

MOMENTIVE™

**Silicone Material Solutions
for LED Packages and Assemblies**

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LED Packaging and Assembly Solutions from Momentive Performance Materials

The growth of optoelectronic devices and LEDs in segments such as handheld devices, mobile phones, display backlights, automotive, and electronic signs, has led to an increase in demand for enhanced performance and long-term reliability. Designers of LEDs and optoelectronic devices will find a range of silicone material solutions from Momentive, that are excellent candidates to address a wide array of challenges facing the LED industry.

Glob Top Encapsulants

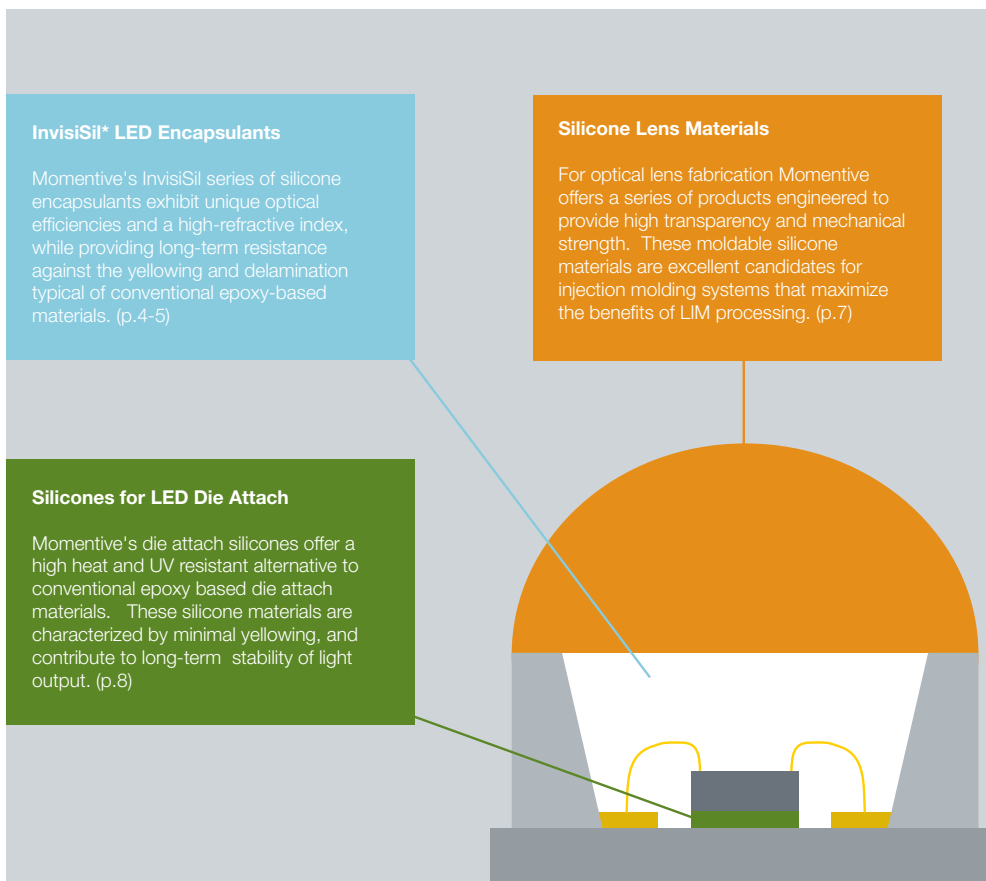
Momentive's Glob Top encapsulants exhibit good light transmittance, and are formulated to provide consistent dispensing performance and material flow to form a dome shape. Component designers with chip-mounting and wire-bonding capabilities can benefit from the process simplicity that these materials offer in LED Glob Top packaging applications. (p.6)

Dot Matrix and LED Assembly Materials

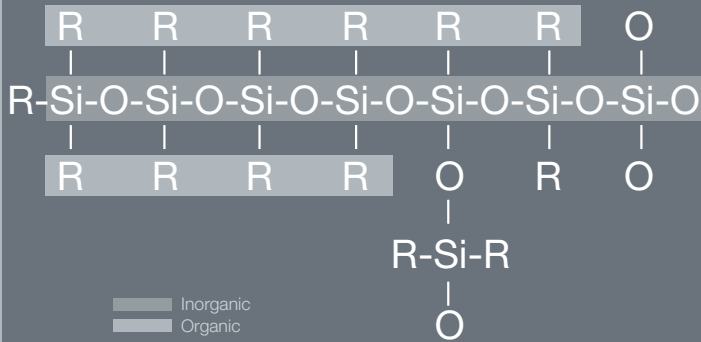
LED dot matrix potting materials are available in room temperature and heat-accelerated alternatives. The low viscosities of these potting materials make them great materials of choice for potting applications in intricate Dot Matrix applications and LED Assemblies. (p.9)

