Shin-Etsu Silicone Products Guide

Highly Functional Silicone Products Lineup

Shin-Etsu Silicone

- Flexible Silicone Conductive Paste
- UV Cure RTV Silicone Rubbers
- Radical Polymerization Type Temporary Adhesive Silicones
- Low Elasticity RTV Silicone Rubbers
- Polyimide Silicone Primers
- Silicone Gel for Protecting Electrodes
- Conductive Polyimide Silicone Silver Paste
- High Hardness Die Bond Materials
- Visible Light Shielding Silicone Encapsulants
- One-component Addition Cure Type RTV Silicone Rubber High Strength Elastic Adhesive

Shin-Etsu Silicone Makes Various Devices More Reliable and Expands Product Design Potential.

Contents

Features of Silicone

Silicones have an amazing array of properties.

Silicones consist of a main chain of inorganic siloxane linkages (Si-O-Si) plus side chains which contain organic groups.
Silicones are **hybrid polymers** that contain **both inorganic and organic components.**

The main chain of a silicone consists of siloxane linkages which are stable and have a high bonding energy.

Compared to organic polymers, which have a carbon backbone (C-C/bonding energy: 85 kcal/mol), silicones have superior heat resistance and weatherability (UV light, ozone).
This is due to the greater stability of siloxane bonds, which have a bonding energy of 106 kcal/mol.

With their long bond length and high bond angle, siloxane bonds have weak intermolecular forces and move freely.

Siloxane bonds have a bond length of 1.64 Å and bond angle of 134°. Compared to carbon bonds (bond distance: 1.54 Å, bond angle: 110°), they have a long bond distance, high bond angle, and a low rotational energy barrier. As a result, siloxane bonds move more freely and intermolecular forces are weak. These characteristics manifest themselves in features of the silicone material, including softness, gas permeability, cold resistance, and small changes in viscosity due to temperature changes.

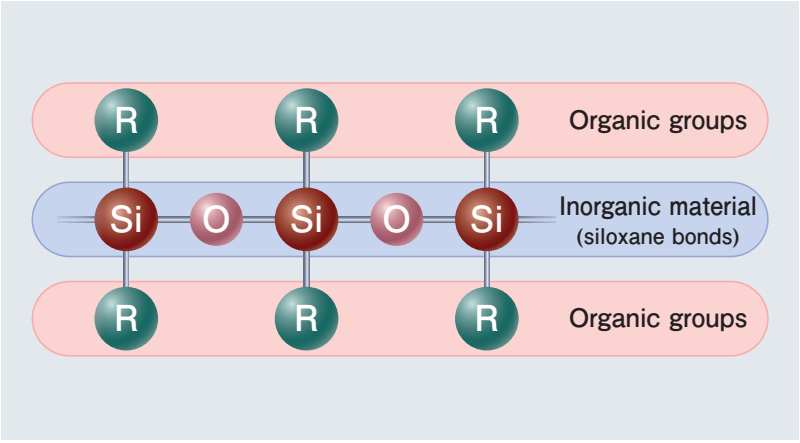
The molecules of silicone polymers are covered by hydrophobic methyl groups, and surface energy is low.

The backbone of a silicone polymer molecule is a twisted helical structure. The molecules are almost completely covered by hydrophobic methyl groups, and surface energy is low. This gives rise to unique properties including water repellency and easy release.

Furthermore, silicones are low-polarity polymers so they exhibit low moisture absorption.

Silicones: compounds which feature a main chain of siloxane bonds

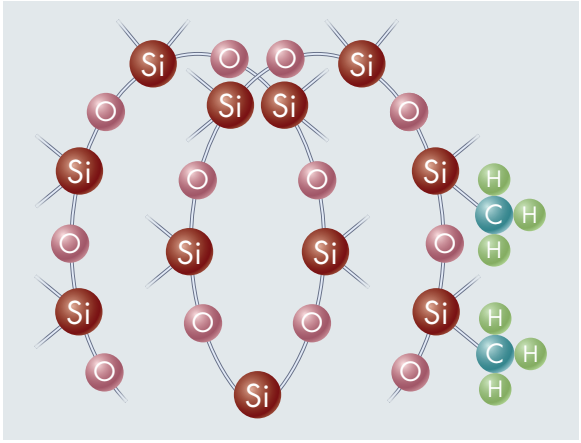
Features attributable to siloxane linkages



- Heat resistance
- Flame resistance
- Chemical stability
- Weatherability
- Radiation resistance
- Electrical properties

Si-O bonds 106kcal/mol
C-C bonds 85kcal/mol
C-O bonds 76kcal/mol

Features attributable to molecular structure



- Water repellency
- Release properties
- Cold resistance
- Compression characteristics

Helical (spiral) structure
Intermolecular forces are weak

Flexible Silicone Conductive Paste

SCP-101

Features

- Excellent elasticity and consistent bending properties after curing
- Circuit formation by screen printing is possible.
- UV irradiation + room-temperature or heat curing is possible.
- Excellent adhesion to silicone rubber base material

Application Examples

- Circuit formation conductive paste for flexible packages

General Properties

Parameter \ Product name		SCP-101	
Appearance		Grayish white	
Viscosity at 23℃ 10 [1/s]	Pa•s	41	
Viscosity at 23℃ 2 [1/s]	Pa•s	105	
Storage temperature		≦0℃	
Standard curing conditions		Metal halide lamp 6,000mJ+23℃×12h	120℃×1h
Density at 23℃	g/cm³	NA※1	5.34※2
Hardness	Durometer A	NA※1	10※2
Tensile strength	MPa	NA※1	0.3※2
Elongation at break	%	NA※1	65※2
Thermal conductivity	W/mk	NA※1	3.2※2
Adhesion (cross cut adhesion test) silicone rubber		100/100	100/100

※1 Rubebr thickness: 0.08 mm, not measurable due to thin film
※2 Rubber thickness 1.0 mm

(Not specified values)

Volume Resistivity Data

Standard curing conditions		Metal-halide lamp 6,000mJ+23℃×12h	120℃×1h
Initial	Ω-cm	Not measurable (Immediately after UV irradiation)	2×10^{-4} (After heat curing)
After 12 h at 23℃	Ω-cm	4×10^{-4}	-

(Not specified values)

Durability Test Data

Durability Test		Initial	500 h	1,000 h
After high temperature exposure (120℃)	Ω-cm	4×10^{-4}	1×10^{-4}	2×10^{-4}
After high temperature and humidity exposure(85℃/85% RH)	Ω-cm	4×10^{-4}	8×10^{-5}	5×10^{-5}

* Test samples prepared under the conditions of 6,000mJ + 23℃ × 12 h by metal halide lamp

(Not specified values)

Stretchability Test Data

Substrate: KE-106 (high strength silicone rubber) Thickness: 1.0 mm
SCP-101: 5.0 mm × 60.0 mm Thickness: 0.04 mm

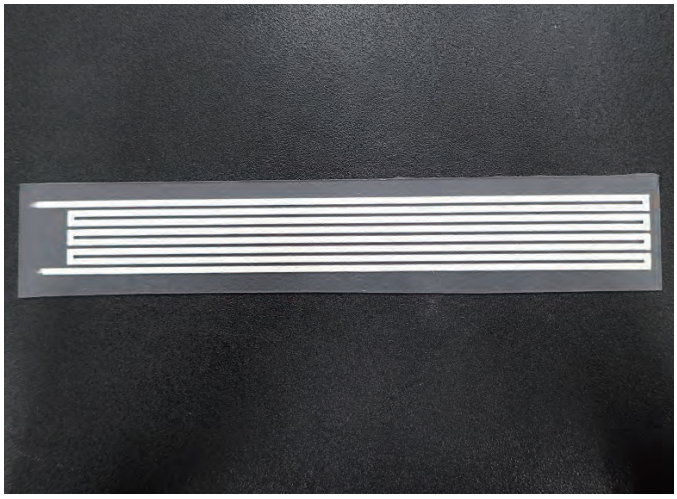
Volume resistivity change during elongation

Cure conditions	Elongation rate: 10%	Elongation rate: 20%
UV cure	4 times	17 times
Heat cure	9 times	50 times

