Information About *Dow Corning*® Brand LED Materials

Silicones and Electronics

Silicones have long been known for durable dielectric insulation, as barriers against environmental contaminants and for their stress-relieving shock and vibration absorption. They can sustain their physical and electrical properties over a wide range of temperature, humidity and other harsh environmental conditions.

Capitalizing on these basic properties, *Dow Corning*® brand silicone LED (light emitting diode) encapsulants can be designed to meet the challenging needs of the LED market, including high adhesion, high purity, moisture resistance, thermal stability and optical transmittance.

Silicone materials can absorb stresses caused by thermal cycling inside the package, protecting the chip and the bonding wires. And with the electronics industry quickly moving toward lead-free processing, silicone encapsulants, with their demonstrated, excellent stability at reflow temperatures, are a natural fit for LED applications.

Features/Benefits

- Excellent thermal stability – greater reliability in processing and performance
- Low moisture uptake – greater reliability in the field
- Tuneable modulus – design flexibility
- Low ionic content
- Excellent optical properties – useful for a broad range of applications
- Addition cure – no byproducts and minimal shrinking
- Solvent-free – no hazardous emissions

Fast Formulation

Dow Corning manufactures a wide variety of LED materials to meet the needs of most application and process situations, and we are continuously expanding our product offerings to ensure that there are specific products to meet your needs. However, if you can't find an exact match for your needs, Dow Corning can modify any of our existing products to help meet your exact needs through our *Fast Formulation* process. Examples of *Fast Formulation* options include modification of a product's cure schedule, modulus or viscosity.

Gels

Type
One- or two-part silicone heat-cure gels

Physical Form
Provided as low- to medium-viscosity liquids; cures to a soft, stress-relieving gel

Special Properties
Transparent with 1.41 refractive index; low moisture pickup

Potential Uses
Seal and protect LEDs

Elastomers

Type
One- or two-part silicone heat-cure elastomers; fast- or standard-cure materials available

Physical Form
Provided as low- to medium-viscosity liquid; cures to a firm but flexible elastomer

Special Properties
Transparent with refractive index ranging from 1.41 to 1.52; low moisture pickup

Potential Uses
Seal and protect LEDs

Resins

Type
Two-part silicone heat-cure material

Physical Form
Cures to a hard material for LED fabricated parts

Special Properties
High refractive index with excellent transparency; low moisture pickup

Potential Uses
Seal and protect LEDs, discrete lenses for LEDs and optical parts

Total Support

Related Products – Dow Corning features a unique interactive product finder on our website for a broad range of products such as thermal interface materials. You can access the product finder at www.dowcorning.com/electronics by selecting "Technical Data" on any of our product family pages.

Analytical, Environmental and Physical Testing – We have expertise to share on a wide range of testing to monitor quality, on specialized testing for troubleshooting, or to assist in reliability testing.

Consultation with Technical Experts – Have our experts visit your facility or join us at one of our global application centers to work together on your material and processing needs. We can provide seminars and training for your personnel to allow them to work more knowledgeably. Dow Corning can assist in material, process and equipment integration for your application needs.

Tutorials – LED and other silicone tutorials can be found on our website. The tutorials are accessible from the product family pages or the left-hand navigation bar under Technical Library.

Product/Application Information

SURFACE PREPARATION AND ADHESION

Surfaces should be clean and dry. Recommended cleaning methods include *Dow Corning*® brand OS Fluids, naphtha, mineral spirits, methyl ethyl ketone (MEK) or other suitable solvent. Roughening surfaces tends to promote adhesion of silicones.

Dow Corning LED materials are specially designed for adhesion to commonly used LED substrates. Surface treatments such as chemical etching or plasma treatment may provide a reactive surface and improve adhesion to these types of substrates.

In general, increasing the cure temperature and/or cure time will improve the ultimate adhesion.