Thermal Management Silicones

Momentive's materials help dissipate heat generated from power and high-brightness LEDs. Products includes silicone grease, and heat-cure and condensation cure adhesives. (p.9)



Silicone Advantages



The chemical structure of silicone provides several advantages over conventional materials used in optoelectronic applications. The backbone structure of polydimethylsiloxane consists of silicon (Si) and oxygen (O). The siloxane bond (Si-O) is inorganic and has a higher bond energy of (444kJ/mol) than either carbon (C) - carbon (C) bond (356kJ/mol), or carbon (C) - oxygen (O) bond (339kJ/mol). This bond energy difference is ascribed as one of the contributing factors to the better thermal stability of silicone over that of epoxy resin. The inorganic siloxane bond of silicone materials and its resultant bond energy, contributes to stable performance under harsh operating conditions. This is manifest in performance advantages to epoxy resins under some usage conditions.

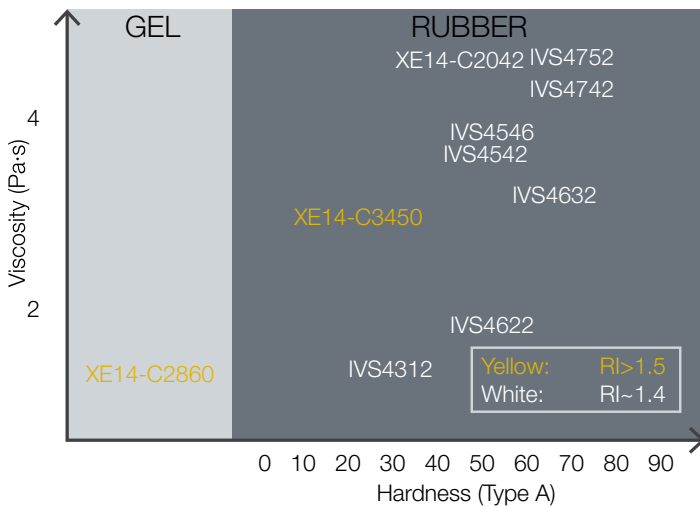
Performance Comparison

	Silicone	Epoxy
Thermal Resistance	Excellent	Fair
UV Resistance	Excellent	Poor
Hardness	Good	Excellent
Adhesion Strength	Good	Excellent
Thermal Expansion	Fair	Good
Moisture Absorption	Good	Fair
Moisture Permeability	Fair	Good



InvisiSil* LED Encapsulants

InvisiSil series, silicone encapsulants deliver high refractive index & light transmittance to effectively transmit light emitted from LEDs. They help contribute to durability and reliability of devices through their long-term resistance to yellowing and delamination of encapsulant from the substrate. They also provide low viscosities that make them candidates for a wide variety of LED packages such as small SMD packages, larger power packages, and multi-chip COB packages.



Key Features

- Selection from a range of refractive index
- up to 1.53 (nD25)
- High light transmittance (>95%, 400-800nm)
- Good workability
- High purity
- Adhesion to LED package substrates

Product Details	High Refractive Index	
	XE14-C2860	XE14-C3450
Components	2 Part	2 Part
Cure Type	Heat Cure	Heat Cure
Property	Gel	Rubber
Viscosity (A) Pa·s	0.9	6.7
	(B) Pa·s	0.6
Mixing Ratio (A:B)	100:100	20:100
Viscosity (mixed) @23°C Pa·s	0.8	2.5
Refractive Index	1.51	1.53
Curing Condition	80/1	150/1 ¹
Transmittance (1mm: 400nm, 800nm) %	98, >99	98, >99
Penetration	35	-
Hardness (Type A)	-	29
Specific Gravity @23°C	-	1.11
Adhesion Strength (PPA) MPa	-	0.2
CTE 1/K	-	2.6 x 10 ⁻⁴

Packaging: XE14-C2860 A & B 500g bottles. XE14-C3450 A 100g, B 500g bottles.
¹Step cure (90min@80°C, 1h@150°C) recommended for package dispensing applications.
 Typical property values should not be used as specifications