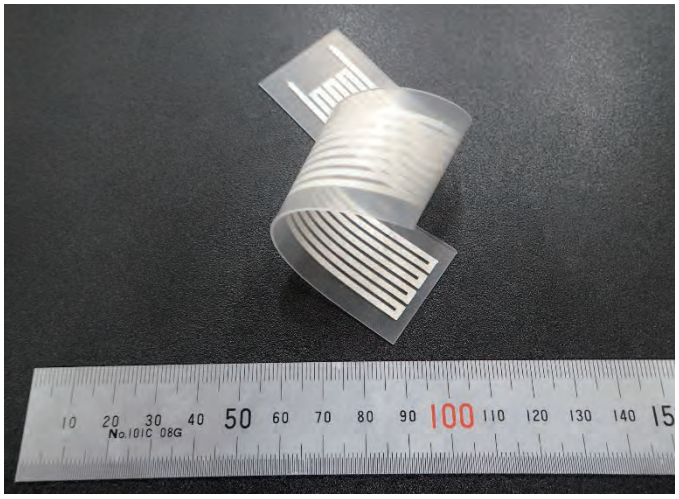
(Not specified values)

Circuit Formation by Screen Printing

Substrate: KE-106 (high strength silicone rubber) Thickness: 1.0 mm
Silver paste Thickness: 0.04 mm
Overcoat material (silicone rubber) Thickness: 1.0 mm



Circuit formation example



Excellent flexibility

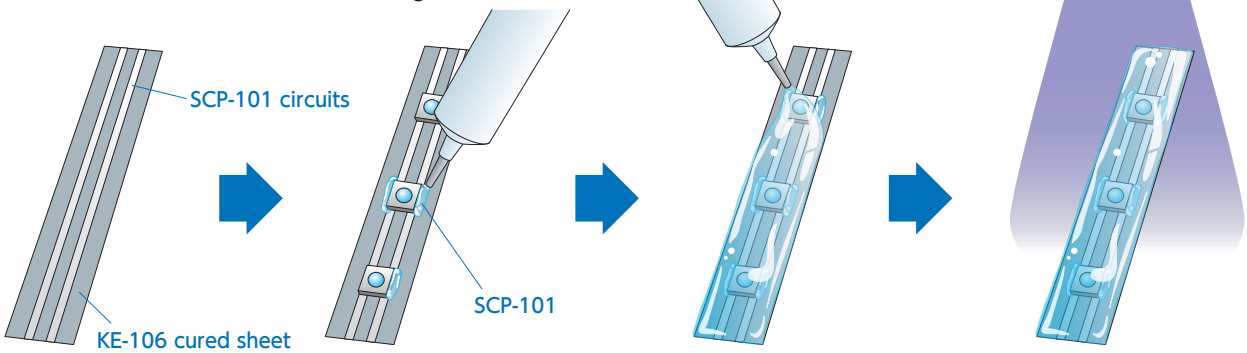
Manufacturing Procedure for a LED Lighting Sample of Conductive Silicone Rubber Circuit

① Print SCP-101 on a KE-106 cured sheet and cure with a metal halide lamp

② Place LED elements on printed SCP-101 circuit and apply SCP-101, bonding them at 120℃ × 1 h.

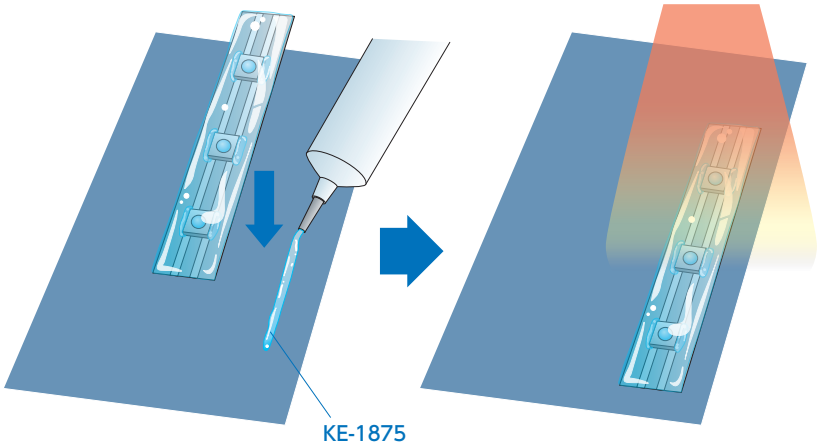
③ Apply KER-4690-A/B

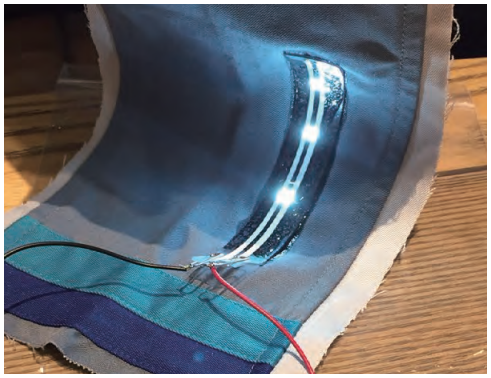
④ Cure at 23℃ for 24 h after metal halide lamp irradiation



⑤ Apply KE-1875 to cloth and position sheets.

⑥ Cure at 120℃ × 1 h



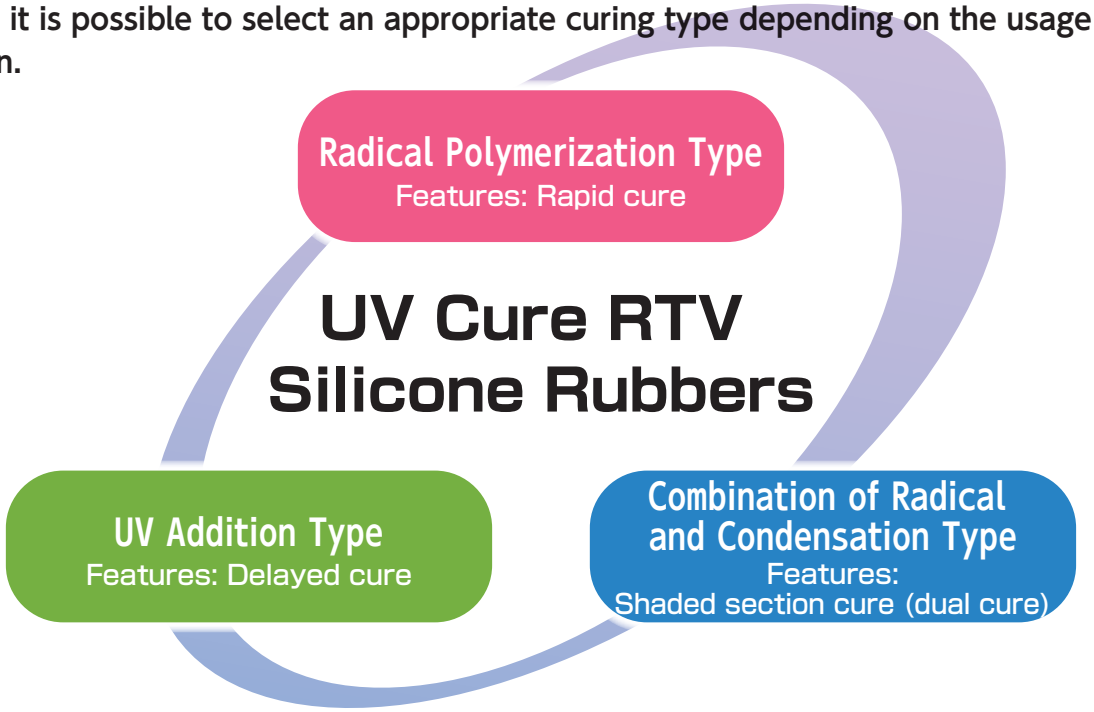


LED is lit by conductive silicone rubber circuit on the cloth.

UV Cure RTV Silicone Rubbers

Three Cure Types

Shin-Etsu offers a wide variety of UV cure RTV silicone rubbers, including a fast curing radical-polymerization type, a UV addition type that is irradiated with UV light and then cures fully at room temperature or with heating, and a combination of radical and condensation types that cures via condensation reaction in sections where the UV rays can't reach. Therefore, it is possible to select an appropriate curing type depending on the usage and application.



■Types and features of UV cure RTV silicone rubbers

Parameter \ Type		Radical Polymerization	UV Addition	Combination of Radical and Condensation
Features		Rapid cure, Low to high hardness Both silicone and polyimide silicone available	Parts can be laminated after UV irradiation (process reversal). Ultra-low shrinkage with room-temperature curing Shortened cure time with low-temperature heating	Cures by condensation reaction in sections where UV light won't reach
By-product		—	—	Alcohol or acetone
Curability	UV	Rapid	Slow	Rapid
	Heating	NA	Room temperature to 80°C×1 h	NA
	Moisture	NA	NA	> 1 day *1
Cure inhibition factors	Oxygen	Inhibits curing	No effect	Inhibits curing *2
	S・N・P compound	No effect	Inhibits curing	No effect
	Acids, alcohols, etc.	No effect	Inhibits curing	Inhibits curing

*1 The time required for curing depends on the thickness.
For curing properties of condensation reaction type, please refer to the catalog of RTV silicone rubbers for electrical & electronic applications.
*2 Oxygen-inhibited areas are cured by condensation reaction.

