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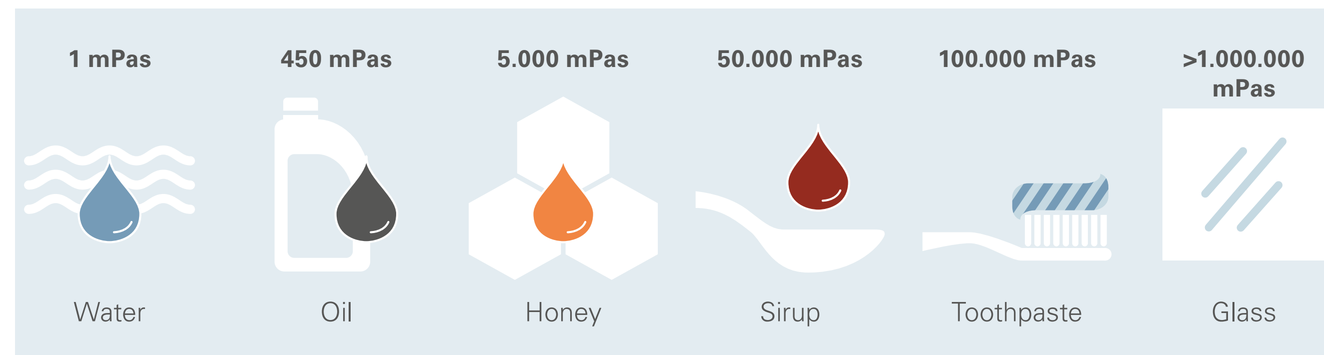
Viscosity

Viscosity describes the resistance of a liquid to flow and is inversely proportional to the fluidity of a system. This means: the higher the viscosity, the thicker (or more viscous) the system. In this process, viscosity is defined by a system's "inner friction" which is caused by the attractive interactions between the liquid's molecules.

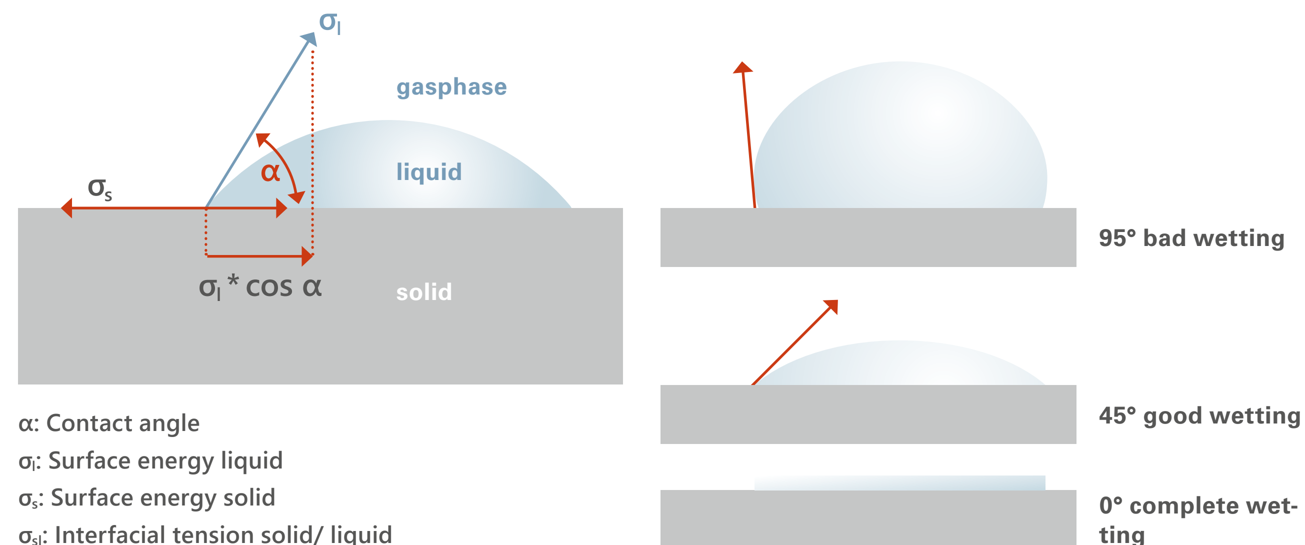


Within a molecular context this means that molecular layers flow past each other as a result of an externally acting shear force. This generates shear stress within the fluid, which influences the shear rate, a measure of the spatial change in the flow rate. Ultimately, the viscosity results from the ratio between shear stress and shear rate.

In most non-complex fluids the viscosity is not influenced by the active shear force and these are known as "Newtonian fluids". However, there are also more complex fluids in which the viscosity is influenced by the active shear force. These "non-Newtonian fluids" have two important properties that are regularly applied in the industry. In pseudoplastic fluids the viscosity reduces with an increasing shear force, which is known as structural viscosity (example: paint that does not drip from the roller during application). Apart from this, there is also thixotropy, which describes a reduction in viscosity at constant shear (example: tomato sauce being shaken in a glass bottle, making it runnier, causing it to flow out of the bottle).

About the surface of the substrate

A further important variable associated with technical adhesion, conformal coatings or sealing is surface wettability. This is always derived from the surface tension acting between solids, fluids and gases. In this process, surface tension is defined as the work that must be generated per area to increase the surface of a fluid.



Surface wettability depends heavily on the type of fluid, the surface of the joining part and the gaseous phase. In this process, the following applies: a fluid's surface energy must always be lower than the surface energy of the joining part to be able to guarantee sufficiently high wetting of the substrate, which is required for successful bonding. The Figure illustrates that this is the case for contact angles between 0° and 90°. From a contact angle of over 90° a fluid's surface wetting is no longer sufficient to be able to guarantee correct bonding.

Measuring the surface wettability is simple: users can rely on many methods, such as very simple tests involving the interpretation of water drops on a plastic surface, test inks that have been adapted to an exact surface energy as well as mobile surface analysers capable of directly determining the contact angle. Typical surface energy values for a selection of substrates and substances have been listed in Table 1. As illustrated, plastics demonstrate lower surface energy values with the result that they are considered as harder to bond. > 40 mNm-1 has been established as a value indicating a polymer with good bonding properties.

	Substance	Surface energy/mNm^{-1}
Polymers	PTFE	18
	Silicone	20
	PP	29
	PE	31
	PMMA	33-44
	PC	34-40
	PVC	40
	PA	46

	Substance	Surface energy/mNm^{-1}
Metals	Aluminium	1200
	Copper	1850
	Chrome	2400
	Nickel	2450
	Iron	2550
	Titanium	2050
	Silver	1250
	Gold	1550

Bonding materials with low surface energy

However, how do you bond materials with a very low surface energy? Preparing the surface is the first step of any technical bonding process. This is because many substrates are produced with auxiliary agents, such as release agents in plastics production or oils and greases in metal machining. In this process, cleaning agents help keep a surface free from dust, grease and further processing agents. If test inks show that the surface energy remains below 40 mNm^{-1}, the surface must be further processed. Mechanical, chemical and physical methods have been established in this context.

Mechanical methods

- Roughing up the surface
- Mechanically interlocking the adhesive with the substrate surface
- Not increasing the surface energy

Chemical methods (primers)

- Wet, chemical products break up molecular connections
- Functional groups are incorporated into the substrate surface
- Increasing the surface energy

Physical methods

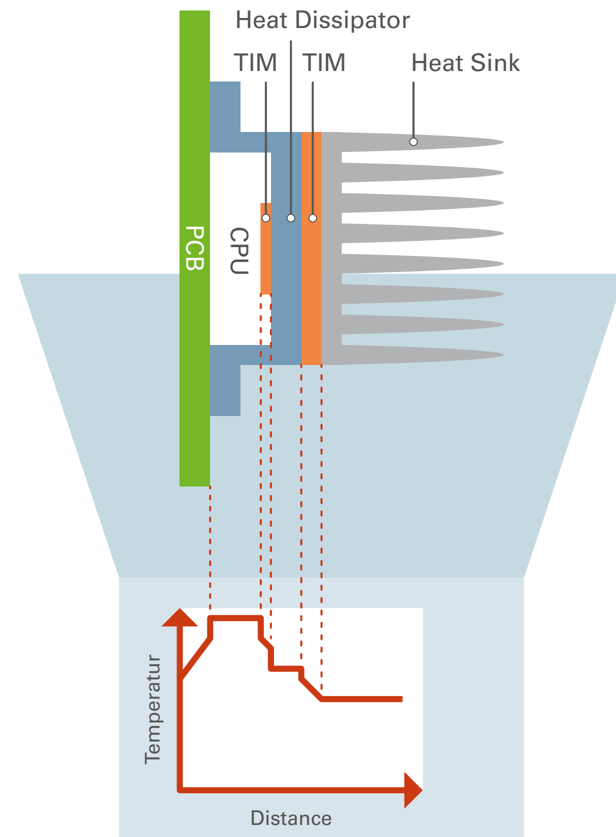
- Plasma/corona activation
- Input of polar molecular groups into the substrate surface
- Increasing the surface energy

Thermal management

Heat develops as part of many industrially produced products, which may influence the product's performance. For this reason, the heat must be dissipated from the product. As a result, materials must be used that are capable of managing heat dissipation: thermal management. The most familiar example is the computer chip, but there are many more examples, such as lamps or batteries.

As a rule, heat flows from the warm object towards the cold object along a temperature gradient. In this process, a distinction must first be made between thermal conductivity and heat transfer (see info box for details). Firstly, the following drawing schematically shows the structure of an electronic assembly that generates heat and secondly, it schematically demonstrates the temperature profile.

The heat transfer (vertical temperature drop in the drawing) takes place between all materials involved in the thermal transport. Thermal management is not yet perfect even if the cooling element has been attached to a heat source as accurately as possible. Given that there is no complete positive engagement between the two objects and air is an extremely poor thermal conductor, thermal interface materials must be used to transfer the heat. In most cases, the polymer matrix of thermally conductive materials is only a very poor thermal conductor so that ceramic fillers are frequently used to establish thermal conductivity. In this process, the thermal transport along the adhesive boundary layer is also influenced by the adhesion potential and the wetting potential. As a consequence, materials with lower thermal conductivity can demonstrate lower thermal resistance overall while simultaneously showing better wetting as well as substrate adhesion and thus performing better on the whole than materials with high thermal conductivity.



Thermal conductivity

The specific thermal conductivity is a measure of materials' ability to conduct energy in the form of heat. Its physical unit is W/mK (watts per metre and kelvin). It states the heat output in watts that flows through a material with an area of 1 m^2 and a thickness of 1 m at a temperature difference of 1 kelvin.

Thermal resistance

A system's thermal resistance is a measure of the temperature difference in kelvin, required to transfer a heat output of 1 watt and it is described in the following unit of measurement: K/W. Looking at an entire system, it is always necessary to analyse all contributions consisting of specific thermal conductivity and the materials' heat transfer coefficients involved in the thermal transport.

Heat transfer coefficient

The heat transfer coefficient is a measure of the transfer of heat to a boundary surface and it is measured in W/m^2K. It is a complex variable that depends on many factors, for instance the three types of heat transfer: thermal conduction, convection and thermal radiation.

As a rule, gases demonstrate very poor heat output. Consequently, the adhesion and wetting potential of a thermally conductive product have a considerable influence on a substrate.

The following applies: the more interference-free the boundary level between substrate and thermal conductor, the better the thermal transport.

