Information About *Dow Corning*® Brand Silicone Dielectric Gels

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. Silicones have been used to isolate circuits from the harmful effects of moisture and other contaminants and provide electrical insulation for high voltages. Physical and electrical stability is maintained over a wider temperature range (-45 to 200°C [-49 to 392°F]) compared to other chemistries. Another use is providing stress relief to protect circuits and interconnections from thermal and mechanical stresses. Gels are usually applied in thick layers to totally encapsulate higher architectures. More recently, gels have found application in optoelectronics due to their stress relieving capability and high refractive index, as well as the stability of these properties over time. For more information on gels for optoelectronic applications, please refer to the *LED Materials* family data sheet.

A key characteristic of most silicone gels is a naturally tacky surface after cure. This natural adhesion allows gels to gain physical adhesion to most common surfaces without the need for primers. This tacky nature also results in the unique ability to re-heal if the cured gel has been torn or cut, thereby permitting the use of test probes directly through the gel for circuit testing. Unlike organic materials, silicone gels can be easily repaired.

Dow Corning® brand dielectric gels are supplied as solventless, typically low-viscosity liquids. Most are designed as two-part products with 1:1 mix ratios (parts A and B). Others are formulated as one-part products, eliminating the need for mixing. The two-part products generally allow for either room-temperature or heat-accelerated cure. One-part products require heat cure. A few specialized one-part gels allow for very rapid UV cure.

Types of Gels

Dow Corning offers a broad range of products with a wide variety of cure speeds, viscosities, hardnesses, colors and other variables. Characteristics range from our general purpose (standard) gels to certain applications that are uniquely sensitive and require specialized properties.

Standard Gels

One-Part, Heat-Cure and Two-Part, Room-Temperature or Heat-Accelerated-Cure Silicone Gels

Although most silicone gels are supplied as 1:1 mix ratio two-part products, for easy processing, one-part gels are also available. One-part gels feature long room-temperature storage lives but require heat exposure to cure and have generally longer curing times. Two-part gels offer more processing flexibility with the options of room-temperature or heat-accelerated cure.

Low-Temperature Gels

Extreme Low-Temperature Products

Dow Corning® brand silicone gels can typically withstand cold environments down to at least -45°C (-49°F). For even colder uses, there are specialized products that will perform down to -80°C (-112°F).

Toughened Gels

Tough/Firm Gels

For applications that require gels with added strength, there are tough or firm gel products. These materials have enhanced chemical adhesion and cure slightly harder than standard gels, but may have limited applicability depending on processing conditions, device design, end-use environment and other conditions. Some of these products allow rapid room temperature curing and some contain UV dyes for easy inspection.

Specialty Gels

Low-Volatility Silicone Gels

For some uses, low-molecular-weight volatiles from the gels can result in problems, such as volatiles re-condensing on surfaces, which can interfere with adhesion or lead to decomposition under high-voltage or very high-temperature conditions. Volatiles may also re-condense and obscure/fog optical surfaces. For these situations, low-volatility silicone gels are recommended.

Low Extractable Gels

Compared to standard gels, a low extractable gel such as *Dow Corning*® 3-4130 Dielectric Gel offers approximately 25-50% less extractables with methyl ethyl ketone (MEK) solvent. (Gel extractables are measured by determining the

weight loss of a cured gel after immersion in a solvent. The weight loss represents the gel fraction from the cured material in a swollen state.)

Optically Clear Materials

For optical applications, many of the silicone gels are highly transparent in many wavelengths including the visible range. These materials have some of the highest transmission values of any polymeric materials in selected wavelength ranges. They also provide excellent stress relief and their properties do not vary significantly with time or environmental exposure. For more information on these products, please refer to the *LED Materials* family data sheet.

One-Part UV-Curing Gels

For applications requiring extremely rapid cure, faster than a traditional room-temperature or heat-accelerable cure product offers, UV-curing gels offer cure within seconds, even in the presence of temperature-sensitive components. However, deep-section cure is generally not possible with these materials.