Radical Polymerization Type RTV Silicone Rubbers

KER-43XX-UV Series

Features

- Processing time shortened by UV irradiation.
  After curing, it becomes a flexible elastomer and reduces stress.
- Low cure shrinkage optimal for securing precision parts <0.1%
- Excellent heat resistance and durability for hygroscopic reflow mounting

Application Examples

- Fixing of sensors and precision glass components

General Properties

Parameter \ Product name		KER-4301-UV	KER-4302-UV	KER-4303-UV	KER-4304-UV	KER-4320-UV
Brief description		Transparent, flowable	Transparent, thixotropic	Resistant to oxygen inhibition hygroscopic reflow resistance flowable	Resistant to oxygen inhibition hygroscopic reflow resistance thixotropic	Hygroscopic reflow resistance thixotropic
Reaction mechanism		Radical	Radical	Radical	Radical	Radical
Appearance		Colorless transparent	Colorless transparent	Yellow transparent	Yellow transparent	Yellow transparent
Viscosity	mPa·s	7,000	20,900	5,500	20,400	15,000
Refractive index		1.44	1.44	1.44	1.44	1.44
Standard curing conditions	UV light source	Metal halide lamp				
	Illuminance* mW/cm²	100	100	100	100	100
	Irradiation time s	40	40	40	40	40
	Estimated light intensity mJ/cm²	4,000	4,000	4,000	4,000	4,000
Density at 23℃	g/cm³	1.10	1.13	1.10	1.12	1.13
Hardness	Durometer A	41	54	41	56	16
Tensile strength	MPa	4.0	4.0	2.6	3.8	2.1
Elongation at break	%	110	100	100	80	320
Tensile lap-shear strength (glass/glass) t=460 μm	MPa	1.2	1.3	0.9	1.2	0.9 (t=80μm)
Cure shrinkage	%	< 0.1	< 0.1	< 0.1	< 0.1	—
Light transmissivity 400 nm/2.0 mm	%	90	81	39	34	—
Moisture transmissivity 40℃×24 h/1.3 mm	g/cm²	46.6	46.6	52	46.1	51.8
LED-UV (365nm) applicability		○	○	○	○	○
Atmospheric air cure		×	×	○	○	×
Refrigeration storage		Unnecessary	Unnecessary	Unnecessary	Unnecessary	Unnecessary

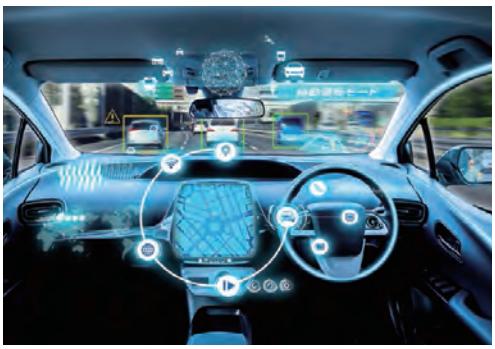
*Illuminance at 365 nm

(Not specified values)

UV Addition Type RTV Silicone Rubbers

Features

- Step cure: 3,000mJ/cm² + 23℃×24h ※Recommended light source: UV-LED(365nm)
- Parts can be fixed and laminated after UV irradiation. (Process reversal is possible.)
- Ultra-low shrinkage with room-temperature curing
- Cure time can be shortened by low-temperature heating



Application Examples

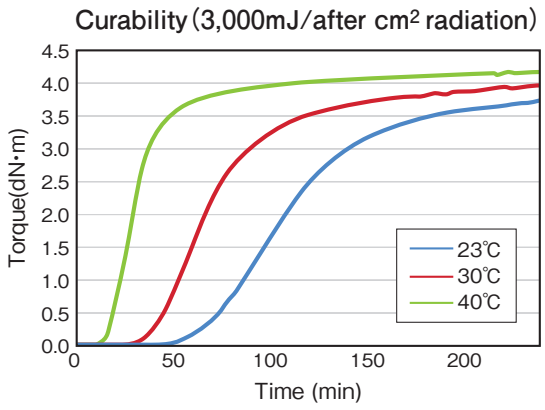
- Fixing of sensors and precision glass parts

General Properties

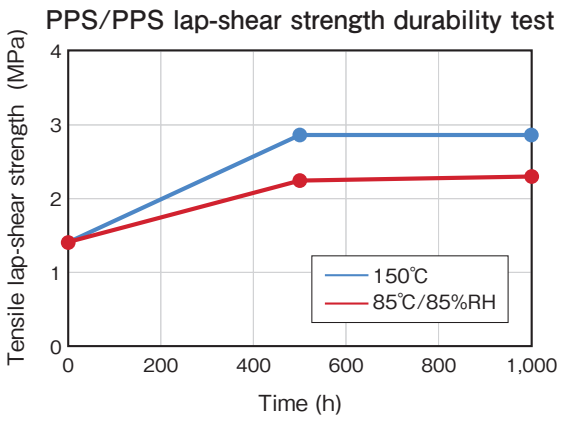
Parameter \ Product name		KER-4410	KER-4510	KER-4690-A/B	KER-4691-A/B
Brief description		Adhesion, room-temperature curing possible	Adhesion, low-temperature curing	Non-adhesive, high-definition transfer	Non-adhesive, high-definition transfer
Reaction mechanism		Addition	Addition	Addition	Addition
Appearance		Colorless slightly cloudy	Colorless slightly cloudy	Colorless transparent	Colorless transparent
Viscosity mPa·s		59,000	30,000	3,000	80,000
Recommended curing conditions	UV light source	UV-LED(365nm)			
	Illuminance mW/cm²	100	100	100	100
	Irradiation time sec	30	30	30	30
	Estimated light intensity mJ/cm²	3,000	3,000	3,000	3,000
Curing conditions after UV irradiation		80℃×1h or 23℃×24h	60℃×1h	23℃×24h	23℃×24h
Density at 23℃ g/cm³		1.06	1.04	1.03	1.09
Hardness Durometer A		15	50	56	42
Tensile strength MPa		2.3	6.6	7.9	6.2
Elongation at break %		350	530	110	420
Tensile lap-shear strength MPa		1.6(AL/AL) 1.7(PBT/PBT) 1.4(PPS/PPS)	2.2(GL/GL)	NA	NA
Light transmissivity 400 nm, t=2.0 mm %		NA	87	90	NA
Cure shrinkage %		—	—	< 0.1	< 0.1
Atmospheric air cure		○	○	○	○
Refrigeration storage		Necessary	Necessary	Unnecessary	Unnecessary

(Not specified values)

■ Curability of the KER-4410



■ Adhesion of the KER-4410



UV Addition Type Optical Bonding Silicones

LOCA = Liquid Optical Clear Adhesive

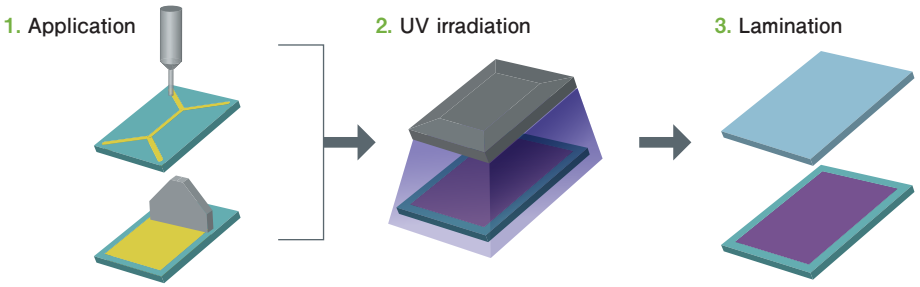
Features

- One-component so mixing is unnecessary.
- Step cure: 3,000mJ/cm² + 23℃×24h ※Recommended light source: UV-LED(365nm)
- Curing time can be adjusted by changing UV irradiation conditions.
- Low risk of color unevenness and heat resistance to discoloration is excellent.
- Lamination after UV irradiation is possible due to process reversibility of UV addition cure type.
- LOCA curability can be ensured, even in areas not irradiated with UV rays.