Comparing fillers

Selection of various fillers used to establish a product's thermal conductivity.[1]

Filler	Thermal conductivity/W(mK)$^{-1}$	Density/gcm^{-3}
Al2O3	39	3.98
ZnO	21	5.6
SiO2	1	2.65
BeO	218	2.9
Ag	427	10.49
Al	237	2.56
AlN	170	3.27

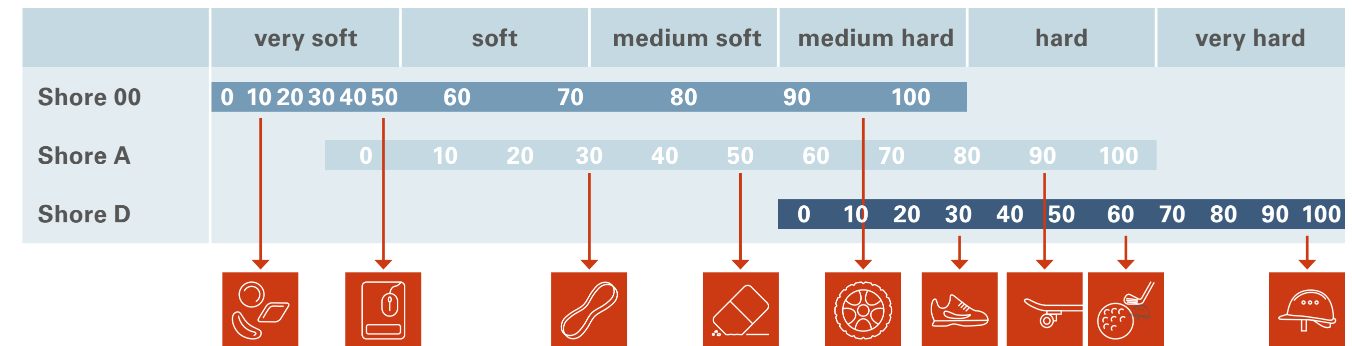
[1] G. Becker et al., Advanced Packaging, July, 2005, 2-4.

Component stress and relieving stress

A number of forces may affect manufactured electronic assemblies and these may damage the assembly as a direct consequence. Thermal and mechanical stresses are most likely. These can be almost fully compensated for by a targeted use of certain protective paints or encapsulants (in particular in the case of glob tops). The following factors must be taken into account.

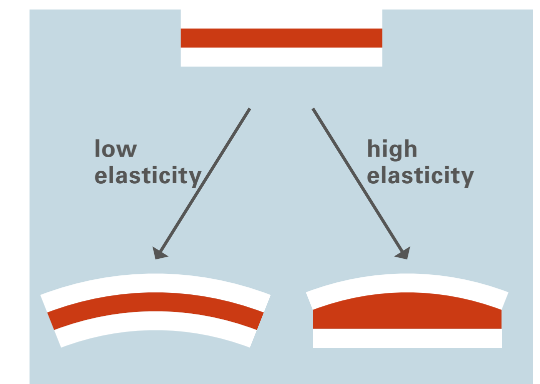
Hardness, durometer

Materials' hardness is measured with a shore durometer. For this purpose, a defined body is always pressed into a material at the same force whereby the depth of penetration determines its hardness value. The hardness type can additionally be determined using the shape of the penetrating body. The most common types are Shore A, Shore D and Shore 00, which have been compared with each other in the following illustration.



Elasticity

Elastic materials have the ability to change their shape while being subjected to a force. In terms of stress relief this means that flexible materials linking two substrates do not transfer the introduced force equally, but rather compensate for this to a certain extent as shown in the figure below. Depending on the acting force, the elasticity is described as elastic modulus (correlation between tension and elongation), bulk modulus (correlation of volume change at a change in pressure) or shear modulus (correlation between material deformation caused by shear forces or shear stress).



Coefficient of thermal expansion

The coefficient of thermal expansion (CTE) is also a pivotal variable that influences the stress in electronic modules. Heat causes the distance of a material's atoms to increase so that this value indicates a material's linear expansion in relation to the heat. Stress may be caused in electronic modules as a result of the material expanding. This stress can especially have the strongest effect on soldered connections. As a result, the individual heat expansion of the products used must already be taken into account during the design phase of the electrical module.

Linear shrinkage

The linear shrinkage of a UV adhesive must frequently be taken into account within optoelectronics. As a result of the hardening mechanism, the distances between individual atoms once again change so that a material may shrink. Excessively high shrinkage may firstly cause stress and secondly, it causes highly precisely aligned components to change their position. As a result, materials with low linear shrinkage should always be selected for highly precise applications.

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Lab and Innovation Centre

Lab & Innovation Centre

Our Lab and Innovation Centre in Hamburg is equipped to facilitate product testings according to your project's requirements.

Furthermore, our technical experts and highly skilled laboratory personnel are able to conduct in-depth testing series with our entire product portfolio to provide the best product solution. Of course, all necessary information and documentation will be provided.

If you have an idea for a project get in touch:
electronics.solutions@biesterfeld.com

Silicone Conformal Coatings

Conformal coatings from DOW are applied in a very thin layer on printed circuit boards (PCB). Due to their properties silicones are able to protect PCBs and very sensitive electronic components against environmental factors such as moisture, and against solvents and abrasion, to prevent short circuits or corrosion of the electronic module. Furthermore, they reduce dendritic growth and the electromigration of metal between conductors. Depending on their hardness most conformal coatings also provide very good stress relief.

Conformal Coatings can be applied by dipping, spraying or flow coating in manual and automated processes. The outstanding performance of conformal coatings allows application in very harsh conditions, from automotive under-hood conditions right through to extremely harsh conditions required by the military and defence industries.
For inspection purposes most conformal coatings contain a UV indicator for blacklight visualisation.

Product name	Features	Viscosity / mPas	Durometer	Tack-free time / minutes	Room-temperature cure time / minutes	Heat cure time / minutes	Heat cure conditions	Viscosity / a Specific gravity	UL 94 rating	UL 746 E approval	Mil specification	Mil specification type, class group	IPC-CC test
DOWSIL™ 3-1944 HP RTV Coating	Allows higher-thickness coverage in critical areas	49000	36 Shore A	7	60	—	—	1	V-0	No	—	—	—
DOWSIL™ 3-1944 RTV Coating	Coverage of taller components, wire bonds and edges	64000	36 Shore A	14	60	—	—	1.03	V-0	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ 3-1953 Conformal Coating	Medium viscosity	350	34 Shore A	8	60	0.5	60°C/15% RH	0.98	V-0	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ 3-1965 Conformal Coating	Thinner cured coating; Greater coverage area per kg; Faster dispensing; Easier to jet-dispense	115	33 Shore A	6	60	0.5	60°C/15% RH	0.99	V-0	No	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ 3140 RTV Coating	Allows higher one-pass coating thickness	34000	32 Shore A	116	72 hrs	—	—	1.05	V-1	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ CC-3122 Conformal Coating	Low viscosity; Controlled volatility	80	75 Shore A	6	—	—	—	1.03	—	No	—	—	—
DOWSIL™ SE 9157 Coating	Medium viscosity	5675	25 Shore A	6	300	—	—	1	—	No	—	—	—
DOWSIL™ SE 9186 L Sealant	High viscosity; Controlled volatility	27000	25 Shore A	8	300	—	—	1.02	—	No	—	—	—
DOWSIL™ SE 9187 L Adhesive	Medium viscosity; Controlled volatility	1100	17 Shore A	8	300	—	—	1	V-0	Yes	—	—	—
DOWSIL™ SE 9189 L RTV Adhesive	High viscosity; Controlled volatility	245000	33 Shore A	8	300	—	—	1.19	V-0	No	—	—	—
DOWSIL™ 1-4105 Conformal Coating	Long open time; "Command cure"; Uses CTE to its advantage to hold chips down to board	450	65 Shore 00	—	—	10	105°C	0.97	V-1	Yes	—	—	—
DOWSIL™ CC-4555 Long Bath Life CC	Optimised version for dip-coating	225	78 Shore 00	—	—	20	120°C	0.98	V-0	No	—	—	—
DOWSIL™ Q1-4010 Conformal Coating	Allows higher one-pass coating thickness	825	33 Shore A	—	—	10	100°C	1	V-1	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
SYLGARD™ 1-4128 Conformal Coating	Two-part; Much longer room-temperature shelf life	470	65 Shore 00	—	—	5	105°C	0.97	—	No	—	—	—
DOWSIL™ 1-2577 Conformal Coating	Medium viscosity with firm, abrasion-resistant surface after curing	950	20 Shore D	7	60	2	60°C/15% RH	1.11	V-0	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ 1-2577 Low VOC CC	Solvent is not considered a volatile organic compound; Low odour; Non-ozone depleting	1050	25 Shore D	6	60	2	60°C/15% RH	1.12	V-0	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ 1-2620 Dispersion Coating	Thinner cured coating; Greater coverage area per kg; Faster dispensing	150	25 Shore D	5	60	2	60°C/15% RH	1.11	V-0	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ 1-2620 Low VOC Conformal Coating	Low viscosity	350	25 Shore D	5	60	2	60°C/15% RH	1.12	V-0	Yes	MIL-I-46058C Amend 7	Type SR, QPL	IPC-CC-830
DOWSIL™ CC-2570 Conformal Coating	No fluorescence; Better optical performance	1000	25 Shore D	7	60	2	60°C/15% RH	1.11	V-0	Yes	—	—	—
DOWSIL™ CC-2571 Conformal Coating	No fluorescence; Better optical performance	75	25 Shore D	15	60	2	60°C/15% RH	1.11	V-0	Yes	—	—	—
DOWSIL™ CC-8030 UV and Dual Moisture Cure CC	No added solvents; Low viscosity - sprayable with fast UV cure	520	30 Shore A	Yes	> 2,000 mJ/cm²	—	—	0.98	pending	pending	—	—	pending

Silicone Encapsulants

Silicone Encapsulants from DOW are supplied as two-part liquid component kits with mixing ratios of 1:1 and 10:1. These encapsulants cure without an exothermic reaction and post curing is not needed. They are easy to rework and to repair. Due to their properties, some encapsulants meet with the highest requirements in terms of UL or military specifications. The silicone elastomers cure to a flexible elastomer at a constant cure rate regardless of sectional thickness.

Additionally, they offer a broad operating temperature range of -45 to 200°C, have excellent dielectric properties and a low modulus for perfect stress relief.
The application of silicone encapsulants is recommended in environments such as high humidity, moisture, temperature extremes, thermal cycling stresses, mechanical shock and vibration dampening and dirt.