USEFUL TEMPERATURE RANGES

For most uses, silicone encapsulants and resins (except for JCR 6175) should be operational over a temperature range of -45 to 200°C (-49 to 392°F) for long periods of time. However, at both the low- and high-temperature ends of the spectrum, behavior of the materials and performance in particular applications can become more complex and require additional considerations.

For low-temperature performance, thermal cycling to conditions such as -55°C (-67°F) may be possible, but performance should be verified for your parts or assemblies. Factors that may influence performance are configuration and stress sensitivity of components, cooling rates and hold times, and prior temperature history.

At the high-temperature end, the durability of the cured silicone encapsulants and resins is time and temperature dependent. As expected, the higher the temperature, the shorter the time the material will remain useable.

Application

These products are also compatible with commercially available equipment and industry standard processes. These materials can be dispensed or molded depending on the product and application.

Dow Corning OS Fluids are recommended to clean cured or uncured silicone residue from application equipment.

COMPATIBILITY

Certain materials, chemicals, curing agents and plasticizers can inhibit the cure of addition-cure silicones. Most notable of these include:

- Organotin and other organometallic compounds
- Silicone rubber containing organotin catalyst
- Sulfur, polysulfides, polysulfones or other sulfur-containing materials
- Amines, urethanes or amine-containing materials
- Unsaturated hydrocarbon plasticizers
- Some solder flux residues

If a substrate or material is questionable with respect to potentially causing inhibition of cure, it is recommended that a small scale compatibility test be run to ascertain suitability in a given application. The presence of liquid or uncured product at the interface between the questionable substrate and the cured silicone indicates incompatibility and inhibition of cure.

STORAGE AND SHELF LIFE

Shelf life is indicated by the "Use Before" date found on the product label.

For best results, *Dow Corning* one-part products require cold storage at or below -5°C (23°F). Special precautions must be taken to prevent moisture from contacting these materials. Containers should be kept tightly closed with head space minimized. Partially filled containers should be purged with dry air or other gases, such as nitrogen.

Dow Corning two-part products should be stored at or below 25°C (77°F). Containers should be kept tightly closed at all times to extend shelf life.

Check the product label for specific storage conditions.

PRODUCT INFORMATION

***Dow Corning*® Brand Product**	**Description**	**Features**
Gels		
JCR 6109	1-part, translucent, low-modulus LED gel encapsulant	One-part formulation; very long working time
JCR 6110 A/B	2-part, transparent, low-modulus LED gel encapsulant	High transparency; long working time
Hipec® Q3-6646 Semiconductor Protective Coating Kit	2-part, transparent, low-modulus LED gel encapsulant	High transparency; low viscosity; very long working time
Elastomers		
JCR 6101	1-part, translucent, medium-modulus LED encapsulant	One-part formulation; very long working time
JCR 6101 UP	1-part, translucent, medium-modulus LED encapsulant	Thixotropic; higher viscosity version of JCR 6101
JCR 6115	2-part, low-modulus LED encapsulant	Low viscosity; fast cure; very long working time
JCR 6122	2-part, transparent, medium-modulus LED encapsulant	Very low viscosity; very long working time; high transparency
JCR 6126 W/C	2-part, translucent, medium-modulus LED encapsulant	Thixotropic; very long working time
JCR 6140	2-part, transparent, medium-modulus LED encapsulant	High transparency; medium viscosity
EG-6301	2-part, transparent, high-modulus (hard) LED encapsulant	High transparency; harder elastomer; very long working time
OE-6336	2-part, transparent, LED encapsulant	Lower-viscosity version of EG-6301
JCR 6175	2-part, transparent, LED encapsulant	High refractive index (>1.52); high transparency; very long working time
Resins		
SR-7010	2-part, hard, clear LED resin for fabricated parts	High refractive index/excellent light transparency; hard-resin material for molding fabricated parts

TYPICAL PROPERTIES – PHYSICAL

Specification Writers: Please contact your local Dow Corning sales office or your Global Dow Corning Connection before writing specifications on this product.