Application Examples

- Touch panel lamination

■ Lamination process using the "delayed curing" property of the UV addition type



Point

The use of the UV addition (delayed curing) type makes it possible to irradiate the material first and then laminate the pieces.This ensures the LOCA curability even in areas not irradiated with UV rays

General Properties

Parameter \ Product name			KER-4530	KER-4551	KER-4531	KER-4532	KER-4580
Brief description			Low viscosity, gel	Medium viscosity, gel	Medium viscosity, gel	High viscosity, gel	Thixotropic, gel
Reaction mechanism			Addition	Addition	Addition	Addition	Addition
Appearance			Colorless transparent	Colorless transparent	Colorless transparent	Colorless transparent	Colorless slightly cloudy
Viscosity		mPa·s	4,000	10,000	25,000	95,000	4,000
Refractive index			1.41	1.40	1.41	1.41	1.44
Recommended curing conditions	UV light source		UV-LED(365nm)				
	Illuminance	mW/cm²	100	100	100	100	100
	Irradiation time	s	30	30	30	30	15
	Estimated light intensity	mJ/cm²	3,000	3,000	3,000	3,000	1,500
Curing conditions after UV irradiation			23℃×24h				
Density at 23℃		g/cm³	0.97	0.97	0.97	0.97	1.04
Hardness	Durometer A		5	NA	NA	NA	NA
	Penetration		NA	30	30	35	37
Tensile strength		MPa	0.3	NA	NA	NA	0.2
Elongation at break		%	550	1,200	NA	NA	660
Cross adhesion strength		MPa	0.5	0.3	0.3	0.3	0.4
Light transmissivity 400 nm, t=310μm		%	> 99	> 99	> 99	> 99	> 99
LED-UV (365nm) applicability			○	○	○	○	○
Atmospheric air cure			○	○	○	○	○
Refrigeration storage			Necessary	Necessary	Necessary	Necessary	Necessary

(Not specified values)

Radical Polymerization Type Temporary Adhesive Silicones

Featuress

- Various levels of adhesion and hardness are available.
- They have stable adhesion and resilience (excellent repeat durability).
- Excellent adhesive strength after high-temperature exposure

Application Examples

- Temporary adhesive silicone pad for transfer of microelectronic components

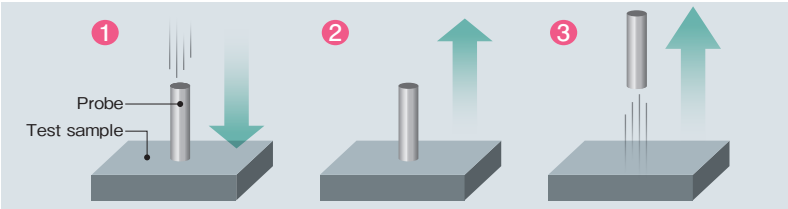
Application Examples

Parameter \ Product name			STP-102-UV	STP-103-UV	STP-104-UV	STP-106T-UV
Brief description			Medium sticky force	Low sticky force, ultra low viscosity	Low sticky force	Low sticky force, thixotropic
Reaction mechanism			Radical	Radical	Radical	Radical
Appearance			Pale yellow transparent	Pale yellow transparent	Pale yellow transparent	Pale yellow translucent
Viscosity		mPa•s	1,650	170	290	250,000
Recommended curing conditions	UV light source		UV-LED(365nm)*			
	Illuminance	mW/cm²	100	100	100	100
	Irradiation time	s	80	80	80	80
	Estimated light intensity	mJ/cm²	8,000	8,000	8,000	8,000
Density at 23℃		g/cm³	1.08	1.05	1.08	1.14
Hardness		Durometer A	24	28	37	33
Tensile strength		MPa	2.8	2.8	4.1	1.9
Elongation at break		%	250	210	240	170
Sticky force 200 mm/min		MPa	1.30	0.62	2.07	0.40
Tensile lap-shear strength (glass/glass) t = 230 μm		MPa	8.5	7.0	10.8	5.9
Atmospheric air cure			×	×	×	×
Refrigeration storage			Unnecessary	Unnecessary	Unnecessary	Unnecessary

*When cured with a high-pressure mercury lamp, no adhesive strength develops.

(Not specified values)

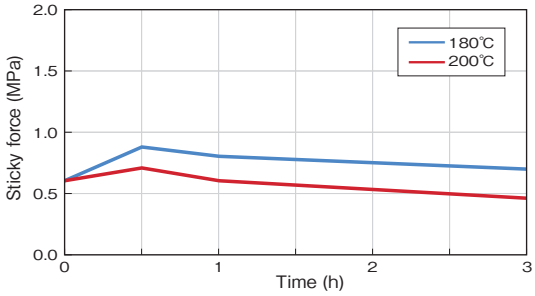
■ Adhesion measurement method



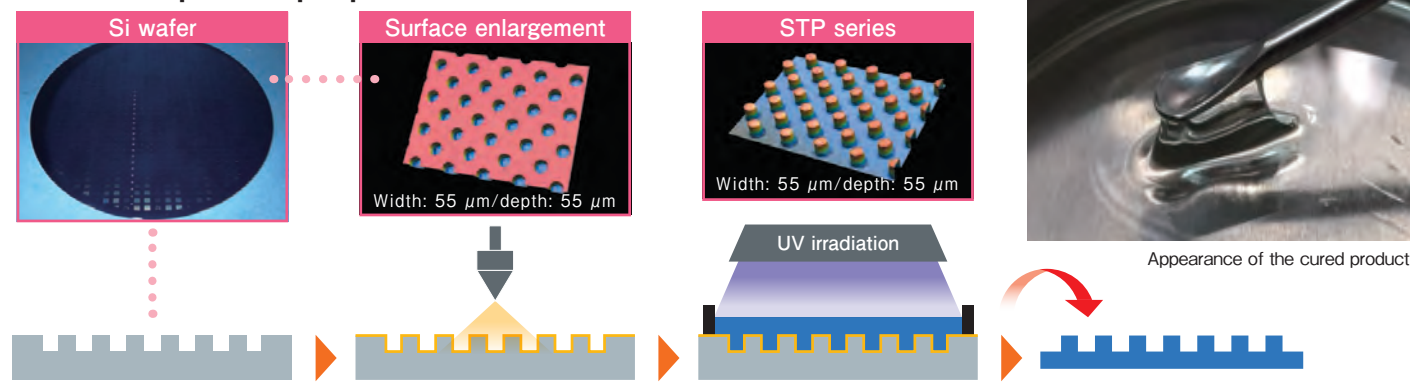
Testing method

1. The tip of the probe is pressed against the sample of silicone with a force of 1.0 MPa for 15 seconds.
2. The probe is then peeled off at a rate of 200mm/min. taken to pull a part the probe from material sample. Surface area of the probe (that makes contact with material sample) needs to be calculated by unit area and this value is the sticky force. Sticky force is derived from the maximum strength.

■ Sticky force of STP-103-UV after leaving at high temperature



■Transcriptional properties of the STP series



Appearance of the cured product

Fine irregularities are formed on a Si wafer.

Fluorinated mold release agent applied

Apply STP Series on Si Wafer
Remove air bubbles from fine holes by evacuation.
Cure by UV irradiation (8,000mJ/cm²)

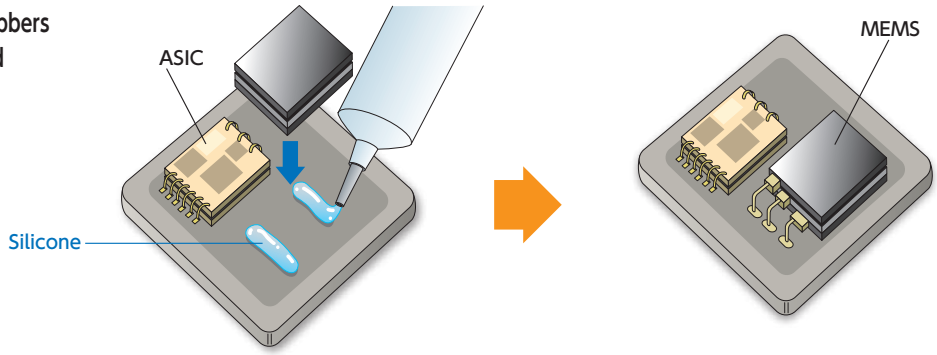
Remove the STP series from the Si wafer

Application Examples in Various Devices

Four possible uses in response to demand for smaller and more accurate devices, ICs, and MEMS chip