Product name	Features & benefits	Chem-istry	Colour	Viscosity / mPas	Mixing ratio	Pot life	Room-tempera-ture cure	Heat Cure	Specific gravity	Durometer / Shore A	Tensile Strength / MPa	Elongation / %	Dielectric Strength / kV/mm	Agency listing
DOWSIL™ 3-6121 Low Temperature Elastomer	Remains a soft elastomer down to -65°C, with a higher refractive index compared to standard silicones	Addition cure	Translucent	19000	Two-part (10:1)	>2 hrs	48 hrs	20 min @ 100°C 10 min @ 150°C	1.12	35	4.3	275	18	—
DOWSIL™ CN-8760 G Thermally Conductive Encapsulant	Designed for fast fill rates and reworkability, with moderate thermal conductivity	Addition cure	Grey	3200	Two-part (1:1)	1 hr 40	24 hrs	30 min @60°C	1.58	45	1.8	85	24	UL 94 V-0
DOWSIL™ CN-8760 Thermally Conductive Encapsulant	Even higher flow version of DOWSIL™ CN-8760 G Encapsulant	Addition cure	Dark grey	2700	Two-part (1:1)	1 hr 30	—	40 min @ 50°C	1.6	55	2.7	80	33	UL 94 V-0
DOWSIL™ EE-1010 Low Viscosity Encapsulant	Capable of improved throughput speeds with one of our highest flow rates to rapidly fill around complex board architectures and a fast heat cure	Addition cure	Grey	850	Two-part (1:1)	50 min	24 hrs	3 min @ 100°C 2 min @ 150°C"	1.26	65	3.1	40	18	—
SYLGARD™ 160 Silicone Elastomer	Proven reliability with higher thermal conductivity and heat stability	Addition cure	Dark grey to black	4500	Two-part (1:1)	20 min	24 hrs	4 min @ 100°C	1.61	55	4.2	100	19	UL 94 V-0
SYLGARD™ 164 Silicone Elastomer	Fast, room-temperature cure version of SYLGARD™ 160 Elastomer	Addition cure	Grey	9100	Two-part (1:1)	—	35 min	Heat acceler-able	1.57	60	—	—	19	UL 94 V-0
SYLGARD™ 170 Silicone Elastomer	An industry standard, with moderate thermal conductivity	Addition cure	Dark grey to black	2100	Two-part (1:1)	15 min	24 hrs	45 min @ 50°C 25 min @ 70°C 15 min @ 85°C 10 min @ 100°C	1.37	50	2.8	150	19	UL 94 V-0, Mil Spec: MIL-PRF-23586F EN45545-2 HL3
SYLGARD™ 170 Fast Cure Silicone Elastomer	Much faster curing version of SYLGARD™ 170 Elastomer	Addition cure	Black	2300	Two-part (1:1)	<5 min	10 min	Heat accelerable	1.38	45	3.7	125	14	UL 94 V-0
SYLGARD™ 182 Silicone Elastomer	Well established industry standard that is transparent with a long working time	Addition cure	Clear	5700	Two-part (10:1)	8 hrs	14 days	75 min @ 100°C 30 min @ 125°C 20 min @ 150°C	1.04	50	7.6	100	18	UL 94 V-1 Mil Spec
SYLGARD™ 184 Silicone Elastomer	Faster curing version of SYLGARD™ 182 Elastomer	Addition cure	Clear	3500	Two-part (10:1)	1 hr 30	48 hrs	35 min @ 100°C 20 min @ 125°C 10 min @ 150°C	1.03	45	6.8	125	19	UL 94 V-1 @ 6 mm UL 746C f2 SAE AS81550
SYLGARD™ 186 Silicone Elastomer	One of our toughest encapsulants with proven performance and controlled flowability	Addition cure	Translucent	65000	Two-part (10:1)	1 hr 40	48 hrs	25 min @ 100°C 15 min @ 150°C	1.12	25	5	425	14	UL 94 V-1
DOWSIL™ 3-8264 Encapsulant	Self-priming version of SYLGARD™ 170 Elastomer	Addition cure	Black	Part A: 2700 Part B: 2600	Two-part (1:1)	5 hrs NA	NA	2.5 hrs @ 70°C 30 min @ 100°C	1.33	45	3.6	125	17	—
DOWSIL™ EE-1840 Encapsulant	Fast fill rates and repairable with enhanced stress relief	Addition cure	Black	1300	Two-part (1:1)	12 min	7 days	Yes	1.01	20	0.55	175	17	UL 94 V-1
DOWSIL™ SE 1816 CV Encapsulant	Long working time for production flexibility with UL recognition	Addition Cure	Black	2600	Two-part (1:1)	>24 hrs	NA	1 hr @ 100°C	1.35	35	2.9	225	26	UL 94 V-0
SYLGARD™ 567 Primerless Silicone Encapsulant	One of our fastest fill rates with enhanced high-temperature stability	Addition cure	Black	Part A: 2100 Part B: 550	Two-part (1:1)	>3 days	NA	3 hrs @ 70°C 2 hrs @ 100°C 85 min @ 115°C 15 min @ 150°C	1.24	40	—	—	21	UL 94 V-0 Mil Spec: MIL-PRF-23586F
DOWSIL™ 3-6512 Elastomer	Highly flowable to fill in narrow spaces with enhanced stress relief	Addition cure	Transparent /red	900	Two-part (1:1)	24 hrs	—	2 hrs @ 70°C	40 Shore 00	—	—	21	—	—

continued on next page

Silicone Encapsulants

Product name	Features & benefits	Chem-istry	Colour	Viscosity / mPas	Mixing ratio		Pot life	Room-tempera-ture cure	Heat Cure	Specific gravity	Durometer / Shore A	Tensile Strength / MPa	Elongation / %	Dielectric Strength / kV/mm	Agency listing
DOWSIL™ 93-500 Space Grade	Highly transparent with very low levels of volatile condensable materials – proven for space-grade applications	Addition cure	Clear	8100	Two-part (10:1)		2 hrs 45	24 hrs	10 min @ 100°C 4 min @ 150°C	1.03	45	6.7	125	19	—
DOWSIL™ 93-500 Thixotropic Encapsulant	Non-flow version of DOWSIL™ 93-500 Space Grade Encapsulant	Addition cure	Translucent / white	Non-flow/ thixotropic	Two-part (10:1)		50 min	24 hrs	15 min @ 100°C 10 min @ 125°C 5 min @ 125°C"	1.08	60	8.5	125	18	—
DOWSIL™ EE-3200 Low Stress Silicone Encapsulant	One of our most stress relieving encap-sulants with fast processing, moderate thermal conductivity and proven reliabili-ty in outdoor applications	Addition cure	Dark grey	1700	Two-part (1:1)		30 min	2 hrs 45	20 min @ 50°C	1.48	20 Shore 00 65	0.2	350	14	UL 94 V-0 EN 45545-2 HL3
DOWSIL™ EI-1184 Optical Encapsulant	Highly transparent with reduced yellow-ing for optical application reliability – in a convenient 1:1 mix ratio	Addition cure	Clear	4600	Two-part (1:1)		10 min	4 hrs	15 min @ 100°C	1.04	10	8.3	75	18	UL 94 V-1 UL 746C f1
DOWSIL™ EI -2888 Primer-less Silicone Encapsulant Kit	Highly transparent encapsulant with pri-merless adhesion for optical application	Addition cure	Clear	2700	Two-part (1:1)		130 min	12 hrs*	Heat acceler-able	—		0.2	190	19	UL 94 HB

Silicone Gels

Silicone gels are a special class of encapsulants that cure to an extremely soft material. Gels cure in place to form cushioning, self-healing, resilient materials. Cured silicone gels retain much of the stress relief and self-healing qualities of a liquid while providing the dimensional stability of an elastomer. Typically, gels are used to protect circuits from the harmful effects of moisture and other contaminants and provide electrical insulation for high voltages. They are available as standard gels, toughened gels, temperature gels and speciality gels.

Standard Gels: 1:1 system, easy processing, RT cure, heat acceleration, 1-part systems, RT storage and heat cure
Temperature Gels: withstand extreme cold (-80°C) or extreme hot (+200°C) temperatures
Toughened Gels: enhanced chemical adhesion, added strength and harder cure
Specialty Gels: high fuel and solvent resistance, UV-Cure available

Gel-Type	Product name	Features	Chemistry	Colour	Viscos-ity / mPas	Mixing ratio	Pot life	Gel time / min	Room-tempera-ture cure	Heat cure	Specific gravity	Gel hardness / g	Pene-tration / 1/10 mm	Diel-ectric strength / kV/mm	Agency listing
Standard Gels	DOWSIL™ 3-4118 Gel	Controlled flowability Clear	Addition cure	Clear	7.000	Two-part (1:1)	30 min	—	Possible	1 hr @ 125°C	0.97	50	110	18	—
	DOWSIL™ 3-4133 Dielectric Gel	Long working time with fast heat cure	Addition cure	Clear	450	Two-part (1:1)	6 hrs	—	Possible	4 min @ 100°C 2.2 min @ 125°C 1.6 min @ 150°C	0.97	600	10	19	—
	DOWSIL™ 3-4150 Dielectric Gel	Blue + yellow that turns to green when mixed, fast cure version of SYLGARD™ 527 Dielectric Gel	Addition cure	Transparent / green	470	Two-part (1:1)	6 min	30	90 min	—	0.97	110	50	15	—
	DOWSIL™ 3-4154 Dielectric Gel	Longer processing time version of DOWSIL™ 3-4150 Dielectric Gel	Addition cure	Clear	550	Two-part (1:1)	30 min	NA	—	3 hrs @ 80°C 1.75 hrs @ 100°C	0.97	100	50	18	—
	DOWSIL™ 3-4170 Dielectric Gel	Fast heat cure with UL recognition	Addition cure	Clear	460	Two-part (1:1)	>24 hrs	—	NA	9 min @ 100°C 5 min @ 125°C 3 min @ 150°C	0.97	80	65	20	UL 94 HB
	DOWSIL™ 3-4680 Silicone Gel	One of our highest flow rates for fast filling and processing	Addition cure	Transparent / blue	260	Two-part (1:1)	—	10	30 min	1 min @ 125°C	0.97	90	60	16	—
	DOWSIL™ EG-3000 Thixotropic Gel	Thixotropic to allow selective and cost-effective protection	Addition cure	Slightly hazy/ clear	2300	Two-part (1:1)	6 hrs	8 NA	NA	1 hr @150°C 3 hrs @ 70°C	0.99	80	60	22	—
	SYLGARD™ 3-6636 Silicone Dielectric Gel	Tougher with a controlled flow	Addition cure	Clear	3300	Two-part (1:1)	<10 min	6	24 hrs	45 min @ 100°C	0.99	125	55	16	—
	SYLGARD™ 527 Silicone Dielectric Gel	Proven industry standard with a long working time for greater processing flexibility	Addition cure	Clear	460	Two-part (1:1)	2 hrs	—	>1 wk	3.5 hrs @ 100°C 1.25 hrs @ 125°C 35 min @ 150°C	0.95	115	—	17	UL 94 HB
	SYLGARD™ 528 Firm Gel	Intermediate modulus with a long working time	Addition cure	Clear	400	Two-part (1:1)	6 hrs	—	Possible	Possible	0.97	200	—	—	—
	SYLGARD™ 535 Thixotropic Dielectric Gel	One-part version of DOWSIL™ EG-3000 Thixotropic Gel	Addition cure	Translucent	3000	One-part	—	—	—	1 hr @ 150°C	0.97	85	60	11	—
	SYLGARD™ 537 Dielectric Gel	One-part, harder version of SYLGARD™ 528 Firm Gel	Addition cure	Clear	360	One-part	—	—	—	1 hr @ 120°C	0.98	290	20	22	—
Temperature Gels	DOWSIL™ 3-4155 HV Dielectric Gel	Proven automotive grade with blue + yellow that turns to green when mixed, and designed for use down to -80°C	Addition cure	Transparent / green	1850	Two-part (1:1)	—	8	60 min	—	1	60	90	16	—
	DOWSIL™ 3-6635 Dielectric Gel	Fast filling automotive grade, designed for use down to -80°C	Addition cure	Clear	650	One-part	—	11	NA	2 hrs @100°C	1	80	85	20	UL 94 HB
	DOWSIL™ EG-3810 Gel	Enhanced use temperature range from -60 to + 200°C	Addition cure	Clear	690	One-part	—	—	NA	15 min @ 125°C 10 min @ 150°C	0.97	80	80	21	—
	DOWSIL™ Q3-6575 Dielectric Gel	Extended shelf life, two-part version of DOWSIL™ 3-6635 Dielectric Gel	Addition cure	Clear	670	Two-part (1:1)	20 min	6	24 hrs	40 min @ 70°C 20 min @ 100°C	1.02	65	80	10	—
Toughened Gels	DOWSIL™ 3-4207 Dielectric Tough Gel	Designed as a toughened gel for additional strength, with blue + yellow that turns to green when mixed, conditional primerless adhesion at room temperature, and a UV indicator	Addition cure	Translucent / green	410	Two-part (1:1)	—	7	90 min	10 min @ 50°C 3 min @ 100°C	0.98	60 Shore 00	NA	17	UL 94 V1 f2
	DOWSIL™ 3-4222 Dielectric Firm Gel	Enhanced stress relief version of DOWSIL™ 3-4207 Dielectric Tough Gel	Addition cure	Translucent / green	340	Two-part (1:1)	3 min	13	30min	2 min @ 100°C 1 min @ 125°C	0.97	35 Shore 00	NA	14	—
	DOWSIL™ 3-4241 Dielectric Tough Gel	Enhanced working life version of DOWSIL™ 3-4207 Dielectric Tough Gel	Addition cure	Translucent / green	410	Two-part (1:1)	>1h	—	11 hrs	2 min @ 125°C	0.98	60 Shore 00	NA	17	UL 94 V-1
	DOWSIL™ EG-3896 Gel	Designed as a toughened gel for improved crack resistance at operating temperatures as high as 185°C	Addition cure	Slightly hazy/ clear	520	Two-part (1:1)	>4 hrs	—	—	30 min @ 70°C 10 min @ 100°C 5 min @ 150°C	0.98	220	30	22	UL 94 V-1