	Normal Refractive Index							
	IVS4312	XE14-C2042	IVS4542	IVS4546	IVS4622	IVS4632	IVS4742	IVS4752
Components	2 Part	2 Part	2 Part	2 Part	2 Part	2 Part	2 Part	2 Part
Cure Type	Heat Cure	Heat Cure	Heat Cure	Heat Cure	Heat Cure	Heat Cure	Heat Cure	Heat Cure
Property	Rubber	Rubber	Rubber	Rubber	Rubber	Rubber	Rubber	Rubber
Viscosity(A) Pa·s	1.2	6.2	5.7	6.1	4.2	7.5	14	7.0
	(B) Pa·s	0.8	4.4	3.2	3.3	1.5	1.4	2.4
Mixing Ratio (A:B)	100:100	100:100	100:100	100:100	100:100	100:100	100:100	100:100
Viscosity (mixed) @23oC Pa·s	1.0	4.9	3.8	4.2	2.4	3.2	4.2	5.0
Refractive Index	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
Curing Condition	150/1 ¹	150/1 ¹	150/1 ¹	150/1 ¹	150/1 ¹	150/1 ¹	150/1 ¹	150/1 ¹
Transmittance (1mm: 400nm, 800nm)%	>99, >99	>99, >99	>99, >99	>99, >99	>99, >99	>99, >99	>99, >99	>99, >99
Hardness (Type A)	29	43	48	49	55	64	71	72
Tensile Strength MPa	0.8	6.0	6.6	7.1	7.2	9.0	11	4.6
Elongation %	110	170	110	130	100	80	70	90
Specific Gravity @23°C	0.99	1.02	1.03	1.03	1.04	1.05	1.05	1.05
Adhesion Strength (PPA) MPa	0.3	3.0	3.7	3.2	3.2	1.5	2.7	3.1
CTE 1/K	3.3 x 10 ⁻⁴	2.8 x 10 ⁻⁴	2.8 x 10 ⁻⁴	2.8 x 10 ⁻⁴	2.8 x 10 ⁻⁴	2.8 x 10 ⁻⁴	2.7 x 10 ⁻⁴	2.7 x 10 ⁻⁴

Packaging: 500g Bottles 1Step cure (90min@80°C, 1h@150°C) recommended for package dispensing applications
 Typical property values should not be used as specifications

InvisiSil Encapsulants Technical Data

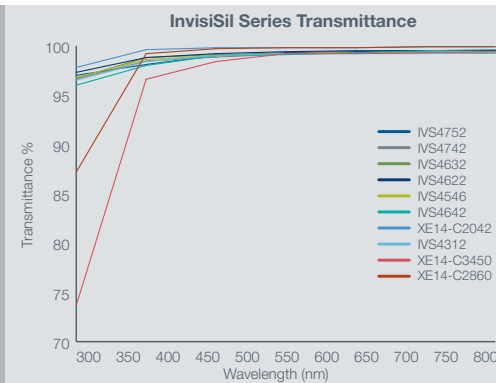
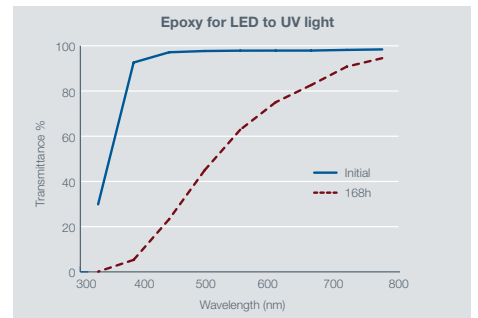
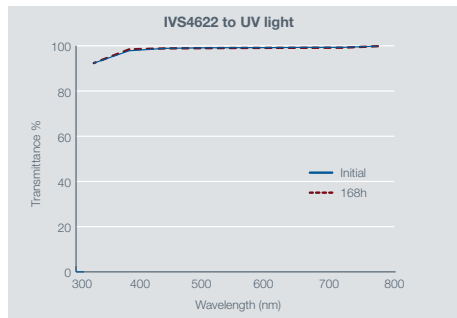
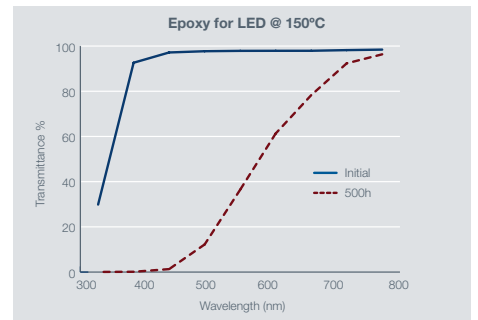
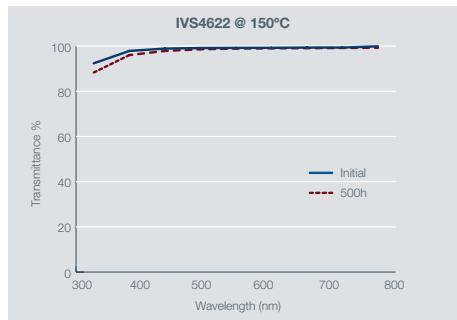
Thermal Stability

InvisiSil LED Encapsulants help contribute to long-term thermal stability of LEDs. This is represented in thermal stability tests conducted using IVS4622 and LED grade epoxy resins. Tests were performed by exposing both materials to 150°C temperatures. While the transmittance of IVS4622 remained stable under prolonged periods of heat exposure, epoxy resins demonstrated deterioration in transmittance over time accompanied by yellowing of the encapsulant material.