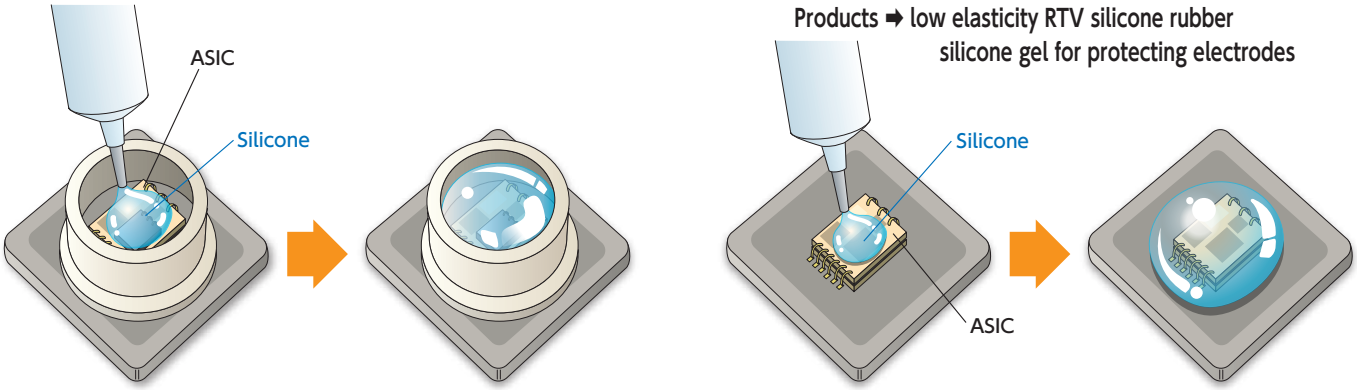
❶ Precision Application/Stress Relaxation Countermeasures for MEMS Chip Die Bond Materials

Products ➡ low-elasticity RTV silicone rubbers
UV addition type die bond



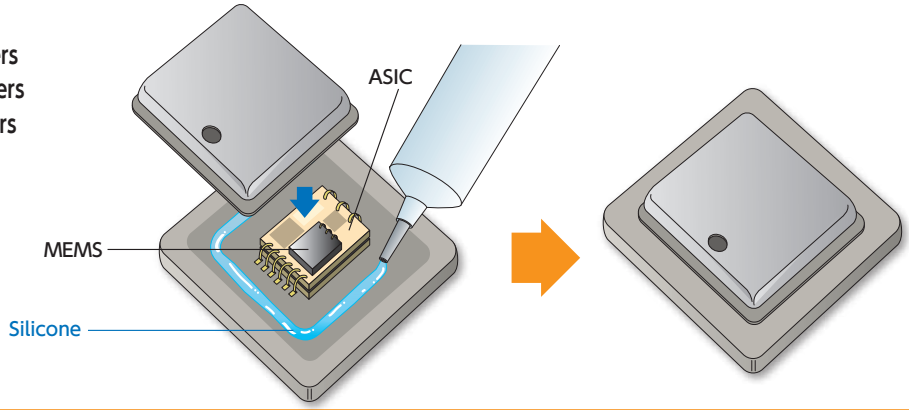
❷ Stress Relaxation Countermeasures in Electrode-protecting Materials for MEMS Chip

Products ➡ low elasticity RTV silicone rubber
silicone gel for protecting electrodes



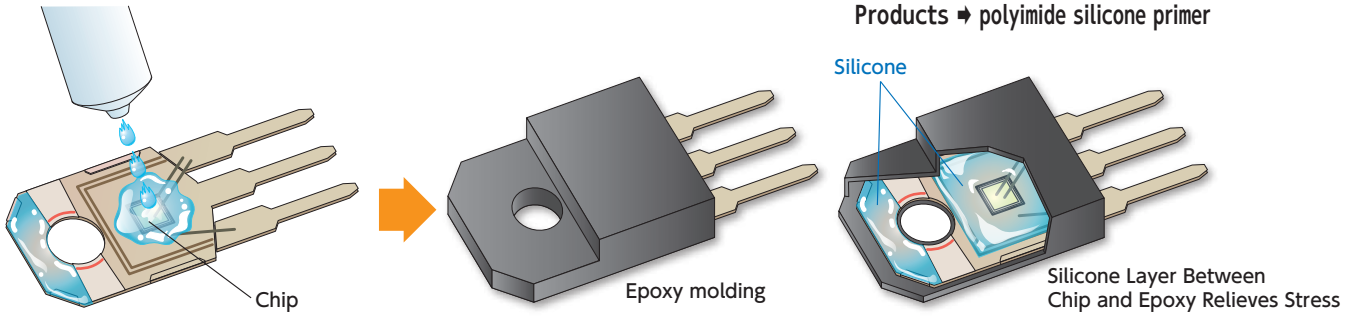
❸ Water Proof / Static Electricity Countermeasures for Lid Sealing Materials

Products ➡ Low Elasticity RTV Silicone Rubbers
Conductive RTV Silicone Rubbers
Functional RTV Silicone Rubbers



❹ Stress Relaxation / Peel Countermeasures in Primers for Epoxy Molding Resins

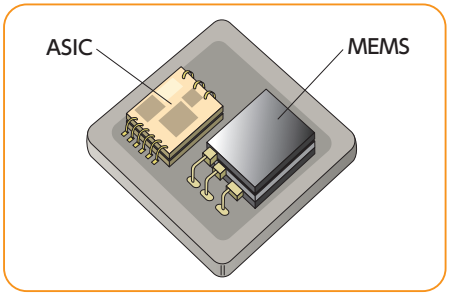
Products ➡ polyimide silicone primer



Low Elasticity RTV Silicone Rubbers

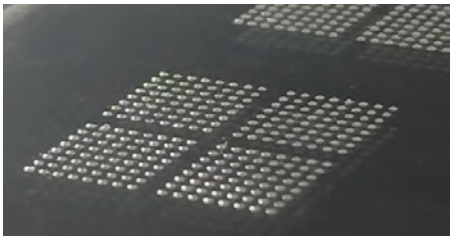
Features

- Rubber elasticity remains consistent from -60℃ to +200℃.
- Consistent application reproducibility can contribute to improved chip mounting accuracy.
- Products available in different viscosities for a variety of packaging formats.
- Syringe packaging available for small-volume projects.



Application Examples

- MEMS such as pressure sensors and MEMS microphones, ASIC die bonding materials, wires, and coating materials for electrodes



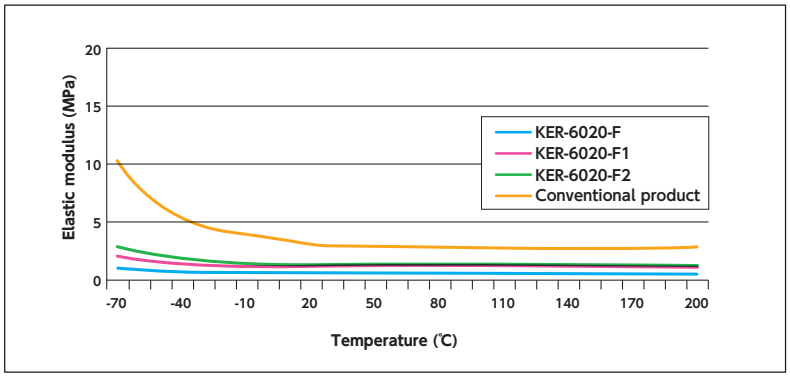
Precision application is possible using a jet dispenser.