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Silicone Gels

Gel-Type	Product name	Features	Chemistry	Colour	Viscosity / mPas	Mixing ratio	Pot life	Gel time / min	Room-temperature cure	Heat cure	Specific gravity	Gel hardness / g	Penetration / 1/10 mm	Dielectric strength / kV/mm	Agency listing
Specialty Gels	DOWSIL™ 3-6371 UV Gel	UV cure with a secondary moisture cure for shadowed areas	UV + Moisture secondary cure	Translucent / amber	820	One-part	7 days	—	25 sec @ 4000 mJ/cm² (15mm thick)	NA	0.98	40	140	12	—
	DOWSIL™ X3-6211 Encapsulants	Extremely fast line-of-sight UV cure	UV cure	Clear	850	One-part	—	—	5 sec @>3000 mJ/cm² (12 mm thick)	NA	0.99	105	50	17	—
	FLUOROGEL™ 4-8022 Gel	Automotive grade with solvent and fuels resistance, in a one-part formulation	Addition cure	Translucent	600	One-part	30 days	—	NA	1 hr @ 125°C 30 min @ 150°C	1.23	50	105	—	—
	FLUOROGEL™ Q3-6679 Dielectric Gel	Two-part, enhanced processing, flexibility version of FLUOROGEL™ 4-8022 Gel	Addition cure	Clear	1100	Two-part (1:1)	>4 hrs	7	>1 week	2 hrs @ 100°C	1.26	180	30	—	—

Silicone Thermally Conductive Encapsulants

DOWSIL™ and SYLGARD™ thermally conductive encapsulants are used as potting materials for high voltage transformers and sensors, assembly of heat sinks and fillers between heat sources. They offer sonstant cure rates regardeless of applied thickness and no post-cure is required.

Product	Mix ratio	Chemistry	Features	Develops adhesion	Room temperature cure	Heat cure	UL 94 V-0	Controlled volatility	Reworkable, printable	Excellent dielectric properties	Appearance	Thermal conductivity / W/mK	Viscosity / mPas	Cure conditions	Density @ 25°C / g/cm³	Durometer	Tensile strength / MPa	Elongation / %	Lap shear adhesion / MPa (substrate)	Dielectric strength / kV/mm	Volume resistivity / Ω•cm	Shelf life
DOWSIL™ TC-6020 Thermally Conductive Encapsulant	Two-part 1:1	Addition by hydrosilylation	High thermal conductivity with good flowability		✓		✓			✓	Part A: White Part B: Gray Mixed: Gray	2.7	Part A: 10800 Part B: 10000 Mixed: 10600	23 min @ 60°C 13 min @ 80°C 5 min @ 100°C 30 min @ 80°C	2.9	63 Shore A	1	21	0.3 (Al)	24	8.22E+15	9 months @ 25°C
DOWSIL™ TC-4025 Dispensable Thermal Pad	Two-part 1:1	Addition by hydrosilylation	DOWSIL™ TC-4026 Dispensable Thermal Pad provides 180 µm glass bead		✓		✓		✓		Part A: White Part B: Blue Mixed: Blue	2.7	Part A: 73000 Part B: 74000 Mixed: 70000	24 hr @ 25°C 30 min @ 100°C	2.8	50 Shore OO	0.2	209	-	18	3.9E+12	6 months @ 25°C
DOWSIL™ TC-3015 Reworkable Thermal Gel	One-part	Addition by hydrosilylation				✓	✓	✓	✓		Pink	2	220000	7 hr @ 60°C 30 min @ 100°C	2.8	66 Shore OO	0.3	485	-	15	5.9E+14	6 months @ 25°C
DOWSIL™ SE4445 CV Thermally Conductive Gel	Two-part 1:1	Addition by hydrosilylation				✓	✓	✓			Part A: White Part B: Black Mixed: Gray	1.3	Mixed: 15000	30 min @ 120°C	2.4	51 P	0.1	350	-	6	3E+15	6 months @ 25°C
DOWSIL™ 3-6651 Thermally Conductive Elastomer	Two-part 1:1	Addition by hydrosilylation	Low viscosity; low modulus; excellent wetting of surfaces			✓	✓				Part A: White Part B: Gray Mixed: Gray	1.1	Part A: 20400 Part B: 11600 Mixed: 13300	60 min @ 120°C	2.4	50 Shore OO	0.6	180	-	13	8.8E+14	2 months @ 25°C
DOWSIL™ TC-4605 HLV Thermally Conductive Encapsulant	Two-part 1:1	Addition by hydrosilylation	Low viscosity	✓		✓	✓			✓	Part A: White Part B: Gray Mixed: Gray	1	Part A: 1.600 Part B: 1400 Mixed: 1900	60 min @ 120°C	1.7	60 Shore A	2.6	95	1.5 (Al)	24	1.08E+15	6 months @ 25°C

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Silicone Thermally Conductive Encapsulants

Product	Mix ratio	Chemistry	Features	Develops adhesion	Room temperature cure	Heat cure	UL 94 V-0	Controlled volatility	Reworkable, printable	Excellent dielectric properties		Appearance	Thermal conductivity / W/mK	Viscosity / mPas	Cure conditions	Density @ 25°C / g/cm³	Durometer	Tensile strength / MPa	Elongation / %	Lap shear adhesion / MPa (substrate)	Dielectric strength / kV/mm	Volume resistivity / Ω•cm	Shelf life
DOWSIL™ TC-6011 Thermally Conductive Encapsulant	Two-part 1:1	Addition by hydrosilylation		✓		✓	✓			✓		Part A: White Part B: Gray Mixed: Gray	1	Part A: 3200 Part B: 2400 Mixed: 3000	60 min @ 120°C	1.6	0 Shore A	0.8	100	0,6 (Al) 0,5 (FR4)	21	5.3E+14	9 months @ 25°C
SYLGARD™ 3-6605 Thermal Conductive Elastomer	Two-part 1:1	Addition by hydrosilylation	High tensile strength; long working time			✓				✓		Part A: White Part B: Gray Mixed: Gray	0.8	Part A: 48800 Part B: 41600 Mixed: 59100	90 min @ 100°C 45 min @ 125°C 15 min @ 150°C	2.1	79 Shore A	5.6	83	2,7 (Al)	25	5.7E+15	12 months @ 25°C
SYLGARD™ Q3-3600 Thermally Conductive Encapsulant	Two-part 1:1	Addition by hydrosilylation	High tensile strength; long working time	✓		✓						Gray	0.8	Part A: 4500 Part B: 3000 Mixed: 3200	60 in @ 150 °C	2.2	89 Shore A	6.6	55	4,5 (Al)	26	1.00E+15	12 months @ 25°C
DOWSIL™ CN-8760G Thermally Conductive Encapsulant	Two-part 1:1	Addition by hydrosilylation	Low viscosity				✓			✓		Dark Grey	0.67	Part A: 2900 Part B: 3200 Mixed: 3200	24 h @ 25°C	1.6	45 Shore A	-	-	-	24	1.00E+17	9 months @ 25°C
DOWSIL™ CN-8760 Thermally Conductive Encapsulant	Two-part 1:1	Addition by hydrosilylation	Low viscosity				✓			✓		Dark Grey	0.66	Part A: 3436 Part B: 1287 Mixed: 2361	40 min @ 50 °C	1.6	52 Shore A	-	-	-	33	1.00E+16	9 months @ 25°C
SYLGARD™ 164 Silicone Elastomer	Two-part 1:1	Addition by hydrosilylation			✓		✓					Dark Grey to Black	0.64	Part A: 8925 Part B: 9175 Mixed: 9050	30 min @ 25 °C	1.6	50 Shore A	-	-	-	19	1.10E+13	15 months @25°C
SYLGARD™ 160 Silicone Elastomer	Two-part 1:1	Addition by hydrosilylation			✓	✓	✓					Dark Grey to Black	0.62	Part A: 6000 Part B: 3730 Mixed: 4865	24 h @ 25°C 4 min @ 100 °C	1.6	50 Shore A	-	-	-	19	5.60E+14	12 months @ 25°C
SYLGARD™ 170 Silicone Elastomer	Two-part 1:1	Addition by hydrosilylation	UL 94 V-0 and MIL1 Spec tested to MIL-PRF-23586F, EN45545-2: HL3		✓	✓	✓					Dark Grey to Black	0.48	Part A: 3160 Part B: 1110 Mixed: 2135	24 h @ 25 °C 25 min @ 70 °C 10 min @ 100 °C	1.37	47 Shore A	-	-	-	18	5.60E+17	24 month @ 25°C
SYLGARD™ 170 Fast Cure Silicone Elastomer	Two-part 1:1	Addition by hydrosilylation	Rapid room temp or heat accelerated cure		✓		✓					Dark Grey to Black	0.4	Part A: 3436 Part B: 1287 Mixed: 2361	10 min @ 25 °C	1.4	42 Shore A	-	-	-	14	2.42E+15	18 month @ 25°C

Silicone Thermally Conductive Compounds

DOWSIL™ thermally conductive compounds are used as filling between heat source and heat sink. A very thin bond line thickness is achievable, but materials nevertheless show common properties such as low thermal resistance and high thermal conductivity. These no-cure materials offer thermal conductivity of up to 5.2 W/mK.