Solvent-Resistant Gels

Unlike standard silicone gels, which are non-polar and susceptible to swelling in solvents and fuels, fluorosilicone solvent-resistant gels have an increased polar nature and provide improved resistance in applications with solvent and fuel exposure.

Flame-Resistant Gels

For applications requiring UL 94V flammability classification, Dow Corning offers a selection of flame-resistant gels (as listed in section QMFZ2 files E40195, E55519 and E251343). Refer to Underwriters Laboratory website (www.ul.com) for specific details.

Thermally Conductive Gels

Most gels are formulated without fillers. However, for applications that require both heat dissipation and the soft nature of silicone gels, thermally conductive gels include conductive fillers. This significantly increases the thermal conductivity values of these materials to >0.8 watts/meter-K. For more information on these gels, please refer to the *Thermally Conductive Materials* family data sheet.

Thixotropic Gels

Unlike traditional gels supplied as low-viscosity liquids, thixotropic gels are formulated to reduce the tendency to flow and allow the gels to be more easily contained in specific areas of a module.

Fast Formulation of Custom Gels

Dow Corning manufactures a wide variety of dielectric gels to meet the needs of most application and process situations, and we are continuously expanding the product offerings in each of these families to ensure that there are specific products to meet your needs. However, if you can't find a match for your needs, Dow Corning can modify any of our existing products to help meet your exact needs through our *Fast Formulation* process. Examples of *Fast Formulation* options include modification of a product's cure schedule, rheology, viscosity or conductivity – all in a timely manner.

Total Support

Product Finder

Dow Corning features a unique interactive product finder on our website that can help you pick the right materials for your applications. You can access the product finder at www.dowcorning.com/electronics by selecting "Technical Data" on any of our product family pages.

Production of Prototype Printed Boards or Process Design

We can produce printed boards or test patterns for early evaluation of a material's abilities. Based on our extensive industry experience, we can advise you on the best methods and conditions for your process.

Analytical, Environmental and Physical Testing

We have expertise to share to monitor quality, perform specialized testing for troubleshooting, or simulate accelerated service conditions.

Equipment Recommendations

Through many years of providing electronics materials, Dow Corning has developed strong alliances with key equipment suppliers worldwide. Save time and expense by taking advantage of these alliances to ensure the optimum integration of material and processing.

Consultation with Technical Experts

Have our experts visit your facility or join us at one of our global application centers to work together on your material and processing needs. We can provide seminars and training for your personnel to allow them to work more knowledgeably. With material, process and equipment integration solutions from Dow Corning, you can manufacture more modules and assemblies in less time, at less cost, with fewer shutdowns and fewer customer rejects.

Special Packaging

Our products are supplied in a variety of standard package types and sizes but if these will not meet your need, let us know. We also have a number of authorized repackagers we can call upon to help.

Tutorials

Gel materials tutorials, including an overview and a processing tutorial, can be found on our website (dowcorning.com/electronics). The tutorials are accessible from the

Standard Gels

Type: One-part heat-cure and two-part room-temperature or heat-accelerated cure materials, differentiated by cure speed and hardness of the cured gel
Physical Form: 1:1 mix ratio by weight or volume (two-part materials); one-part and two-part materials available in a variety of uncured viscosities
Special Properties: Cure rate controllable via cure temperature; reversion resistant; suited for thick-section cure; cured gels have a wide operating range (-45 to 150°C/-49 to 302°F) ; proven performance for over 40 years in electronics applications
Potential Uses: Sealing and protecting (by coating, encapsulating or potting) various electronic devices, especially those with delicate components from thermal and/or mechanical shock and vibration dampening