UV Stability

InvisiSil LED Encapsulants also help contribute to long-term UV stability of LEDs. This is represented in UV stability tests conducted using IVS4622 and LED grade epoxy resins. Tests were performed by exposing both materials to a 365nm UV LED lamp (30J/cm²/min). IVS4622 silicone encapsulant demonstrated stable performance, while LED epoxy resins generated results suggesting lower UV stability.

Transparency Performance¹



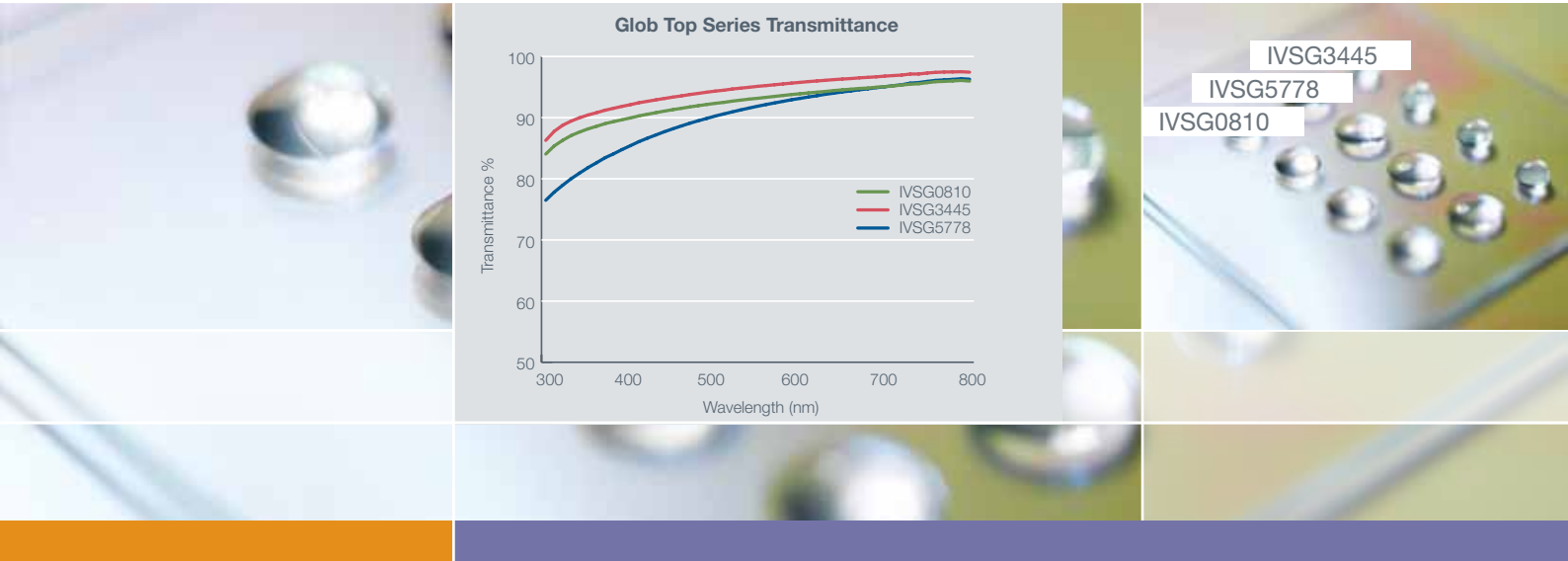
¹Transmittance measured using 1mm liquid film

Glob Top Encapsulants

Momentive's Glob Top encapsulants exhibit good light transmittance, and are excellent candidates to provide consistent dispensing performance and material flow to form a dome shape for COB (chip on board) encapsulation. Component designers with chip-mounting and wire-bonding capabilities can benefit from the process simplicity that these materials offer in LED COB packaging applications.

Product Details			IVSG3445	IVSG5778	IVSG0810
Components			2 Part	2 Part	1 Part
Cure Type			Heat Cure	Heat Cure	Heat Cure
Property			Rubber	Rubber	Rubber
Appearance			Translucent	Translucent	Translucent
Viscosity	(A)	Pa·s	70	5.5	-
	(B)	Pa·s	55	5.0	-
Mixing Ratio	(A:B)		100:100	100:100	-
Viscosity (mixed)	@23°C		63	14	14
Pot Life	@23°C		72	8	-
Refractive Index			1.41	1.41	1.41
Curing Condition			150/1	80/2	150/1
Transmittance (1mm: 400nm, 800nm) %			92, 97	85, 96	90, 96
Hardness (Type A)			70	16	24
Specific Gravity @23°C			1.10	1.02	1.02
Tensile Strength	MPa		-	0.5	-
Elongation	%		-	190	170
Adhesion Strength (AI)	MPa		3.5	0.3	0.6
Thermal Conductivity	W/m.K		0.20	0.17	0.18
CTE	1/K		2.7 x 10 ⁻⁴	2.3 x 10 ⁻⁴	3.0 x 10 ⁻⁴
Volume Resistivity	MΩ.m		1 x 10 ⁷	2 x 10 ⁵	2 x 10 ⁷
Dielectric Strength	kV/mm		24	24	21
Dielectric Constant (60Hz)			2.8	2.7	2.6
Dielectric Loss (60Hz)			0.001	0.001	0.003
Ionic Content (Na, K, Cl)	ppm		<2, <2, <5	<2, <2, <5	<2, <2, <5