General Properties

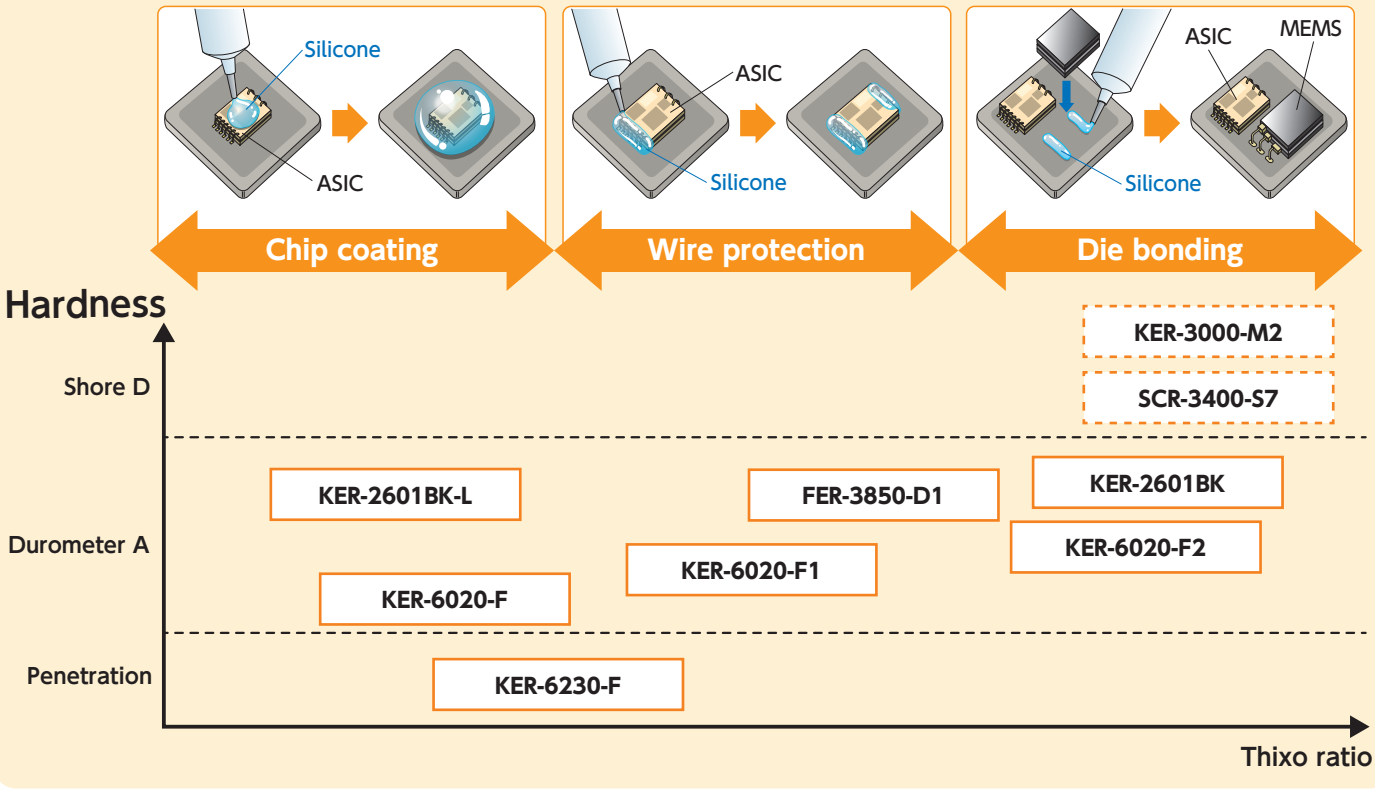
Parameter \ Product name	KER-6020-F	KER-6020-F1	KER-6020-F2	KER-2601BK	KER-2601BK-L	KER-6230-F	FER-3850-D1
Brief description	Cold resistant Low hardness	Cold resistance Low hardness	Cold resistance Low hardness	Black color Noise countermeasure	Black color Noise countermeasure	Ultra-low hardness	Oil resistance
Appearance	Creamy white translucent	Creamy white translucent	Creamy white translucent	Black color	Black color	Creamy white translucent	White
Viscosity at 23℃ Pa·s	23	69	100	25	16	33	65
Thixo ratio (BH7-10/20)	1.3	1.5	1.6	1.8	1.1	-	-
Storage temperature	≦10℃	≦10℃	≦10℃	≦10℃	≦10℃	≦10℃	≦10℃
Standard curing conditions	150℃×1h	150℃×1h	150℃×1h	150℃×2h	150℃×2h	130℃×30min	120℃×1h
Density at 23℃ g/cm³	1.06	1.07	1.09	1.05	1.04	1.04	1.41
Hardness Durometer A	20	26	31	46	45	40 (Penetration)	24
Elongation at break %	220	230	200	120	210	-	230
Tensile strength MPa	1.1	1.8	1.7	4.3	5.7	-	0.4
Tensile lap-shear strength MPa	0.3	0.8	1	1	3.1	-	1.5
Die share strength (Si/Ag) MPa	3.2 (Si 1mm²□)	3.9 (Si 1mm²□)	5.3 (Si 1mm²□)	-	-	-	-
Coefficient of linear expansion at 23℃ ppm/℃	480	400	360	-	-	400	310
Modulus of elasticity MPa	0.7	1.1	1.4	-	-	-	-
Volume resistivity TΩ·m	53.9	47.7	35.5	8.3×10^{3}	1.8×10^{4}	3	-
Dielectric breakdown strength kV/mm	25	29	26	-	-	20	-
Relative permittivity 50 Hz	2.9	2.9	3.1	-	-	3	-
Dielectric dissipation factor 50 Hz	4.9×10^{-4}	5.8×10^{-4}	6.8×10^{-4}	-	-	5×10^{-4}	-

(Not specified values)

■ Temperature dependence of elastic modulus



Material Selection Map by Application



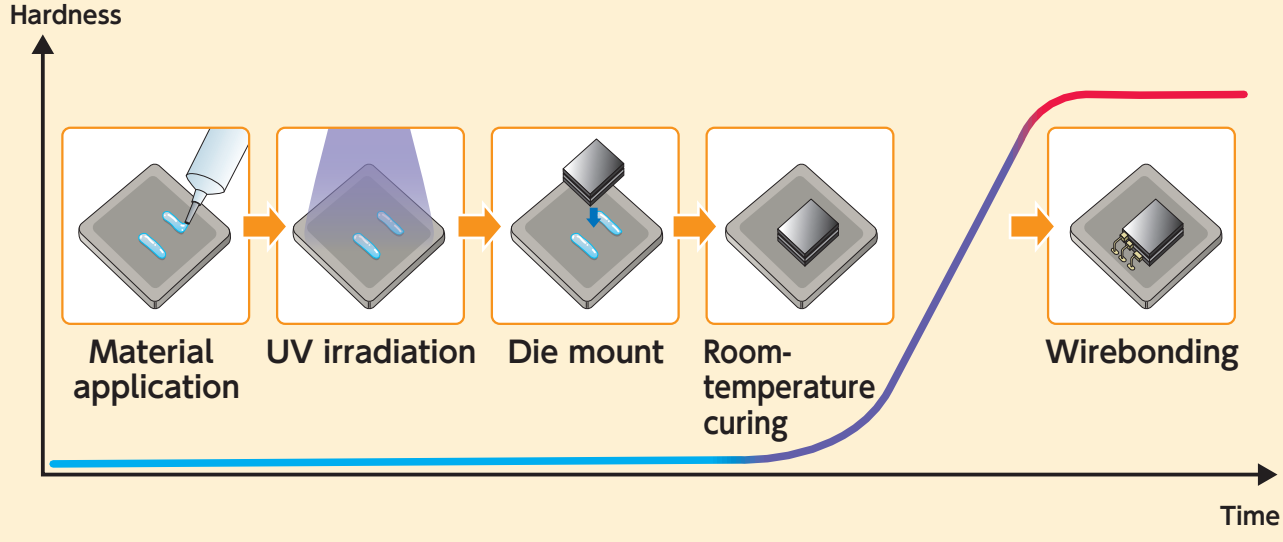
Application of UV Addition Cure Type RTV Silicone Rubbers to Die Bonding Material

By UV irradiating before die mounting, materials will cure at room temperature after mounting, therefore eliminating the need for heating.

■ Potential benefits

① Prevention of misalignment of the tip during heating
② Reducing stress on the chip
③ It is also possible to shorten the curing time by low-temperature heating.

■ Processes



Polyimide Silicone Primers

KER-44XX Series

Features

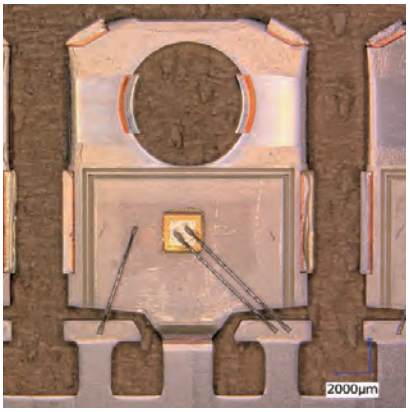
- Excellent adhesion to epoxy molding resins and metal frames
- Products available in different viscosities for a variety of packaging formats
- Low-temperature curing type at 150℃
- Cures to become an elastic film. Can be effective as a stress-relieving layer.

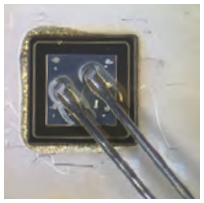
Application Examples

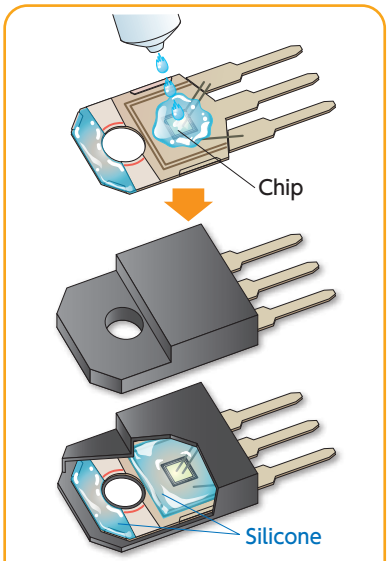
- ICs in power & logic circuits, capacitors, sensors, thermistors, etc.