Product	Unique features	Thixotropic	Thin bond line	UL 94 V-0	Flowable	Nonflowable	Controlled volatility	Chemistry	Appearance	Thermal conductivity / W/mK	Viscosity / mPas		Density @ 25°C / g/cm³	Volatile content: ppm, D4-D10(1) %, 24 hr @ 150°C(2) %, 24 hr @ 120°C(3) %, 48 hr @ 125°C(4) %, 24 hr @ 105°C(5)	Thermal resistance / °C*cm²/W	Minimum BLT / mm	Dielectric strength / kV/mm	Volume resistivity / Ω•cm	Dielectric constant @ frequency	Dissipation factor @ frequency	Shelf life
DOWSIL™ TC-5888 Thermally Conductive Compound	Excellent resistance to pump-out in high-stress MCP architecture; low volatiles content	✓						✓	Gray	5.2	100000		2.6	0.02%[4]	0.05	20	-	-	-	-	12 months @25°C
DOWSIL™ TC-5622 Thermally Conductive Compound			✓	✓					Gray	4.3	95000		2.53	0.08%[2]	0.06	20	-	-	-	-	24 months @25°C
DOWSIL™ TC-5021 Thermally Conductive Compound					✓				Gray	3.3	83000		3.47	<1%2	0.2	-	5	3.70E+11	8.1 @ 1 MHz	6E-02 @ 1 kHz	24 months @25°C
DOWSIL™ TC-5351 Thermally Conductive Compound	Vertical holding capability	✓		✓			✓		Gray	3.3	300000		3.12	<400 ppm[1]	0.24	50	6.2	3.10E+13	-	-	12 months @25°C
DOWSIL™ SC 4476 CV Thermally Conductive Compound							✓		Gray	3.1	310000		3.04	60 ppm[1]	-	-	25	1.50E+14	5.4	1E-01 @ 50 Hz	12 months @25°C
DOWSIL™ TC-5026 Thermally Conductive Compound			✓		✓				Gray	2.9	102000		3.53	0.05%[2]	0.032	7	8.9	5.90E+11	7.4 @ 1 kHz	3E-04 @ 1 kHz	24 months @25°C
DOWSIL™ TC-5121 Thermally Conductive Compound			✓		✓				Gray	2.5	86000		4.18	0.07%[2]	0.096	20	1.89	1.20E+12	19.3 @ 1 kHz	7E-02 @ 1 kHz	
DOWSIL™ SC 4471 CV					✓		✓		White	2	116000		2.76	0.11%[5]	-	-	-	2.00E+15	-	-	12 months @25°C
DOWSIL™ SE 4490 CV Thermally Conductive Compound						✓	✓		White	1.9	520000		2.63	253 ppm[1] 0.4%[3]	0.77	210	NA	2.00E+14	4.8 @ 50 Hz	1E-03 @ 50 Hz	11 months @25°C
DOWSIL™ TC-5080 Thermal Grease	Stable high-temperature performance					✓			White	1	836000		2.1	0.14%[2]	0.325	20	8.7	2.89E+15	-	-	12 months @25°C
DOWSIL™ SC 102 Compound						✓			White	0.8	290000		2.45	0.4%[3]	0.62	50	2.1	2.00E+16	4.0 @ 50 Hz	2E-02 @ 50 Hz	24 months @25°C
DOWSIL™ 340 Heat Sink Compound	MIL-DTL-47113 compliant					✓			White	0.6	540000		2.11	0.38%[2]	0.162	55	8.2	2.00E+15	5.0 @ 100 kHz	2E-02 @ 100 kHz	5 years @ 25°C

Silicone Thermally Conductive Gap Filler

DOWSIL™ thermally conductivegap filler are used as filling between heat source and heat sink. Materials are delivered as two-component materials with a mixing ratio of 1:1. Curing reaction allows to accelerate with moderate heat of between 80 °C and 120 °C. Thermally conductiv gap fillers offer thermal conductivity of up to 3,4 W/mK.

Product	Mix ratio	Chemistry	Room temperature cure	Glass bead option	Nonslump/non-flowable	Vertical holding capability	UL 94 V-0	Controlled volatility D4-D10	Long-term performance stability	Colour	Long-term performance stability		Viscosity / mPas	Thixotropic index (mixed)	Room temperature cure time	Heat cure time	Density @ 25°C / g/cm³	Durometer / Shore OO	Low-molecular-weight siloxane content (D4-D10), ppm	Dielectric strength / kV/mm	Volume resistivity / Ω•cm	Dielectric constant @ 1 MHz	Shelf life
DOWSIL™ TC-4535 CV Thermally Conductive Gap Filler	Two-part 1:1	Addition by hydrosilylation	✓		✓	✓	Pending	✓	✓	Part A: White Part B: Blue Mixed: Blue	3.4		Part A: 200000 Part B: 230000 Mixed: 205000	3.6	120 min @ 25°C	10 min @ 80°C	3.1	52	8	22	3.00E+13	6.50E-03	6 months @ 25°C (target 12 months)
DOWSIL™ TC-4525 Thermally Conductive Gap Filler	Two-part 1:1	Addition by hydrosilylation	✓	✓	✓	✓	✓		✓	Part A: White Part B: Blue Mixed: Blue	2.6		Part A: 207000 Part B: 1930000 Mixed: 217000	4.3	120 min @ 25°C	10 min @ 80°C	2.9	55	NA	18	2.40E+14	6.6	12 months @ 25°C
DOWSIL™ TC-4525 CV Thermally Conductive Gap Filler	Two-part 1:1	Addition by hydrosilylation	✓		✓	✓	✓	✓	✓	Part A: White Part B: Blue Mixed: Blue	2.6		Part A: 223000 Part B: 216000 Mixed: 217000	4	120 min @ 25°C	10 min @ 80°C	2.9	40	15	23	2.60E+14	6.2	12 months @ 25°C
DOWSIL™ SE 4448 CV	Two-part 1:1	Addition by hydrosilylation	✓	✓	✓			✓	✓	Part A: White Part B: Gray Mixed: Gray	2.2		Part A: 52800 Part B: 50300 Mixed: 51500	-	300 min @ 25°C	30 min @ 120°C	2.9	59	300	11	2.00E+15	5.9	12 months @ 25°C
DOWSIL™ TC-4515 Thermally Conductive Gap Filler	Two-part 1:1	Addition by hydrosilylation	✓	✓	✓	✓	✓		✓	Part A: White Part B: Blue Mixed: Blue	>1.8		Part A: 215000 Part B: 227000 Mixed: 240000	5	150 min @ 25°C	30 min @ 80°C	2.7	50	NA	16	8.13E+14	4.27 @ 1 KHz	9 months @ 25°C (target 12 months)
DOWSIL™ TC-4515 CV Thermally Conductive Gap Filler	Two-part 1:1	Addition by hydrosilylation	✓		✓	✓	Pending	✓	✓	Part A: White Part B: Blue Mixed: Blue	>1.8		Part A: 155000 Part B: 153000 Mixed: 151000	5.6	120 min @ 25°C	10 min @ 80°C	2.8	44	8	19	1.00E+12	5,4	12 months @ 25°C
DOWSIL™ TC-5515 LT Lows Density Thermal Conductive Gap Filler	Two-part 1:1	Addition by hydrosilylation	✓		✓	✓	✓		✓	Part A: White Part B: Blue Mixed: Blue	2		Part A: 150000 Part B: 120000 Mixed: 140000	3.5	360 min @ 25°C	30 min @ 80°C	2.0	65	NA	19	1.0E+13	3.0	6 month @ 25°C

Silicone Thermally Conductive Adhesives

DOWSIL™ thermally conductive adhesives are used for the bonding of heat sinks and PCBs as well as for power supply housings. This class of adhesives offers strong and stable bonds to common printed circuit boards and shows an excellent thermal conductivity as high as 3,3 W/mK. A low volatile content will show no negative impact on components such as LED chips in lamps and luminaires.

Product	Mix ratio	Chemistry	Features	Room temperature cure	Heat cure	Short tack-free time	Controlled volatility	UL 94 V-0	Low viscosity	Flowable	Thixotropic	High tensile strength	180 µm glass beads	High performance stability through operating life		Appearance	Thermal conductivity / W/mK	Viscosity / mPas	Tack-free time@25°C/55% RH / min	Cure conditions	Density @ 25°C/ g/cm^3	Durometer / Shore A	Linear coefficient of thermal expansion / ppm/°C	Tensile strength / MPa	Elongation at break / %	Lap shear adhesion / MPa (substrate)	Dielectric strength / kV/mm	Shelf life
DOWSIL™ SE 4485 Thermally Conductive Adhesive	One-part	Addition by hydrosilylation		✓			✓	✓		Semi						White	2.8	23000	3	5 hr/0,6 mm @ 25°C/50% RH 72 hr/2 mm @ 25°C/50% RH	2.9	90	80	3.4	25	2.3 (Al)	19	9 months @ 25°C
DOWSIL™ 1-4173 Thermally Conductive Adhesive	One-part	Addition by hydrosilylation			✓			✓			✓	✓				Gray	1.8	61300	NA	90 min @ 100°C 30 min @ 125°C 20 min @ 150°C	2.7	92	125	6.2	22	4.5 (Al)	18	6 months@ 5°C cold storage
DOWSIL™ 1-4174 Thermally Conductive Adhesive	One-part	Addition by hydrosilylation			✓			✓			✓	✓	✓			Gray	1.8	62300	NA	90 min @ 100°C 30 min @ 125°C 20 min @ 150°C	2.7	92	125	5.2	NA	4.4 (Al)	16	6 months@ 5°C cold storage
DOWSIL™ 3-6752 Thermally Conductive Adhesive	One-part	Addition by hydrosilylation			✓											Gray	1.7	88300	NA	40 min @ 100°C 10 min @ 125°C 3 min @ 150°C	2.6	87	138	3.8	15	3.6 (Al)	16	6 months @ 25°C
DOWSIL™ SE 4486 Thermally Conductive Adhesive	One-part	Alkoxy moisture		✓			✓		✓	✓						White	1.6	19600	4	72 hr/3 mm @ 25°C/55% RH	2.6	81	140	3.9	43	0.7 (Al)	20	12 months @ 25°C
DOWSIL™ TC-2022 Thermally Conductive Adhesive	One-part	Thermal radical cure	Fast cure at moderate temperature													Gray	1.6	190000	NA	15 min @ 100°C	2.7	90	125	4.7	100	4.1 (Al)	16	12 months@ - 5°C cold storage
DOWSIL™ EA-9189 H RTV Adhesive	One-part	Alkoxy moisture		✓		✓	✓	✓								White	0.9	139000	2	72 hr/3 mm @ 20°C/55% RH	1.7	80	189	3.9	31	2.2 (Al)	28	9 months @ 25°C
DOWSIL™ TC-2035 Thermally Conductive Adhesive	Two-part 1:1	Addition by hydrosilylation	Low bond line thickness of 80 µm; optimized wetting on typical electronics substrates		✓			✓						✓		Part A: White Part B: Pink Mixed: Pink	3.3	Part A: 130000 Part B: 118000 Mixed: 125000	NA	30 min @ 125°C 10 min @ 150°C	3	93	92	3.6	43	2.7 (Al)	21	6 months @ 25°C
DOWSIL™ TC-2030 Thermally Conductive Adhesive	Two-part 1:1	Addition by hydrosilylation	Bond line thickness above 130 µm		✓									✓		Part A: White Part B: Gray Mixed: Gray	2.7	Part A: 250000 Part B: 200000 Mixed: 220000	NA	60 min @ 130°C	2.9	92	60	4.7	50	3.3 (Al)	21	12 months @ 25°C
DOWSIL™ 3-6751 Thermally Conductive Adhesive	Two-part 1:1	Addition by hydrosilylation	Low viscosity; low elastomeric modulus		✓			✓								Part A: White Part B: Gray Mixed: Gray	1	Mixed: 20200	NA	60 min @ 100°C 45 min @ 125°C 10 min @ 150°C	2.3	68	180	2.8	36	3.5 (Al)	18	12 months @ 25°C
DOWSIL™ Q1-9226 Thermally Conductive Adhesive	Two-part 1:1	Addition by hydrosilylation	Moderate flow; long pot life; good resilience due to high elongation; low elastomeric modulus		✓											Part A: White Part B: Gray Mixed: Gray	0.8	Part A: 48000 Part B: 43000 Mixed: 59000	NA	60 min @ 100°C 45 min @ 125°C 10 min @ 150°C	2.1	67	168	4.1	124	2.6 (Al)	25	12 months @ 25°C

Silicone One-part Moisture Cure RTV Adhesive & Sealants

These one-part adhesives utilise moisture from the atmosphere for curing. They are supplied ready-to-use and require no mixing equipment or ovens. The assembled parts can simply be set aside at normal room environments. Parts can be handled in 10-120 minutes and achieve full properties in 24-72 hours, depending on the product utilised and its bond line thickness.

Some of our newer products are formulated for faster room temperature cures. Because these products require moisture from the outside, they are not suitable for highly confined or deep-section curing. Some acceleration of curing can be accomplished with mild heating at temperatures not exceeding 60 °C.