Low-Temperature Gels

Type: One- or two-part materials; various cure speeds and hardnesses available
Physical Form: 1:1 mix ratio by weight or volume (two-part materials); one-part and two-part materials available in a variety of uncured viscosities
Special Properties: Cure rate controllable via cure temperature; cured gels have an expanded operating range (-80 to 200°C/ -112 to 392°F); reversion resistant; suited for thick-section cure
Potential Uses: Sealing and protecting (by coating, encapsulating or potting) various electronic devices from thermal and/or mechanical shock and vibration dampening, especially those with delicate components and exposure to low temperatures

Toughened Gels

Type: Two-part materials; various cure speeds available
Physical Form: 1:1 mix ratio by weight or volume, provided as low-viscosity liquids
Special Properties: Chemical adhesion in certain applications and conditions; good dimensional stability; cure rate controllable via cure temperature; reversion resistant; suited for thick-section cure; cured gels have a wide operating range (-45 to 150°C/-49 to 302°F); must be end-product/end-use tested for specific applications
Potential Uses: Sealing and protecting (by coating, encapsulating or potting) various electronic devices, especially those requiring stronger adhesion or improved dimensional stability; *Dow Corning*® 3-4237 Dielectric Firm Gel, with its exceptionally long working time, is especially suited for penetrating intricate parts

Specialty Gels

Type: One- or two-part materials; various cure speeds, cure types and other properties available
Physical Form: 1:1 mix ratio by weight or volume (two-part materials)
Special Properties: Heat-cure and two-part materials feature controllable cure rate via cure temperature; UV-cure one-part materials available; reversion resistant; suited for thick-section cure; available characteristics include low extractables, fuel resistance, solvent resistance, UL listing, thermal conductivity
Potential Uses: Sealing and protecting (by coating, encapsulating or potting) various electronic devices from thermal and/or mechanical shock and vibration dampening; specially adapted for special requirements such as delicate components, low extractables, UV cure or resistance to solvents and fuels

product family pages or the left-hand navigation bar under Technical Library.

HOW TO USE

Mixing Two-Part Gels

Some gels are supplied in bladder packs that avoid direct air contact with the liquid gel components, allowing use of air pressure over the pack in a pressure pot for dispensing. Do not apply air pressure directly to the liquid gel surface (without the bladder pack) as the gel can become super-saturated with air and bubbling can occur when the material is dispensed and cured. Use of bladder packs prevents bubbling, maintains cleanliness and avoids gel contamination.

In general, gels are supplied as two-part products that are mixed in a 1:1 ratio (Parts A and B); one-part gels are available that eliminate the need for mixing. Gels can be dispensed manually or by using one of the available types of meter mix equipment. Typically, the two components are of matched viscosities and are readily mixed with static or dynamic mixers, with automated meter-mix normally used for high volume processes. For low-volume applications, manual weighing and simple hand mixing may be appropriate.

Inaccurate proportioning or inadequate mixing may cause localized or widespread problems affecting the gel properties or cure characteristics. If possible, the potential for entrapment and incorporation of gas (typically air) should be considered during design of the part and selection of a process to mix and dispense the gel. This is especially important with higher-viscosity and faster-curing gels. Degassing at >28 inches (10-20 mm) Hg vacuum may be necessary to ensure a void-free, protective layer.

Working Time and Cure

Working time (or pot life) is the time required for the initial mixed viscosity to double at room temperature (RT). For two-part, addition-cure products, the cure reaction begins when Parts A and B are mixed. As the cure progresses, viscosity increases until the material becomes a soft gel. For one-part, addition-cure and UV-cure products, the viscosity either increases at a much lower rate or does not change significantly at RT. Cure conditions for each product are shown in the typical properties table. Cure is defined as the time required for a specific gel to reach 90% of its final properties. Gels will reach a no-flow state prior to full cure. Addition-cure silicone gels may be RT and heat cure or exclusively heat cure. Adding heat accelerates the cure reaction.