Packaging: 500g Bottles
 Typical property values should not be used as specifications



1 Transmittance measured using 0.6mm liquid film

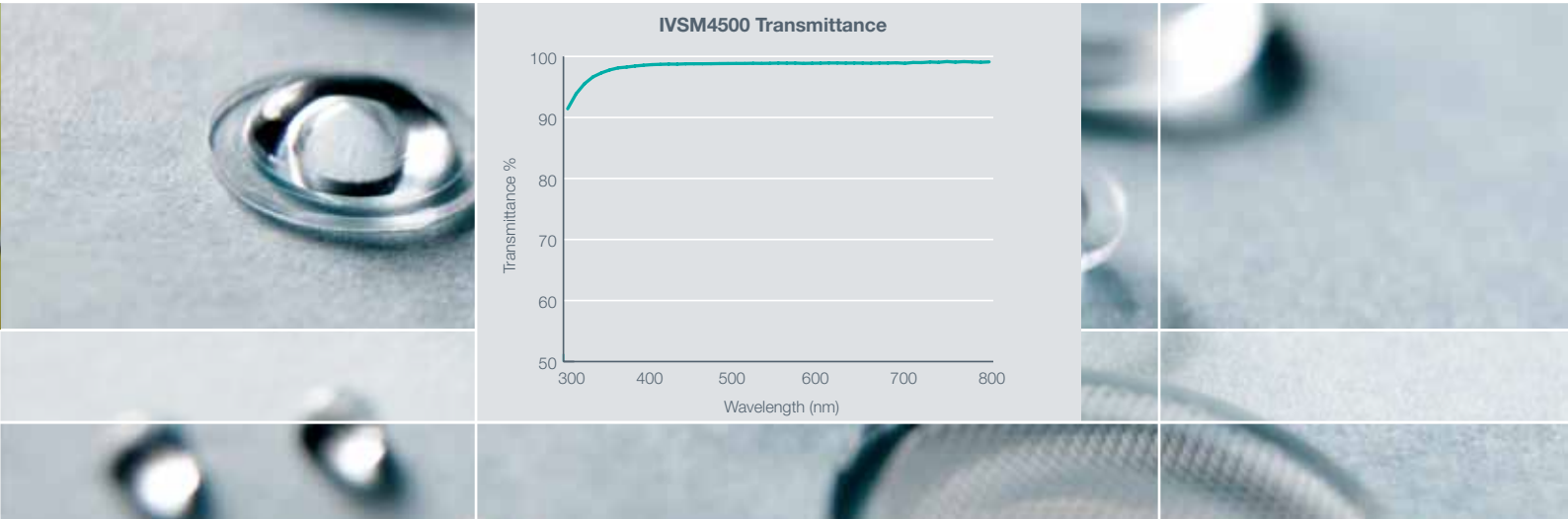
Lens Fabrication Materials

For optical lens fabrication Momentive offers a series of products engineered to provide high transparency and mechanical strength. These moldable silicone materials are excellent candidates for injection molding systems that maximize the benefits of LIM processing.

Product Details			IVSM4500
Components			2 Part
Cure Type			Heat Cure
Property			Resin
Appearance			Transparent
Viscosity	(A)	Pa·s	300
	(B)	Pa·s	50
Mixing Ratio	(A:B)		100:100
Viscosity (mixed) @23°C		Pa·s	30
Pot Life @23°C		h	24
Curing Condition			150/1
Refractive Index			1.42
Transmittance (1mm: 400nm, 800nm) %			99, >99
Hardness (Type D)			50
Young's Modulus		MPa	80
Tensile Strength		MPa	4.7
Elongation		%	<5
CTE		1/K	2.2×10^{-4}
Shrinkage		%	2.5

Packaging: 1kg can, 18kg pail

Typical property values should not be used as specifications.