Product name	Features & benefits	Chemistry	Color	Viscosity / mPas	Mixing ratio	Tack-fee time / min	Potlife / min	Cure time / min	Specific gravity	Durometer / Shore A	Durometer / Shore 0	Tensile strength / MPa	Elongation / %	Unprimed lap shear / MPa	Peel strength / N/cm	Dielectric strength / kV/mm	Agency listing
DOWSIL™ 3145 RTV Mil-A-46146 Adhesive/ Sealant	Very high tensile strength and elongation; Proven performance and an aerospace standard for the most demanding applications	Noncorrosive moisture cure	Clear	Non-flowing	One-Part	70	—	3-7 days @25°C	1.10	50	—	6	700	3,5 (Al)	180 (Al)	19	Mil-A-46146, Group II, Type I; UL 94 HB
DOWSIL™ 3145 RTV Mil-A-46146 Adhesive/ Sealant	Very high tensile strength and elongation; Proven performance and an aerospace standard for the most demanding applications	Noncorrosive moisture cure	Gray	Non-flowing	One-Part	80	—	3-7 days @25°C	1.12	50	—	7	700	3,5 (Al)	180 (Al)	19	Mil-A-46146, Group II, Type I; UL 94 HB
DOWSIL™ 3165 Fast Tack RTV Adhesive/Sealant	Fast, tack-free time, with good green strength	Noncorrosive moisture cure	Gray	Non-flowing	One-part	5	—	3-7 days @25°C	1.35	35	—	1	175	1.5 (Al)	20 (Al)	20	UL 94 V-0
DOWSIL™ 6-1104 CV Sealant	High tensile tear strength and elongation; Extremely low levels of Si volatilities; Proven for space-grade applications	Noncorrosive moisture cure	Translucent	Non-flowing	One-part	65	—	3-7 days @25°C	1.10	45	—	6.7	700	1.5 (Al)	20 (Al)	21	—
DOWSIL™ 730 FS Solvent Resistant Sealant	An aerospace proven fluorosilicone that retains its properties under exposure to fuels, oils, and solvents	Acetoxy	White	Non-flowing	One-part	10	—	3-7 days @25°C	1.44	40	—	3.3	225	—	70 (Al)	15	—
DOWSIL™ 732 Multi-Purpose Sealant	A well established silicone that cures to a tough, flexible rubber; FDA and aerospace approved	Acetoxy	White, black, clear, Aluminium	Non-flowing	One-part	15	—	3-7 days @25°C	1.03	30	—	2.0	525	—	50(Al)	17	Mil-A-46106, FDA 177.2600; UL 94 HB
DOWSIL™ 738 Electrical Sealant	A proven silicone sealant for use around electrical and electronic application	Noncorrosive moisture cure	White	Non-flowing	One-part	90	—	3-7 days @25°C	1.04	35	—	2.7	500	—	40(Al)	19	Mil-A-46146, Group I, Type I
DOWSIL™ 739 Plastic Adhesive	An industry standard for bonding to many plastics	Noncorrosive moisture cure	White, black, gray	Non-flowing	One-part	75	—	3-7 days @25°C	1.40	25	—	1.5	500	0.7(Al)	—	25	UL 94 V-1
DOWSIL™ 744 RTV Adhesive/Sealant	Electronic grade with high adhesion to many metals and plastics	Noncorrosive moisture cure	White	Non-flowing	One-Part	40	—	3-7 days @25°C	1.43	35	—	2.5	600	1,5	—	16	UL 94 HB
DOWSIL™ 7091 Adhesive	Automotive grade; Excellent adhesion to many substrates; Used as a Formed-in-Place gasket (FIPG) material	Noncorrosive moisture cure	Black, white, gray	Non-flowing	One-Part	28	—	3-7 days @25°C	1.43	30	—	2.5	680	1,5	—	16	UL 94 V-1
DOWSIL™ 7092 High Green Strength Adhesive and Sealant	Provides improved immediate green strength — saves time as no buffer time for strength build-up required	Noncorrosive moisture cure	Black, white	Non-flowing	One-Part	30	—	3-7 days @25°C	1.58	50	—	2,0	425	1-1,5	—	17	UL 94 V-1
DOWSIL™ 7093 Adhesive Sealant	Extra low modulus for high movement capability	Noncorrosive moisture cure	Black, white, gray	Non-flowing	One-Part	30	—	3-7 days @25°C	1.50	30	—	2.0	750	100% CF (Al, Glass)	—	13	—
DOWSIL™ 7094 Flowable Sealant	Flowable and self-leveling	Noncorrosive moisture cure	Black, white	33000	One-Part	40	—	3-7 days @25°C	1.30	20	—	1.2	—	0.8	—	—	UL 94 HB
DOWSIL™ EA-2900 Sealant	High green strength; Fast assembly with improved UL flame resistance	Noncorrosive moisture cure	White	Non-flowing	One-Part	20	—	3-7 days @25°C	1.52	50	—	2.0	400	1.5	—	18	UL 94 V-1
DOWSIL™ SE 9100 Adhesive	Repairable adhesive with controlled silicone volatility	Noncorrosive moisture cure	Black	45000	One-Part	10	—	NA	1.05	25	—	2.5	400	0.5	—	—	—
DOWSIL™ SE 9120 Adhesive	Highly flowable with controlled silicone volatility	Noncorrosive moisture cure	Clear	6500	One-Part	10	—	3-7 days @25°C	1.02	25	—	1.5	375	—	—	23	—
DOWSIL™ SE 9120 S Adhesive	White repairable version of DOWSIL™ SE 9120 Adhesive	Noncorrosive moisture cure	White	7000	One-Part	10	—	3-7 days @25°C	1.03	20	—	1.5	400	—	—	23	—
DOWSIL™ SE 9152 HT Adhesive	Flowable with heat resistance for sustained 275°C exposure	Noncorrosive moisture cure	Reddishbrown	10000	One-Part	20	—	3-7 days @25°C	1.05	25	—	3.0	300	5.5	—	25	—
DOWSIL™ SE 9160 Adhesive	Repairable, hybrid (UV cure with secondary moisture cure) for faster in-line processing	UV Cure (secondary moisture cure)	Bluish	20000	One-Part	30	—	3-7 days @25°C	1.04	35	—	3.0	250	0.5	—	—	—

continued on next page

Silicone One-part Moisture Cure RTV Adhesive & Sealants

Product name	Features & benefits	Chemistry	Color		Viscosity / mPas	Mixing ratio	Tack-fee time / min	Potlife / min	Cure time / min	Specific gravity	Durometer / Shore A	Durometer / Shore 0	Tensile strength / MPa	Elongation / %	Unprimed lap shear / MPa	Peel strength / N/cm	Dielectric strength / kV/mm	Agency listing
DOWSIL™ SE 9168 RTV Adhesive	Controlled silicone volatility with top UL flame resist-ance	Noncorrosive moisture cure	Gray		Non-flowing	One-Part	5	—	3-7 days @25°C	1.25	40	—	3.5	375	1.5	—	26	UL 94 V-0
DOWSIL™ SE 9185 Adhesive	Non-flowing; High elongation for added stress relief, with controlled silicone volatility	Noncorrosive moisture cure	Translucent/ white		Non-flowing	One-Part	10	—	3-7 days @25°C	1.04	25	—	3.0	500	1	—	22	—
DOWSIL™ SE 9186 Sealant Adhesive	Self-leveling with controlled silicone volatility	Noncorrosive moisture cure	Translucent/ white		65,000	One-Part	10	—	3-7 days @25°C	1.03	20	—	2.5	550	1	—	23	—
DOWSIL™ SE 9188 RTV Adhesive	Lower modulus for improved stress relief, with con-trolled silicone volatility	Noncorrosive moisture cure	Gray		Non-flowing	One-Part	10	—	3-7 days @25°C	1.29	30	—	3.0	400	1	—	30	UL 94 V-0
DOWSIL™ Q3-1566 Heat Resistant Adhesive/Sealant	High temperature resistant, with broad adhesion to many substrates	Acetoxy cure	Black		Non-flowing	One-Part	5	—	3-7 days @25°C	1.06	45	—	3.5	350	1.9	—	—	—

Silicone One-part Moisture Cure RTV and Hotmelt Adhesive & Sealants

DOWSIL™ one-part heat cure adhesives deliver greater control and flexibility in processing. Curing in few minutes at temperatures of 150 °C or more energy-efficiently at lower temperatures. Material will be delivered as a one-component product which does not require any mixing equipment. This class of products cure in an addition reaction without any by-products.

DOWSIL™ hot melts are neutral cure sealants. Products are one-component and can ideally be applied at temperatures of approx. 120 °C. This technology allows a rapid adhesion on different substrates and also a long open time for assembly.

Product name	Features	Cure system	Color	Viscosity / mPas	Thixotropic		Mixing ratio	Tack-fee time / min	Potlife / min	Cure time / min	Specific gravity	Durometer / Shore A	Durometer / Shore 0	Tensile strength / MPa	Elongation / %	Unprimed lap shear / MPa (substrate)	Peel strength / N/cm	Dielectric strength / kV/mm	Agency listing
Silicone One-part Moisture Cure RTV Adhesives and Sealants																			
DOWSIL™ 3-1595 Silicone Adhesive	High enlongation adhesive with a very low modulus for added stress relief; UV indicator for inspection	Addition cure	Gray	650000	✓		One-part	—	—	1 hr @ 125° C 30 min @ 150°C	1.06	—	60	1.5	800	1.5 (Al)	—	18	—
DOWSIL™ 3-1598 HP Adhesive	Version of DOWSIL™ X3-1598 Adhesive with extra low void formation after cure for sensitive substrate	Addition cure	Black	85000			One-part	—	—	3 hrs @ 100°C 30 min @125° C 15 min @ 150°C	1.31	60	—	5.5	250	5 (Al)	—	20	—
DOWSIL™ 3-6265 Thixotropic Adhesive	Thixotropic version of DOWSIL™ 3-6265 Adhesive	Addition cure	Black	1000000	✓		One-part	—	—	1 hr @ 125°C 30 min @ 150°C	1.34	60	—	5	175	4 (Al)		21	
DOWSIL™ 3-6265 HP Adhesive	Version of DOWSIL™ 3-6265 Adhesive with extra low void formation after cure for sensitive substrates	Addition cure	Black	1080000	✓		One-part	—	—	2.5 hrs @ 100°C 25 min @125°C 10 min @ 150°C	1.34	70	—	6	275	5.5 (Al)		24	UL 94 V-0
DOWSIL™ 3-6876 Adhesive	Lower viscosity version of DOWSIL™ Q3-6611 Adhesive	Addition cure	Black	40000			One-part	—	—	5 hrs @ 100°C 1 hr @ 125°C 30 min @ 150°C	1.31	50	—	5.5	250	4.5 (Al)		21	UL 94 V-0
DOWSIL™ 3-6876 Adhesive	Lower viscosity version of DOWSIL™ Q3-6611 Adhesive	Addition cure	Gray	40000			One-part	—	—	1 hr @125°C 30 min @ 150°C	1.31	50	—	6	175	4 (Al)		14	
DOWSIL™ ME-4530 Encapsulant Clear	Aerospace recognized; Thixotropic non-corrosive adhesive with enhanced fuel and solvent resistance	Addition cure		Non-flowing			One-part	—	—	4 hrs @ 125°C	1.28	25	—	3.5	350	2.5 (Al)			
DOWSIL™ 866 Primerless Silicone Adhesive	Automotive established; Flowable; High strength adhesive	Addition cure	Gray	50000			One-part	—	—	1 hr @125°C 30 min @150°C	1.29	55	—	6.5	200	5.5 (Al)		20	
DOWSIL™ EA-7100 Adhesive	Fast cure at lower temperatures; Adhesion to a wide variety of substrates that forms simutaneously with the cure; Less sensitive to contamination and cleaning	Thermal radical cure and moisture cure	Dark gray	270000	✓		One-part	—	—	15 min @100°C	1.09	40	—	3.5	250	3 (Al)	20	17	UL 94 HB
DOWSIL™ Q3-6611 Adhesive	Industry standard; Flowable; High tensile strength adhesive	Addition cure	Black	80000			One-part	—	—	3 hrs @ 100°C 1 hr @125°C 30 min @150°C	1.31	55	—	6	225	5.5 (Al)		13	UL 94 V-0
DOWSIL™ Q3-6611 Adhesive	Industry standard; Flowable; High tensile strength adhesive	Addition cure	Gray	75000			One-part	—	—	1 hr @125°C 30 min @150°C	1.31	55	—	5.9	240	5.5 (Al)		14	
DOWSIL™ X3-1598 Adhesive	Flowable; Automotive industry standard adhesive with high strength; UV indicator for inspection	Addition cure	Black	75000			One-part	—	—	1 hr @125°C 30 min @150°C	1.32	60	5.5	225	5.5		22		
Silicone Hotmelt Adhesives and Sealants																			
DOWSIL™ EA-4600 HM RTV UV Adhesive	A tough, electronicgrade silicone adhesive that adheres as soon as it cools to nearly all surfaces; UV indicator for inspection	Moisture cure	Black	60000@120°C			One-part	—	24		1.08	55	10	4.5	1000	1.5 (PC)	17	20	UL 94 HB
DOWSIL™ HM 2600 Silicone Assembly Sealant	A tough, clear silicone adhesive that delivers adhesion as soon as it cools to nearly all surfaces; Industrial grade	Moisture cure	Clear	70000@120°C			One-part	15	24		1.08	60		4.5	1000	1.5 (PC)	10	20	UL 94 HB