Instructions for Use

- Apply using jetting system, pressurized dispenser, spraying, dipping, etc.



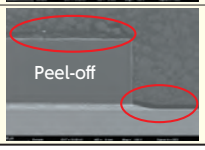




Silicone layer between
the chip and the epoxy relieves stress.

Evaluating Adhesion to Lead Frames & Epoxy Molding Resins

- **Hygroscopic reflow test (MSL-1) : 85℃ / 85%RH×168h ⇒ Reflow cycle performed 3 times**
- **Package : TO-247 (substrates: AMB Cu-SiN, chips: SiC-SBD)**

Appearance / Conditions	Before testing	After testing	
	SAT results	SAT results	SEM images of cross sections
Treated with SMP-5008PGMEA			
Untreated			

- **Thermal cycle test** : -40℃⇔175℃ × 1,000cycle
- **Packages: TO-247 (substrates: AMB Cu-Sin, chips: SiC-SBD)**

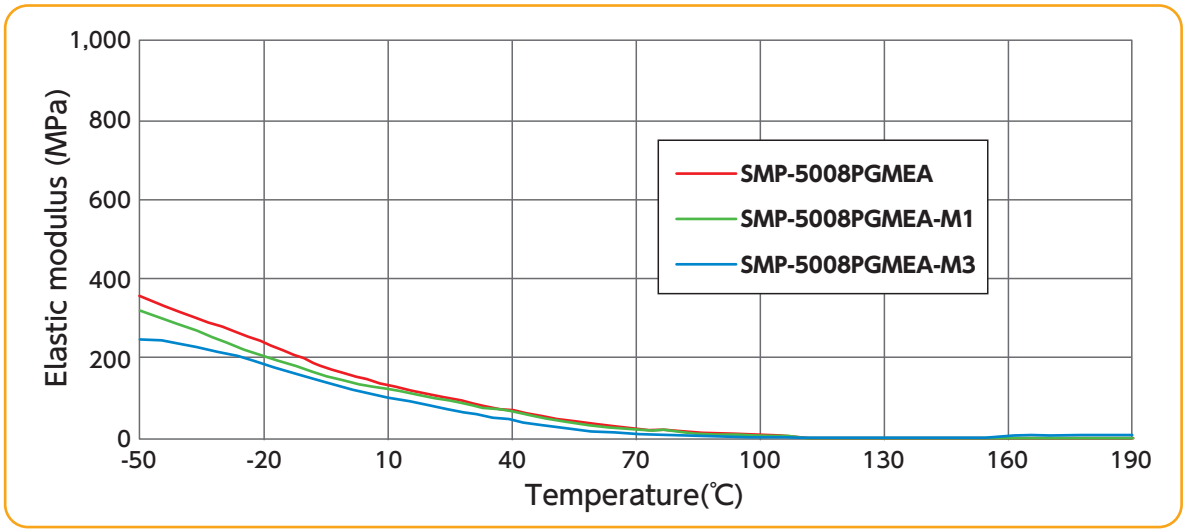
Appearance / Conditions	Before testing	After testing
	SAT results	SAT results
Treated with SMP-5008PGMEA		
Untreated		

General Properties

Parameter \ Product name			SMP-5008PGMEA	SMP-5008PGMEA-M1	SMP-5008PGMEA-M3
Before curing	Appearance		Dark brown		
	Viscosity at 25℃	Pa･s	0.3	1.0	3.0
	Nonvolatile content 105℃ × 3 h	wt%	30	32.7	33.5
	Specific gravity at 25℃		1.03	1.03	1.03
	Solvent		Propylene glycol monomethyl ether acetate		
Standard curing conditions			50℃×30min+100℃×1h+150℃×2h		
After curing	Tensile strength	MPa	20	13	14
	Elongation at break	%	360	290	290
	5% weight loss temperature	℃	360	420	380
	Modulus of elasticity at 25℃	MPa	200	100	150
	Tg	℃	120	90	98
	Coefficient of linear expansion at 25℃	ppm	200	250	242
	Volume resistivity	TΩ･m	45	58	71
	Dielectric breakdown strength	kV/mm	14	14	14
	Relative permittivity 50 Hz		2.5	2.4	2.8
	Dielectric dissipation factor 50 Hz		3.4×10^{-3}	3.2×10^{-3}	3.2×10^{-3}
	Moisture absorption ratio: 85℃/85% RH × 24 h	%	< 0.1	< 0.1	< 0.1

(Not specified values)

SMP-5008PGMEA Elastic Modulus Data



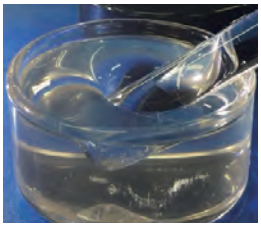
Handring precautions

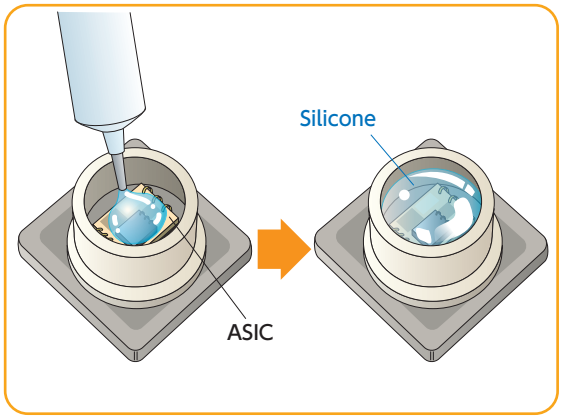
- SMP-5008PGMEA-M1 and SMP-5008PGMEA-M3 may thicken over time due to fillers.
  Please use a centrifugal stirring mixer to loosen the material before use.
  Recommended conditions for centrifugal stirring mixer: 1,300rpm × 30sec.
- Please avoid defoaming by vacuum before coating because this product is diluted with solvents.
- Since each product has a low viscosity, the air pressure dispenser generates liquid dripping.
  Please use a jet dispenser or a spray dispenser.

Silicone Gel for Protecting Electrodes

Features

- Gel state remains consistent from -60℃ to +150℃.
- Consistent, precise application using a dispensing or jetting system.
- Solves a variety of issues related to waterproofing specifications of pressure sensors, etc.





Application Examples

- Electrodes such as pressure sensors
- Wire protection

General Properties

Parameter \ Product name			FE-74	FE-73-BK	FE-78-A/B
Brief description			Oil and solvent resistance	Black color, oil and solvent resistance	Two-component, oil and solvent resistance
Before curing	Appearance		Colorless slightly cloudy	Black color	A/B: colorless transparent
	Viscosity at 23℃	Pa•s	0.7	2.5	A : 0.8 B : 0.6
	Mixed viscosity at 23℃	Pa•s	-	-	0.7
	Specific gravity at 25℃		1.21	1.28	A/B : 1.22
	Storage temperature		-10℃ ~ 10℃	-10℃ ~ 10℃	0℃ ~ 30℃
Standard curing conditions			125℃ × 2h	125℃ × 2h	100℃ × 2h
After curing	Penetration 1/4 cone		90	65	65
	Volume resistivity	TΩ•m	0.02	0.02	0.005
	Dielectric breakdown strength	kV/mm	14	14	14
	Relative permittivity 50 Hz		7.0	7.0	7.0
	Dielectric dissipation factor 50 Hz		1×10^{-1}	2×10^{-1}	1×10^{-2}
	Complex shear modulus 10 Hz	Pa	1,200	6,000	13,000

(Not specified values)

Parameter \ Product name			KER-6201	KER-6201-BK	KER-2201
Brief description			Cold resistance	Black color, cold resistance	Excellent defoaming property
Before curing	Appearance		Colorless slightly cloudy	Black color	Colorless transparent
	Viscosity at 23℃	Pa•s	0.8	0.8	0.8
	Specific gravity at 25℃		0.98	0.98	0.97
	Storage temperature		-10℃ ~ 10℃	-10℃ ~ 10℃	-10℃ ~ 10℃
Standard curing conditions			100℃ × 2h	100℃ × 2h	100℃ × 2h
After curing	Penetration 1/4 cone		90	90	65
	Volume resistivity	TΩ•m	8.0	2.0	10
	Dielectric breakdown strength	kV/mm	14	14	14
	Relative permittivity 50 Hz		3.0	2.8	3.0
	Dielectric dissipation factor 50 Hz		5×10^{-4}	3×10^{-4}	5×10^{-4}
	Complex shear modulus 10 Hz	Pa	2,200	2,200	2,000

(Not specified values)

Functional RTV Silicone Rubbers

Conductive Polyimide Silicone Silver Paste

Features

- SMP-2840 is a conductive polyimide silicone silver paste that combines polyimide and RTV silicone rubbers.
- Excellent crack resistance to heat cycle test and moisture absorption reflow resistance.