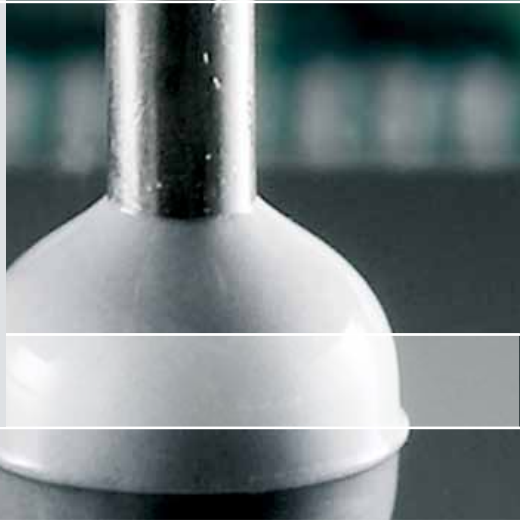
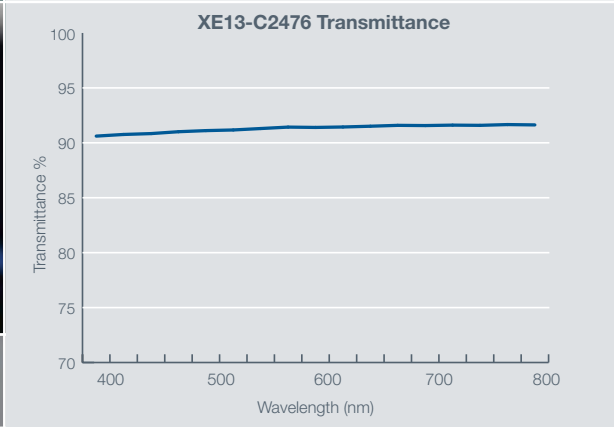
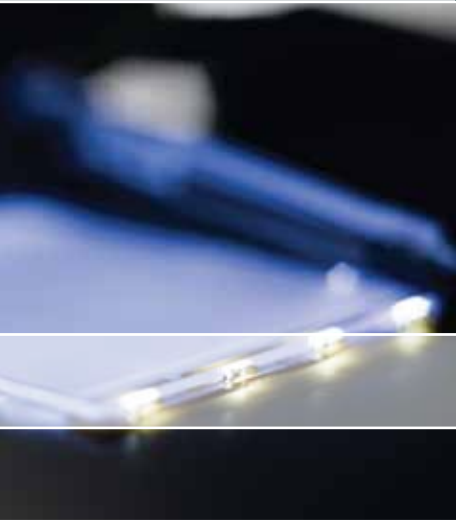
1 Transmittance measured using 1.4~2.0mm liquid film

Die Attach Silicones

Momentive's die attach silicones offer a high heat and UV resistant alternative to conventional epoxy based die attach materials. These silicone materials are characterized by minimal yellowing, and contribute to long-term stability of light output.

Product Details		
		XE13-C2476
Characteristic	Electro-Insulative	
Components	1 Part	
Cure Type	Heat Cure	
Property	Rubber	
Appearance	Translucent	
Viscosity @23°C	Pa·s	30
Curing Condition	°C/h	150/1
Thermal Conductivity	W/m.K	0.20
Specific Gravity @ 23°C	1.15	
Hardness	58 (Type D)	
Adhesive Strength (Al)	MPa	3.0
Volume Resistivity	MΩ.m	1.0 x 10 ⁷
Refractive Index	(n _D 25)	1.42
Ionic Content (Na, K, Cl)	ppm	<2, <2, <5

Packaging: 10ml Syringe
 Typical property values should not be used as specifications



