taiwan
TEL: +886 2 6600 3100
FAX: +886 2 6600 3199
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TEL: +60 3 5032 2128
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LED Protection and Assembly

Advanced silicone technology for LED applications

Dow Corning's comprehensive solutions for LED assembly include optical-grade silicone encapsulants, adhesives, sealants and conformal coatings. These formulations are designed to deliver purity, physical protection and thermal control across the entire spectrum of LED applications, from chip level materials to environmental protection for outdoor applications operating at temperatures of -40 to 180°C.

Typical applications:

- Architectural lighting
- Automobile interior and exterior lighting
- Indicators, switchers, keypads
- LCD backlighting
- Displays
- Mobile device light sources
- Projector light sources
- Traffic lights and guidance

Features

- Resistance to ozone and UV degradation
- Alternate cure schedules
- Sustains physical and electrical properties over a wide range of temperatures, humidity and other harsh environmental conditions
- Wide range of viscosities
- Cures to low-stress elastomer or gel

Benefits

- Improved performance and durability
- Allows process flexibility and/or increased throughput
- Enables package to pass common industry reliability
- Reliable dispense and molding process
- Repairable

Adhesives & Sealants: Noncorrosive silicone products for electronic sealing, bonding and adhering applications. Stress-relieving properties of these products can significantly increase the reliability of electronic modules and components.

Material	Description/Color	Mechanical Properties		Cure Conditions		Unprimed/ Lap Shear Adhesion, psi
		Elongation, %	Tensile Strength, psi/MPa	Room Temperature Cure, Time	Heat Cure, Time	
Dow Corning® 744 RTV Sealant	1-part; excellent adhesion; non-flow; white; room temperature cure	630	380/2.6	48 hr	—	—
Dow Corning® Q3-6093 Adhesive	2-part; rapid room temperature cure; good room temperature adhesion to most substrates; white	220	250/1.7	1.5 hr	—	230
Dow Corning® SE 9186	1-part; fast tack-free time; controlled volatility; RT cure; translucent	490	300/2.1	48 hr	—	230
Dow Corning® 3-6265 HP	1-part; high strength; contains UV indicator; develops good adhesion; rapid heat cure; black	150	870/6.0	—	35 min@100°C 7 min@125°C 5 min@150°C	870
Dow Corning® 866 Primerless Silicone Adhesive	1-part; high strength; flowable; develops good adhesion; grey	210	930/6.4	—	60 min@150°C	700
Dow Corning® EA-6054 Thixotropic Fast Low-Temp Cure Adhesive	Noncorrosive; rapid low-temperature cure; non-slump; contains UV indicator for automated inspection; black	170	800/5.5	—	60 min@90°C 30 min@125°C 10 min@150°C	780

NOTE: Please check with your local Dow Corning office for a full product range and availability in your area.

Conformal Coatings: Silicone coatings protect circuits from moisture and contamination to help prevent short circuits, corrosion, dendritic growth and electromigration; help protect against abrasion and solvents, while delivering stress relief.

Material	Description/Color	Cure Conditions		Viscosity/ Flowability (cP)
		Tack Free Time	Heat Cure, Time	
Dow Corning® 3-1953 Conformal Coating	Elastomeric coating; light straw or translucent	8 min@ 25°C	2 min@ 60°C/ 15% RH	360
Dow Corning® 3-1965 Conformal Coating	Sprayable elastomeric coating; light straw or translucent	7 min@ 25°C	2 min@ 60°C/ 15% RH	110
Dow Corning® 1-2577 Conformal Coating Low VOC	Hard finish with abrasion resistance, low VOC; UV indicator; translucent	—	10 min@ 80°C	1250
Dow Corning® 1-4105 Conformal Coating	Fast heat cure; soft; stress relieving; UV indicator; translucent	—	10 min@ 105°C	470
Dow Corning® Q1-4010 Conformal Coating	Heat cure; moderate hardness; UV indicator; translucent	—	15 min@ 110°C	830

Encapsulants: Silicone elastomer helps protect electronic components and circuits from moisture and contamination; relieves thermal and mechanical stress.

Material	Description/Color	Cure Conditions		Durometer
		Room Temperature Cure, Time	Heat Cure, Time	
Dow Corning® 3-4207 Dielectric Tough Gel	Tough gel; translucent green	15 min	—	62 OO
Dow Corning® SE 1740	Low-temperature cure; develops good adhesion; translucent	—	30 min@ 80°C	35 OO
Dow Corning® SE 9187L	Elastomeric coating; controlled volatility; translucent or black	30 min	—	17 A
Sylgard® 160 Silicone Elastomer Kit	Moderate thermal conductivity; UL 94-V0 at 1.5mm; gray	24 hr	10 min@ 100°C	60 A
Sylgard® 170 Fast Cure Silicone Elastomer Kit	Low viscosity; UL 94-V0 at 5.6mm; black	10 min	—	42 A
Sylgard® 184 Silicone Elastomer Kit	Good strength; UL 94-V0 at 8.4mm / UL 94-V1 at 6.0mm and Mil Spec; translucent	48 hr	45 min@ 100°C	50 A
Sylgard® 567 Primerless Silicone Encapsulant Kit	Develops good adhesion; long working time; UL 94-V0 at 5.65mm and Mil Spec; black	—	60 min@ 125°C	45 A

NOTE: Please check with your local Dow Corning office for a full product range and availability in your area.
NOTE: Dow Corning® 3-4207 Dielectric Tough Gel may lose adhesion. Full environmental exposure testing is recommended.

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North America

Corporate Headquarters
Midland, MI USA
TEL: +1 989 496 6000
FAX: +1 989 496 8026

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Dow Corning do Brasil Limitada, Sao Paulo, Brasil
TEL: +55 11 2759 4300
FAX: +55 11 3758 5727

Europe

Area Headquarters
Seneffe, Belgium
TEL: +32 64 88 8000
FAX: +32 64 66 8401

Asia

Tokyo, Japan
TEL: +81 3 3287 8300
FAX: +81 3 3287 8311

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TEL: +82 2 551 7600
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TEL: +86 21 2306 5500
FAX: +86 21 6351 2600

Taipei, Taiwan
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Kuala Lumpur, Malaysia
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