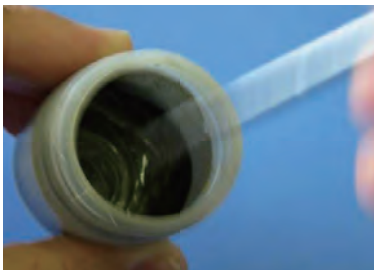
Application Examples

- Lid seal for preventing static electricity in the sensor module
- Conductive die bond for LED devices

General Properties

Parameter \ Product name			SMP-2840
Brief description			Excellent crack resistance
Before curing	Appearance		Gray
	Viscosity at 23℃	Pa·s	30
	Nonvolatile content (volume ratio)	Wt %	86 (50)
	Solvent		Polyethylene glycol dimethyl ether
	Density at 23℃	g/cm³	3.4
	Storage temperature		-40℃ ~ -20℃
Standard curing conditions			100℃ × 2h + 150℃ × 1h
After curing	Density at 23℃	g/cm³	5.6
	Tg	℃	185
	Coefficient of linear expansion	(α1/α2) ppm/℃	40 / 160
	Volume resistivity	Ω·cm	5.8×10^{-5}
	Thermal conductivity	W/m·K	1.0
	Thermal resistance (BLT)	mm²·K/W	8 (7μm)
	Die share strength (Si /Ag)	MPa	23.6 (Si 1mm²□)

(Not specified values)



Precautions

- Silver filler may settle during storage. Please be sure to stir thoroughly before use.
- Please use in an environment at 23℃ or higher.

High Hardness Die Bond Materials

Features

- RTV silicone rubber high hardness die bond material with high die shear strength

Application Examples

- Die bonding of LED devices
- Fixing of the sensor chip

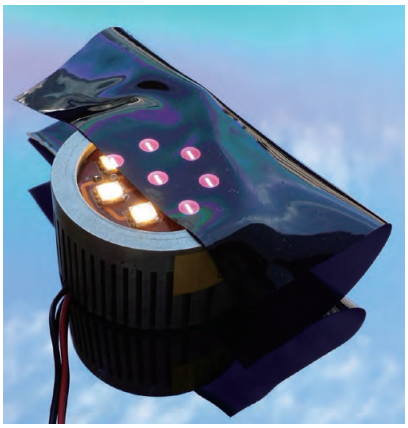
General Properties

Parameter \ Product name	KER-3000-M2	SCR-3400-S7	KER-3201-T3	KER-4033-D2
Brief description	High hardness	High strength	Thermal conductivity	Cure inhibition countermeasure
Appearance	Creamy white translucent	Creamy white translucent	White	Pale yellow translucent
Viscosity at 23℃ Pa·s	40	7	24	16
Storage temperature	≦10℃	≦10℃	≦10℃	≦10℃
Standard curing conditions	150℃×2h			
Density at 23℃ g/cm³	1.15	1.16	2.35	1.16
Hardness Shore D	56	78	71	72
Tensile lap-shear strength (Al/Al) MPa	3.9	9.6	3.9	–
Die share strength Ag / □ 33mil MPa	15.7	28	20.2	29.3
Thermal conductivity W/m·K	0.2	0.2	1.36	0.2
Glass transition temperature ℃	-123	80	-123	-123

(Not specified values)

Visible Light Shielding Silicone Encapsulants

Features



- Shields light up to 650nm but allows light over 700nm to be transmitted.
- Based on silicone polymers and exhibits high reliability
- Hardness that can be diced after curing but has high extensibility

Application Examples

- In-vehicle IR sensors, etc.

General Properties

Parameter \ Product name		AIR-7051-A/B	AIR-7052F-A/B	AIR-7070-A/B
Features		Standard product	Improved heat resistance	High hardness
Appearance		A: Black B: colorless transparent	A: Black B: colorless transparent	A: Black B: colorless transparent
Viscosity	mPa·s	A=14,000 B=20	A=36,000 B=20	A=24,000 B=30
Proportional combination		A:B=1:1		
Mixed viscosity	mPa·s	160	400	300
Standard curing conditions		100°C×1h + 150°C×4h		
Hardness	Durometer D	45	54	73
Elongation at break	%	220	200	5
Tensile lap-shear strength (Al/Al)	MPa	3.9	7.4	3.1
Tensile lap-shear strength (Glass epoxy/Glass epoxy)	MPa	4.7	7.1	3.7
Glass transition temperature	℃	33	40	30

*Please store the AIR-7051-A, AIR-7052 F-A, and AIR-7070-A at 0℃ to 10℃.

(Not specified values)

Instructions for Use

① Dispense application to the package
② Transfer molding

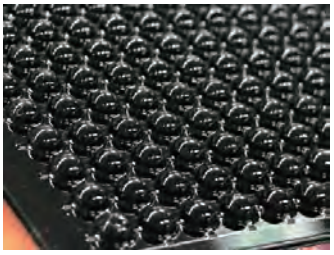
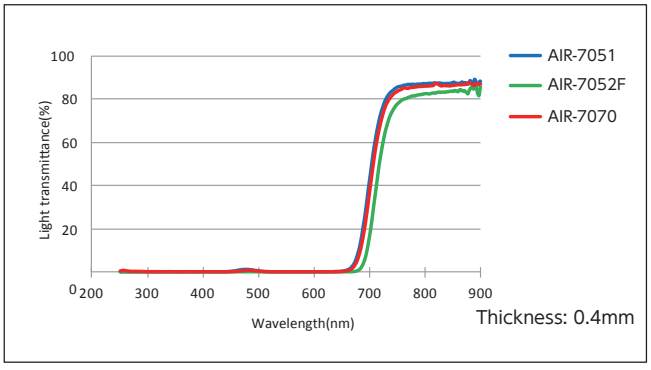
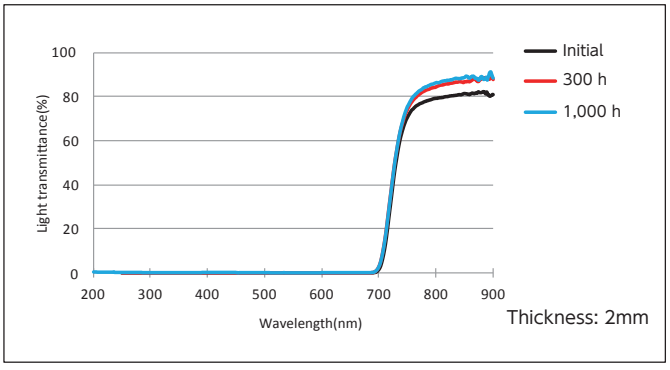


Photo: Microlens by transfer molding

■ AIR series light transmittance data



■ After 150℃ durability test (AIR-7051)



One-component Addition Cure Type RTV Silicone Rubber High Strength Elastic Adhesive

KE-8100

Higher adhesion strength than conventional products

Features

- Tensile lap-shear strength: 4.0MPa　Tested substrates: Aluminum, PBT, and PPS
- Easy-to-handle one-component type (refrigerated storage required)
- Excellent performance unique to silicone, such as heat resistance, cold resistance, weatherability, and electrical insulation, remains unchanged.
- Operating temperature range -40℃ to 150℃
- Standard curing conditions: 120℃ × 1 h

Solutions to Customers

General Properties

Parameter \ Product name		KE-8100
Curing method		Addition
Before curing		
Appearance		Gray
Viscosity at 23℃	Pa·s	120
Standard curing conditions		120℃×1 h
After curing		
Density at 23℃		1.31
Hardness	Durometer A	77
Tensile strength	MPa	7.1

(Not specified values)

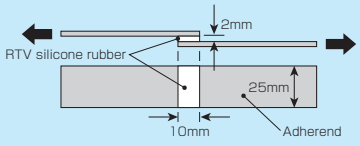
Tensile Lap-shear Strength Test Data

Substrate \ Product name	KE-8100	Conventional product KE-1835S
Aluminum/Aluminum	4.1	3.0
PBT/PBT	4.0	2.6
PPS/PPS	4.0	2.4

(Not specified values)

Test Method of tensile lap shear strength

The RTV silicone rubber is applied as shown in the figure. After curing, shear adhesion is measured using a tension tester.



Curing conditions : condensation cure type
23±2℃ / 50±5% RH for 7days.
addition cure type 120℃ x 1h
RTV silicone rubber thickness : 2mm
Adhesive surface : 10×25mm
Tensile speed : 50mm/min

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This is an edited version of the product data released on Jun. 2019.