1 Transmittance measured using 0.6mm liquid film

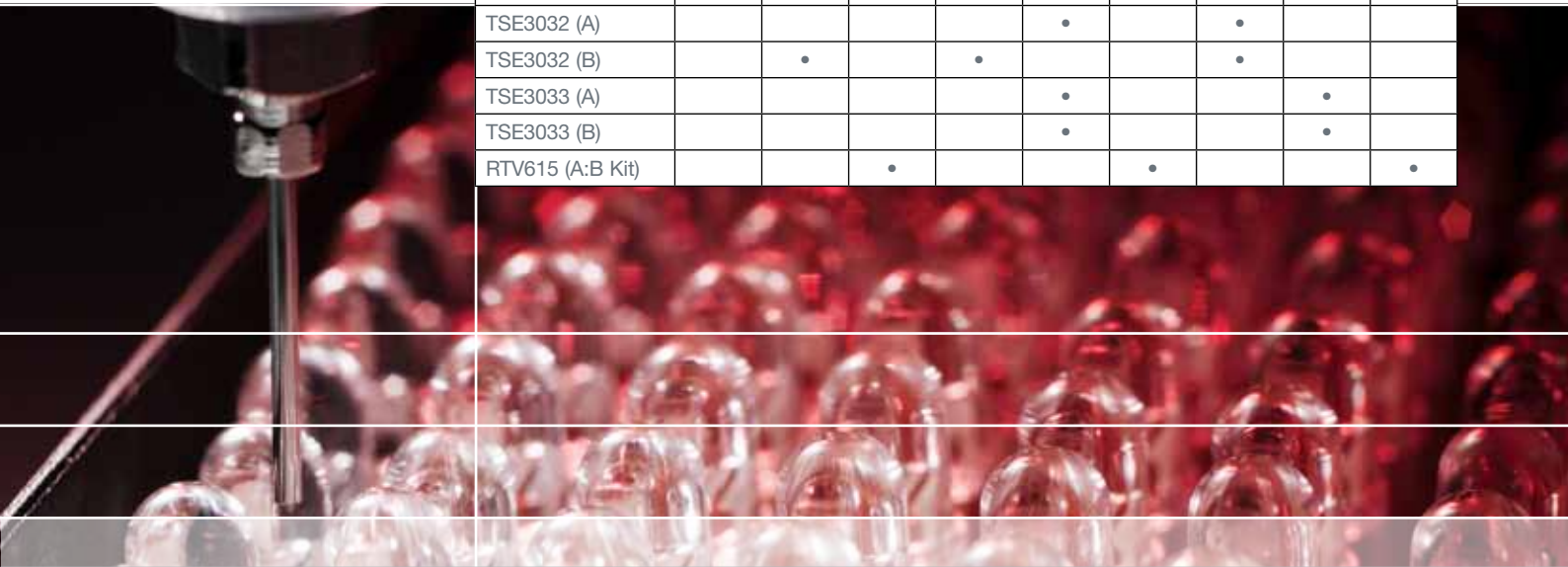
Dot Matrix and Assembly Materials

LED dot matrix potting materials are available in room temperature and heat-accelerated alternatives. The low viscosities of these potting materials make them excellent materials of choice for intricate Dot Matrix applications and LED Assemblies for a variety of industries ranging from signage, automotive, to lighting. These silicone materials provide enhanced weatherability performance, especially in locations with high salt air concentrations, and represent a smart alternative to conventional epoxy or urethane materials.

Product Details	Dot Matrix Materials		LED Assembly Materials			
	XE12-B2543	XE14-C0447	TSE3032	TSE3033	RTV615	
Components	2 Part	2 Part	2 Part	2 Part	2 Part	
Cure Type	Room Temp.	Heat Cure	Heat Cure	Heat Cure	Heat Cure	
Property	Rubber	Rubber	Rubber	Rubber	Rubber	
Appearance	Translucent	Translucent	Translucent	Translucent	Translucent	
Viscosity @23°C	(A) Pa-s	1.8	1.9	4.2	1.1	4.3
	(B) Pa-s	-	1.7	0.7	0.8	-
Mixing Ratio	(A:B)	100:2	100:100	100:10	100:100	100:10
Viscosity (mixed) @ 23°C	Pa-s	-	1.7	4.0	0.9	4.0
Pot Life @ 23°C		2	2	4	6	4
Curing Condition	°C/h	23/72	80/1	100/1	150/0.5	100/1
Specific Gravity @ 23°C		1.11	0.99	1.02	1.01	1.02
Hardness (Type A)		28	15 (Type E)	35	30	44
Tensile Strength	MPa	0.8	-	4.5	1.0	6.3
Elongation	%	130	-	210	130	120
Adhesion Strength	MPa	0.42 (A)	adhesive	-	0.3 (glass)	-

Typical property values should not be used as specifications

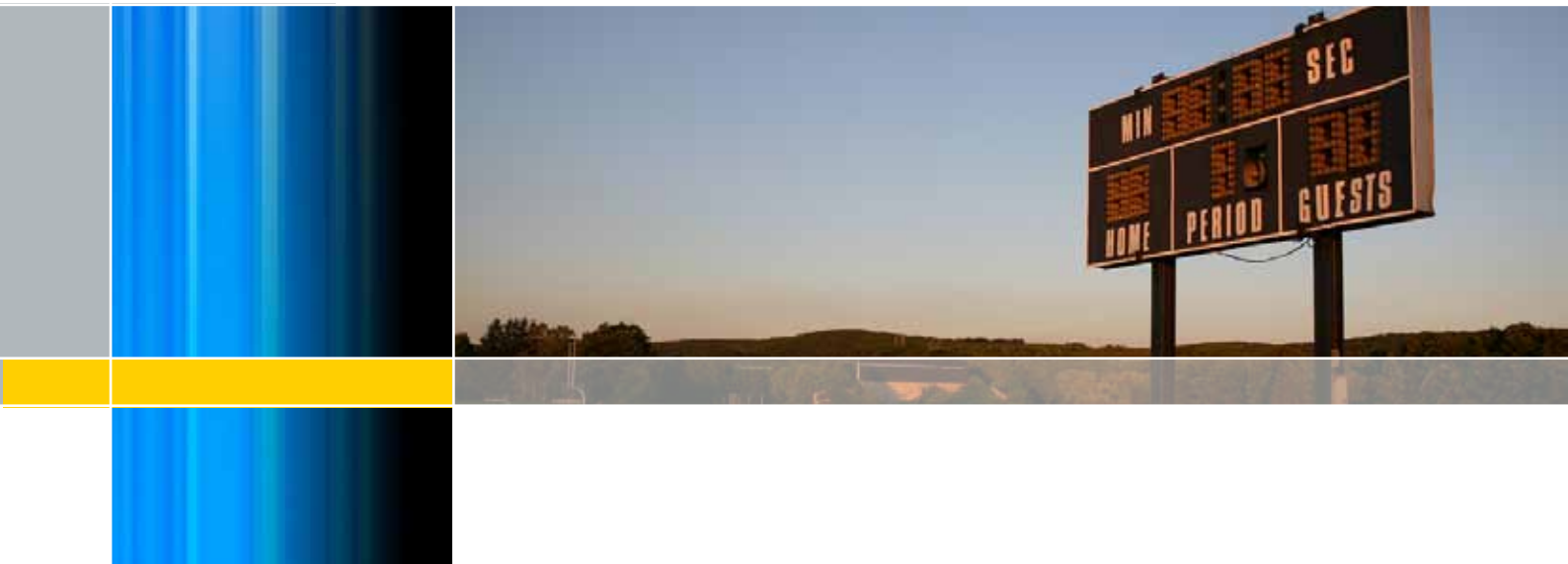
Packaging									
	30g bottle	100g bottle	1lb (454g)	500g bottle	1kg can	10 lb (4.5kg)	15 kg pail	18kg pail	44lb (22kg)
XE12-B2543 (A)					•			•	
XE12-B2543 (B)	•			•					
XE14-C0447 (A)							•		
XE14-C0447 (B)							•		
TSE3032 (A)					•		•		
TSE3032 (B)		•		•			•		
TSE3033 (A)					•			•	
TSE3033 (B)					•			•	
RTV615 (A:B Kit)			•			•			•