	General		Uncured Properties				
***Dow Corning*® Brand Product**	**Cure Conditions**	**Mixing Ratio**	**Viscosity (t=0), mPa·s**	**Time to 20% Rise in Viscosity**	**Time to 50% Rise in Viscosity**	**Time to Doubling of Viscosity**	**Shelf Life from Date of Manufacture, months**
Gels							
JCR 6109	1 hr @ 70°C + 16 hr @ 150°C	1-Part	3,900	8 hr @ 25°C	>72 hr @ 25°C	>672 hr @ 25°C	6
JCR 6110 A/B	1 hr @ 150°C	10:1 (A/B)	2,000/660 (A/B)	>2 hr @ 25°C	>8 hr @ 25°C	>8 hr @ 25°C	12
Hipec® Q3-6646 Semiconductor Protective Coating Kit	1 hr @ 150°C	1:1	660/630 (A/B)	>16 hr @ 25°C	>16 hr @ 25°C	>23 hr @ 25°C	12
Elastomers							
JCR 6101	1 hr @ 70°C + 2 hr @ 150°C	1-Part	5,900	>168 hr @ 25°C	>336 hr @ 25°C	>672 hr @ 25°C	6
JCR 6101 UP	1 hr @ 70°C + 2 hr @ 150°C	1-Part	20,000	>72 hr @ 25°C	>72 hr @ 25°C	>672 hr @ 25°C	6
JCR 6115	5 min @ 175°C	1:1	880/840 (A/B)	—	>120 hr @ 25°C	>120 hr @ 25°C	6
JCR 6122	1 hr @ 150°C	1:1	360/310 (A/B)	>72 hr @ 25°C	>72 hr @ 25°C	>336 hr @ 25°C	6
JCR 6126 W/C	1 hr @ 150°C	10:1	130,000/100 (Base/Cat)	>40 hr @ 25°C	>40 hr @ 25°C	>140 hr @ 25°C	6
JCR 6140	1 hr @ 150°C	1:1	5500/3400 (A/B)	40 hr @ 25°C	>72 hr @ 25°C	—	6
EG-6301	1 hr @ 150°C	1:1	2900/4100 (A/B)	>72 hr @ 25°C	>72 hr @ 25°C	>120 hr @ 25°C	6
OE-6336	1 hr @ 150°C	1:1	950/2100 (A/B)	—	—	—	6
JCR 6175	1 hr @ 150°C	1:1	11,000/3000 (A/B)	>140 hr @ 25°C	>200 hr @ 25°C	>300 hr @ 25°C	6
Resins							
SR-7010	1 min @ 150°C(1)	1:1	20,000/7000	—	>3 hr @ 25°C	>3 hr @ 25°C	9

[1]Injection molding.