Silicone Two-part Room Temperature Condensation Cure Adhesive & Sealant

A few of the condensation cure products are two-part formulations. These provide relatively fast room temperature cures and, because they contain their own source of moisture, can cure readily in more confined situations and in higher bond line thicknesses. Cure times range from about 5 minutes (DOWSIL EA-3838 Fast Adhesive) to 4 hours. The material will continue to cure and reach full properties within a period of 8 hours or up to a few days depending on the product being used.

These cure times can be accelerated by up to 10 times with mild heating not exceeding 60 °C. Higher temperatures will not be of any benefit because severe bubbling in the material will result. Those products offer as well a fast in-depth cure, as no moisture is required compared to typical one component adhesives.

Product name	Features & benefits	Cure system	Color	Viscosity / mPas		Mixing ratio	Tack-fee time / min	Potlife / min	Cure time / min	Specific gravity	Durometer / Shore A	Durometer / Shore 0	Tensile strength / MPa	Elongation / %	Unprimed lap shear / MPa (substrate)	Peel strength / N/cm	Dielectric strength / kV/ mm	Agency listing
DOWSIL™ 93-076-2 RF Sealant	Aero-space recognized, high strength silicone adhesive	Moisture cure	Gray/ turquoise	Non-flowing		Two-part (10:1)	120	—	23 hrs @ 25°C	1.13	50	—	5.5	425	—	133	—	—
DOWSIL™ 93-076-2 RF Sealant	Aero-space recognized, high strength silicone adhesive	Moisture cure	Gray/ turquoise	Non-flowing		Two-part (10:1)	120	—	23 hrs @ 25°C	1.13	50	—	5.5	425	—	133	—	—
DOWSIL™ EA-2626 Adhesive	Automotive-grade adhesive with UV and heat resistance that has fast, in-depth cure	Neutral Cure	White/gray, special black	205000		Two-part (6:1)	10	—	24 hrs @ 25°C	1.33	45	—	2.5	275	>1,0 (PC/PP)	100% CF	—	—
DOWSIL™ EA-3838 Fast Adhesive	Fast room temperature curing thixo-thropic adhesive	Neutral Cure	Black	200000		Two-part (4:1)	5	—	24 hrs @ 25°C	1.6	40	—	1.5	250	1,4 (Al, PBT	—	—	—
DOWSIL™ EA 3500G Fast Cure Silicone Adhesive	Fast, room-temperature cure with good adhesio to metals, glass, and plastic	Moisture cure	White	119000		Two-part (10:1)	5	—	3-7 days @ 25°C	1.36	55	—	1.5	75	1,5	—	23	UL 94 HB
SILASTIC™ Q3-3636 Adhesive	Automotive-grade adhesive with reduced weight loss (fogging) at high operating temperatures; Not humidity-cure sensitive	Moisture cure	Gray, black, special black	200000		Two-part (6:1)	15	—	25 hrs @ 25°C	1.3	35	—	2	350	2	100% CF	—	—

Silicone Two-part Heat Cure Adhesive & Sealant

DOWSIL™ and SYLGARD™ two-part heat cure adhesives deliver greater control and flexibility in processing. Curing in a few minutes at temperatures of 150 °C or more energy-efficiently at lower temperatures. Material will be delivered as two-component material in mixing ratios of 1:1 and 10:1. This class of products cure in an additional reaction without any by-products.

Product name	Features & benefits	Cure system	Color	Viscosity / mPas	Thixotropic	Mixing ratio		Potlife / min	Cure time / min	Specific gravity	Durometer / Shore A	Durometer / Shore 0	Tensile strength / MPa	Elongation / %	Unprimed lap shear / MPa (substrate)	Peel strength / N/cm	Dielectric strength / kV/ mm	Agency listing
DOWSIL™ 96-083 Silicone Adhesive	Aerospace grade; High strength, very flowable adhesive	Addition cure	Translucent	11000		Two-part (10:1)		—	30 min @ 150 °C	1.08	55	—	6	125	5 (Al)	—	20	—
DOWSIL™ EA-6052 Fast Low-Temp Cure Adhesive	Fast curing version of DOWSIL™ 3-1598 HP Adhesive	Addition cure	Black	4355		Two-part (1:1)		6	60 min @ 60°C 30 min @125 °C 10 min @ 150°C	1.24	50	—	3.0	175	5 (Al)	—	23	—
DOWSIL™ EA-6060 Adhesive	Fast, low-temperature cure adhesive with a UV indicator for inspection	Addition cure	Black, white	11500	✓	Two-part (1:1)		—	30 min @ 80°C 15 min @ 90°C 10 min @ 100°C	1.25	40	—	3.0	300	2 (Al)	—	18	UL 94 V-0
DOWSIL™ SE 1700 Adhesive	Non-flowing; Heat cure silicone adhesive with very high strength	Addition cure	Clear	650000		Two-part (10:1)		8	30 min @ 150°C	1.11	45	—	7.5	425	2.5 (Al)	—	22	—
DOWSIL™ SE 1700 Adhesive	Non-flowing; Heat cure silicone adhesive with very high strength	Addition cure	White	550000		Two-part (10:1)		8	30 min @ 150°C	1.13	45	—	7.5	400	2.5 (Al)	—	22	—
DOWSIL™ SE 1720 CV Adhesive	Fast, low-temperature cure, flowable adhesive with con-trolled silicone volatility	Addition cure	White	100000		Two-part (1:1)		6	50 min @ 70°C 30 min @ 80°C 10 min @ 100°C	1.06	30	—	3.0	375	1 (Al)	—	26	—
DOWSIL™ Q5-8401 Adhesive	Long working time after mix-ing; Version of DOWSIL™ 866 Adhesive	Addition cure	Dark gray	70000		Two-part (1:1)		24	1,5 hrs @ 120 °C	1.25	60	—	6.0	225	6,5	20	14	—
SYLGARD™ 577 Primerless Silicone Adhesive	Flowable adhesive with high strength and a long working time after mixing	Addition cure	Gray	110000		Two-part (10:1)		22	1 hr @ 125 °C	1.29	60	—	6.5	225	6 (Al)	—	19	Mil-Spec PRF-23586F; UL 94 V-0

UV Curing Conformal Coatings

Light curable conformal coatings are used to protect printed circuit boards in many applications including military, aerospace or consumer electronics and automotive. They are listed to the most commen standards like IPC-CC-830, Mil-I-4605BC or UL, offer excellent electrical properties and ecellent chemical, abraison or environmental resistance. These conformal coatings are solvent free and cure within seconds. Consequently, with those one-part products production lines could be automated easily whilst throughput is increased.

Product name	Features & benefits	Viscosity / mPas	Durometer	Tensile at break / Mpa	Modulus of Elasticity / MPa	Dielectric Constant (1 MHz)	Dissipation Factor (1 MHz)	Volume Resistivity / ohm*cm	Curing				Agency listing				Substrates							
									Broad Band	LED (365 nm)	LED (385 nm)	LED (405 nm)	UL 94	UL 746-E	MIL-I-46058C	IPC-CC-830B	Solder joints	Lead Frame	Ceramic	FR-4	Flex	Silicone	Glass	Stainless Steel
9-20557	Blue Fluorescing, Secondary Heat Cure	2500	D60	15.8	37.9	4.49	0.03	1.48E+15	✓✓	✓			✓	✓	✓	✓	✓	✓ ✓	✓	✓	✓	✓		
9483	Thermal Shock and Corrosion Resistance	690	A55	16.2	276	3.26	0.2	4.39E+14	✓✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓			
9-20557-LV	Blue Fluorescing, Secondary Heat Cure	850	D70	21.7	310	4.46	0.03	2.38E+15	✓✓						✓	✓		✓	✓	✓	✓	✓		
9452-FC	Secondary Heat Cure, LED Curable, Thermal Shock Resistance	20	D60	34	1137	2.77	0.03	3.55E+14	✓✓	✓✓	✓	✓	•				✓			✓				
9451	Secondary Heat Cure, True Black Coating, Matte Finish	6000	D80	42.7	717	2.86	0.02	4.35E+15	✓✓	✓	✓	✓	✓							✓			✓	✓
9-20558-REV-A	Secondary Heat Cure, Thixotropic, High Viscosity Coating	20000	D50	6,2	2.3	3.66	0.05	2.29E+12	✓✓	✓			✓				✓			✓				
984-LVUF	Secondary Heat Cure	160	D85	55.8	724	3.4	0.03	3.58E+13	✓✓	✓			✓		✓	✓		✓	✓	✓	✓	✓		

✓✓ recommended
✓ positive trials

UV Curing Encapsulants

UV curing encapsulants offer superior protection. The one-part products are 100 % solvent free and most of them could be stored at room-temperature. They cure within seconds and some products offer a secondary cure mechanism for shadowed areas. The key features of these products are low stress under thermal cycling for delicate electronics, high electronic insulation and a very good thermal shock and moisture resistance.