Product Availability by Region ¹					
	Japan	Korea	China	US	Europe
XE14-C2860	•		•	•	•
XE14-C3450	•	•	•		•
IVS4312	•	•	•	•	•
XE14-C2042	•	•	•		•
IVS4542	•	•	•	•	•
IVS4546	•	•	•		•
IVS4622	•	•	•		•
IVS4632	•		•	•	•
IVS4742	•	•	•		•
IVS4752	•	•	•		•
IVSG3445	•	•	•	•	•
IVSG5778	•	•	•	•	•
IVSG0810	•		•	•	•
IVSM4500	•	•	•	•	•
XE13-C2476	•				
XE12-B2543	•				
XE14-C0447	•	•	•	•	
TSE3032	•	•	•	•	•
TSE3033	•	•	•	•	•
RTV615	•	•	•	•	•

¹ Contact a Momentive Performance Materials sales representative for availability in countries and regions not listed

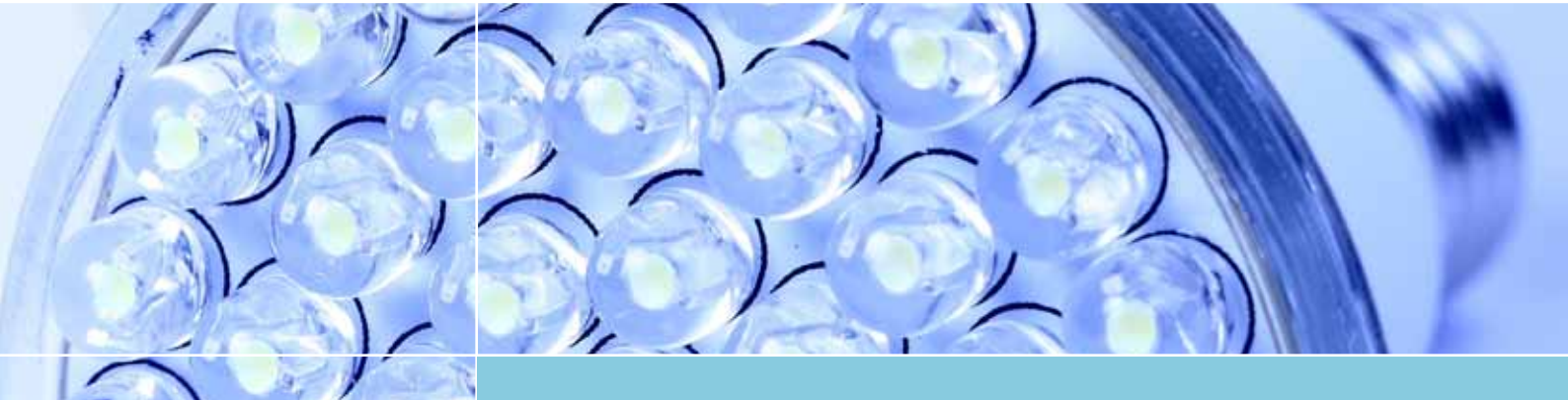
Product Availability



Other Electronic Solutions from Momentive Performance Materials

12-page brochure provides detailed information on silicone materials used for thermal management applications in electronics and micro-electronics. Includes SilCool* grease & adhesives, and conventional grades for adhesion, encapsulation and potting.

Comprehensive package of adhesion, sealing, coating, and encapsulation / potting solutions for a wide range of silicone applications in electric and electronic devices and component assemblies.



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