	Cured Properties														
						Refractive Index,			% Transmittance				Impurities, ppm		
Dow Corning® Brand Product	Hardness, Shore	Penetration, 1/10 mm	Elongation, percent	Tensile Strength, MPa	Young's Modulus, MPa	cured at 633 nm	cured at 1321 nm	cured at 1554 nm	at 450 nm	at 800 nm	CTE ppm/°C	Tg °C	Na+	K+	Cl+
Gels															
JCR 6109	—	170	N/A	N/A	—	1.424	1.414	1.413	—	89[2]	—	—	0.2	0.3	0.9
JCR 6110 A/B	—	200	N/A	N/A	—	1.423	1.413	1.411	99[2]	100[2]	—	—	0.04/0.04 (A/B)	0.07/0.05 (A/B)	0.5
Hipec® Q3-6646 Semiconductor Protective Coating Kit	—	55	N/A	N/A	—	1.402	1.394	1.393	98[2]	100[2]	—	—	0.3/0.3 (A/B)	0.5/0.5 (A/B)	< 1
Elastomers															
JCR 6101	35 (A)	N/A	170	1.7	1.2	1.407	1.398	1.397	Translucent		300	-121	0.5	0.3	< 1
JCR 6101 UP	35 (A)	N/A	170	1.7	1.2	1.406	1.398	1.396	Translucent		300	-121	0.5	0.4	< 1
JCR 6115	13 (A)	N/A	130	0.4	0.2	1.404	1.396	1.395	—	91[3]	—	—	0.2/0.2 (A/B)	0.5/0.5 (A/B)	1.1/1.2 (A/B)
JCR 6122	35 (A)	N/A	60	0.5	1.1	1.404	1.396	1.394	99[3]	99[3]	316	-120	0.1/0.2 (A/B)	0.3/0.3 (A/B)	0.5/0.5 (A/B)
JCR 6126 W/C	26 (A)	N/A	290	1.8	0.7	1.404	1.396	1.395	Translucent		300	-121	0.1/0.2 (Base /Cat)	0.2/0.2 (Base/Cat)	2.1/1.6 (Base/Cat)
JCR 6140	40 (A)	N/A	110	2.5	1.0	1.406	1.399	1.397	94[3]	98[3]	301	-119	0.1	0.2	< 1
EG-6301	71 (A)	N/A	80	9	6.7	1.411	1.403	1.402	97[4]	95[3]	270	-124	0.1	0.2	1
OE-6336	65 (A)	N/A	—	—	—	1.413	1.404	1.402	98[4]	98[3]	—	—	—	—	—
JCR 6175	31 (A)	N/A	40	0.4	—	1.539	1.524	1.522	99[4]	100[2]	222	-28	0.2	0.3	1
Resins															
SR-7010	67 (D)	N/A	N/A	—	—	1.532	1.516	1.514	99[5]	100[5]	200	—	< 1	< 1	< 1

[2]Percent transmittance measured on 1-cm sample thickness.
[3]Percent transmittance measured on 3.1-mm sample thickness.
[4]Percent transmittance measured on 1-mm sample thickness.
[5]Percent transmittance measured on 1.8-mm sample thickness.

PACKAGING

Dow Corning® Brand Product	Product Form	Packaging (Minimum Size)
JCR 6109	1-part gel	500-g bottle
JCR 6110 A/B	2-part gel	460-g/100-g bottle
Hipec® Q3-6646 Semiconductor Protective Coating Kit	2-part gel	900-g kit or 210-mL kit
JCR 6101	1-part encapsulant	500-g bottle
JCR 6101 UP	1-part encapsulant	500-g bottle
JCR 6115	2-part encapsulant	500-g/500-g bottle
JCR 6122	2-part encapsulant	500-g/500-g bottle
JCR 6126 W/C	2-part encapsulant	500-g/50-g bottle
JCR 6140	2-part encapsulant	500-g/500-g bottle
EG-6301	2-part encapsulant	500-g/500-g bottle
OE-6336	2-part encapsulant	500-g/500-g bottle
JCR 6175	2-part encapsulant	500-g/500-g bottle
SR-7010	2-part resin	1-kg/1-kg can

LIMITATIONS

These products are neither tested nor represented as suitable for medical or pharmaceutical uses.

SAFE HANDLING INFORMATION

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED. BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE ON THE DOW CORNING WEBSITE AT WWW.DOWCORNING.COM, OR FROM YOUR DOW CORNING REPRESENTATIVE, OR DISTRIBUTOR, OR BY WRITING TO DOW CORNING CUSTOMER SERVICE, OR BY CALLING (989) 496-6000.

HEALTH AND ENVIRONMENTAL INFORMATION

To support customers in their product safety needs, Dow Corning has an extensive Product Stewardship organization and a team of Product Safety and Regulatory Compliance (PS&RC) specialists available in each area.

For further information, please see our website, www.dowcorning.com, or consult your local Dow Corning representative.

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that Dow Corning's products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

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