Product name	Features & benefits	Viscosity / mPas	Durometer	Tensile at break / MPa	Modulus of Elasticity / MPa	Curing				Substrates														
						Broad Band	LED (365 nm)	LED (385 nm)	LED (405 nm)	ABS	PA	PI	PU	PC	PVC	PS	PPS	LCP	FR-4	Metals	Glass	Ceramics	Kapton	Silicone
9014	Secondary Moisture Cure, Flexible Encapsulant, Blue Fluorescing	12500	A70	8.2	119	✓✓	✓	✓	✓										✓		✓		✓	
9037-F	Secondary Heat Cure, Flexible Encapsulant, Moisture/Thermal Resistance	45000	D35	5.8	6.2	✓✓	✓	✓✓	✓										✓		✓		✓	
9-20558-REV-A	Secondary Heat Cure, Thixotropic, High Viscosity	20000	D50	6.2	2.3	✓✓	✓												✓	✓	✓			✓
9001-E-V3.0	Secondary Heat Cure, Moisture/Thermal resistance	400	D45	6.9	7.6	✓✓																		
9001-E-V3.1	Secondary Heat Cure, Moisture/Thermal resistance	4500	D45	5	17	✓✓														✓	✓			✓
9008	Flexible Encapsulant, Moisture Resistant	4500	D35	10	45	✓✓													✓		✓	✓	✓	
9101	Secondary Moisture Cure, Flexible Encapsulant, Blue Fluorescing	7000	D30-D50	5	17.5	✓✓													✓		✓		✓	
9102	Secondary Moisture Cure, Flexible Encapsulant, Blue Fluorescing	17000	D30-D50	4.8	18.4	✓✓													✓		✓		✓	
9103	Secondary Moisture Cure, Flexible Encapsulant, Blue Fluorescing	25000	D30-D50	4.9	17.6	✓✓													✓		✓		✓	
921-T	Secondary Heat Cure	3000	D80	24	563	✓✓	✓	✓		✓	✓	✓	✓	✓					✓	✓	✓	✓		
921-VT	Secondary Heat Cure	11500	D80	22	540	✓✓	✓	✓		✓	✓	✓	✓	✓					✓	✓	✓	✓		
921-Gel	Secondary Heat Cure	25000	D80	25	583	✓✓	✓	✓		✓	✓	✓	✓	✓						✓	✓	✓		

✓✓ recommended
✓ positive trials

Electronic Maskants

Peelable maskants are used to protect sensitive parts like connectors on PCBs during further processing, e.g. conformal coating processing. The maskants are easy to process and are easy to remove without any ionic contamination.

Product name	Features & benefits	Viscosity / mPas	Durometer	Tensile at break / MPa	Modulus of Elasticity / MPa	Curing				Substrates				
						Broad Band	LED (365 nm)	LED (385 nm)	LED (405 nm)	Lead Frame	Ceramics	PCB	Flex	Silicon
9-20479-B-REV-A	Compatible with Gold & Copper Pins	115000	A75	3.37	4.13	✓		✓		✓	✓	✓	✓	✓
9-318-F	Very low VOC	50000	A55	3	2	✓				✓	✓	✓	✓	✓

TIM Adhesives

Thermal Interface Adhesives (TIM) with UV technology set in seconds via light exposure. Curing in shadowed areas is possible with activator or heat curing mechanism. They offer a high tensile strength and good thermal conductivity.

Product name	Features & benefits	Viscosity / mPas	Durometer	Tensile at break / MPa	Modulus of Elasticity / MPa	Curing				Substrates				
						Broad Band	LED (365 nm)	LED (385 nm)	LED (405 nm)	Lead Frame	Ceramics	PCB	Flex	Silicon
9-20801	Good thermal conductivity and secondary heat cure	110000	D85	14	0.9	✓				✓	✓	✓		✓

UV-Adhesives for Optical Applications

Optical grade adhesives are used, where long assembling times and immediate fixing are needed. Some offer optical clear bond lines with defined refractive index, while others focus on low shrinkage for precision bonding.

They are used for optical assembly processes, which include lens fixing, lens laminating, lens positioning and fiber-optic assembly.

Product name	Features & benefits	Viscosity / mPas	Durometer	Tensile at break / MPa	Modulus of Elasticity / MPa	Linear Shrinkage / %	Refractive Indes (25 °C)	Curing				Substrates													
								Broad Band	LED (365 nm)	LED (385 nm)	LED (405 nm)	ABS	PC	PA	PETG	PMMA	PPS	PS	SAN	LCP	Glass	Metals	Phenolic Plastics	Ceramics	FR-4
Optically Clear Additives																									
OP-29	Medium Viscosity for Gap filling, optically clear adhesive	2500	D60	22	234	0.79	1.5	✓✓	✓												✓	✓	✓		
OP-29-GEL	Gel Viscosity for minimum movement after dispense, optically clear adhesive	20000	D65	24	200	0.79	1.5	✓✓	✓												✓	✓	✓		
Precision Bonder																									
OP-24-REV-B	Secondary Heat Cure, Precision Bonder	800	D80	22	555	0.4	1.5	✓✓	✓✓	✓		✓									✓	✓	✓		
OP-60	Precision Bonder	150000	D80	34	1000	0.8	-	✓✓	✓	✓	✓		✓								✓	✓	✓	✓	✓
OP-81-LS	Epoxy System, Heat Cure Capability	60000	D90	45	1600	1.5	-	✓✓	✓	✓✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓

✓✓ recommended
✓ positive trials

Active Alignment

Active alignment is the key technology for optimizing the image quality in Light Detection and Ranging (LiDAR). For micro-positioning of optics and optical sensors high precision bonder with high technical requirements are needed: low water absorption, low shrinkage, low temperature cure, low CTE.

Product name	Features & benefits	Viscosity / mPas	Durometer	Tensile at break / MPa	Modulus of Elasticity / MPa	Water Absorption / % (25 °C, 24h)	CTEα1 / µm/m/°C	Linear Shrinkage / %	Curing				Substrates													
									Broad Band	LED (365 nm)	LED (385 nm)	LED (405 nm)	ABS	PC	PA	PU	PMMA	PPS	PS	SAN	LCP	Glass	Metals	Phenolic Plastics	Ceramics	FR-4
3013	Moisture resistant, Blue Fluorescing	150	D70	18	350	1.6	120	0.9	✓✓				✓	✓		✓	✓		✓				✓			
3094-T-REV-A	Low Stress Bonder	11750	D65	14	698	18	137	0.7	✓✓				✓	✓	✓	✓	✓		✓	✓	✓					
3094-GEL-REV-A		30000	D67	12.4	179	22	128	0.5	✓✓				✓	✓	✓	✓	✓		✓	✓	✓	✓	✓			
431	High Temperature and Moisture Resistant	500	D70	27	570	1.5	98	0.8	✓✓				✓	✓	✓					✓		✓	✓		✓	✓
431-T		6000	D70	24	439	3.4	97	0.5	✓✓				✓	✓	✓					✓		✓	✓		✓	✓
4-20418	Low Stress Bonder	450	D60	20.6	247	4.4	111	0,4	✓✓				✓				✓		✓	✓		✓				
4-20418-GEL		35000	D60	11.4	690	4.1	95	0.4	✓✓				✓				✓		✓	✓		✓				
6-621	Multi-Cure® for Shadowed Areas, Blue Fluorescing, Ideal for Metal, Glass and Plastics	800	D80	22	550	1.7	66	0.4	✓✓	✓	✓		✓	✓	✓	✓						✓	✓	✓	✓	✓
6-621-T		3500	D80	28	730	1.7	69	0.4	✓✓	✓	✓		✓	✓	✓	✓						✓	✓	✓	✓	✓
6-621-VT		14000	D80	28	730	1,7	64	0.4	✓✓	✓	✓		✓	✓	✓	✓						✓	✓	✓	✓	✓
6-621-GEL		25000	D80	28	730	1.7	67	0.4	✓✓	✓	✓		✓	✓	✓	✓						✓	✓	✓	✓	✓
9801	Very Low Volume Shrinkage and CTE, Moisture and Thermal Cycle Resistant, (Secondary) Heat Cure	60000	D90	45	1600	0.1	17	<<0,1*	✓✓	✓✓	✓✓	✓✓						✓	✓		✓	✓	✓			✓
9803		86000	D94	37	3983	0.1	31	<<0,1**	✓✓	✓✓	✓✓	✓✓	✓	✓				✓	✓		✓	✓	✓			✓

✓✓ recommended
✓ positive trials

* volumetric shrinkage: 1,5%
** volumetric shrinkage: 1,1%

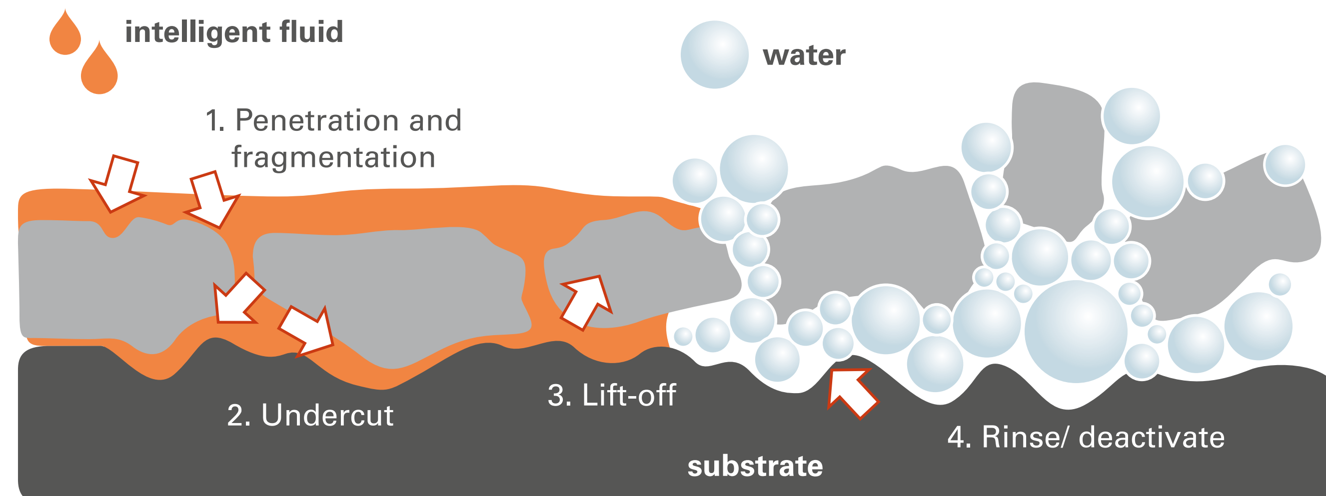
Cleaners and Primers

For assembled components with constant and high quality, surface treatment (cleaning and activation) is essential. Usually, plasma or wet-chemical treatment are utilized for cleaning/activation processes.

Product	Features	Applications
DOWSIL™ DS-1000 Aqueous Silicone Cleaner	Cleaner for silicone oils, greases and uncured elastomers; Aqueos solution	Cleaning of surfaces, equipment and manufacturing units
DOWSIL™ DS-2025 Silicone Cleaning Solvent	Cleaner for silicone oils, greases and uncured elastomers; high basicity; recyclable	Cleaning of surfaces, equipment and manufacturing units
Intelligent Fluids®	pH-neutral, non-flammable, biodegradable, environmental friendly, usable for many substrates and contaminations	Cleaning of all surfaces, equipment and manufacturing units from contaminations with non-covalent bonding to the surface

Intelligent fluids® act in four steps based on the Brownian motion and Ostwald-ripening processes:

1. cleaning fluids penetrating the contamination causing a fragmentation,
2. infiltration of the contamination,
3. resulting in an adhesion failure between substrate and surface,
4. and last but not least rinse off and cleaning of the substrate.



Product	Features	Applications
DOWSIL™ PR-1200 RTV Prime Coat	Improved the adhesion of silicone adhesives to many substrates. Available in clear and red version.	Improved adhesion to the substrates wood, granite, metals, glass, ceramics, plastics, rubbers and coatings
DOWSIL™ 1200 OS Primer Clear	Improved adhesion for moisture-curing RTV and heat-curing silicones, low VOC	Improved adhesion to the substrates wood, metals, glass, ceramics, structural plastics (including FR-4)
DOWSIL™ PR-2260 Prime Coat"	Solution of a silane coupling agent and other active ingredients, improves adhesion of RTH and heat-cure silicones	Improved adhesion to the substrates many metals, ceramics and some plastics

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