For heat-cure products, additional time should be allowed for heating the part to near oven temperature. For *Dow Corning*® 3-4237 Dielectric Firm Gel, even more time

continues on page 10

PRODUCT INFORMATION

Product	Product Form	Features
Standard Gels		
Dow Corning® 3-4118 Gel A & B	2-part, soft, clear gel; 1:1 mix ratio; high viscosity to limit flow-out	Clear gel; high viscosity; room-temperature cure that can be heat accelerated for faster line speeds
Dow Corning® 3-4133 Dielectric Gel	2-part, clear, 1:1 mix ratio gel	Clear gel; fast heat cure; long working time and low viscosity aid process flexibility and impregnation potentially without vacuum
Dow Corning® 3-4150 Dielectric Gel Kit	2-part, transparent green, 1:1 mix ratio, fast room-temperature-cure gel	Fast room-temperature cure; blue and yellow parts turn green when mixed
Dow Corning® 3-4154 Dielectric Gel Kit	2-part, clear, 1:1 mix ratio gel	Clear gel; fast heat cure
Dow Corning® 3-4170 Dielectric Gel Kit	2-part, soft clear, 1:1 mix ratio gel	Clear gel; fast heat cure; long working time and low viscosity aid process flexibility and impregnation potentially without vacuum
Dow Corning® 3-4190 Dielectric Silicone Gel Kit	2-part, transparent green, 1:1 mix ratio gel	Fast heat cure; blue and yellow parts turn green when mixed; low viscosity
Dow Corning® 3-4680 Silicone Gel Kit	2-part, transparent blue, 1:1 mix ratio, fast room-temperature-cure gel	Fast room-temperature cure; transparent blue; low viscosity
Dow Corning® 3-6512 A & B Elastomer	2-part, soft elastomer, transparent red, 1:1 mix ratio gel	Very long working time; soft elastomer; red
Sylgard® 3-6636 Silicone Dielectric Gel Kit	2-part, clear, 1:1 mix ratio, high-viscosity gel	Clear, fast heat-curing gel; high viscosity
Dow Corning® SE 1896 FR A/B	2-part, translucent, 1:1 mix ratio gel	Heat cure, translucent; low viscosity
Sylgard® 527 A & B Silicone Dielectric Gel Clear & Red	2-part, clear or red, 1:1 mix ratio gel	Room temperature or heat cure; clear or red; low viscosity
Sylgard® 537 One-Part Dielectric Gel	1-part, clear gel	1-part gel with no mixing required; low viscosity; heat cure.
Low-Temperature Gels		
Dow Corning® 3-4155 HV Dielectric Gel Kit	2-part, soft, transparent green, 1:1 mix ratio, high-viscosity, low-temperature gel	Fast room-temperature cure; blue and yellow parts turn green when mixed; high viscosity; suitable for very low temperatures (-80 to 200°C/-112 to 392°F)
Dow Corning® 3-6635 Dielectric Gel	1-part, clear, low-temperature gel	1-part gel with no mixing required; heat cure; suitable for very low temperatures (-80 to 200°C/-112 to 392°F)
Dow Corning® Q3-6575 Dielectric Gel A/B Kit	2-part, very soft, clear, 1:1 mix ratio, low-temperature gel	Fast heat cure; suitable for very low temperatures (-80 to 200°C/ -112 to 392°F)
Dow Corning® SE 1880	1-part, clear or blue gel, controlled volatility, low-temperature gel	1-part gel with no mixing required; heat cure; suitable for very low temperatures (-80 to 200°C/-112 to 392°F); controlled silicone volatility
Dow Corning® SE 1885 Kit	2-part, very soft, clear, 1:1 mix ratio, low-temperature gel	Fast heat cure; suitable for very low temperatures (-80 to 200°C/ -112 to 392°F)
Dow Corning® SE 1885 M Kit	2-part, clear, 1:1 mix ratio, low-temperature gel	Heat cure; long working time; suitable for very low temperatures (-80 to 200°C/-112 to 392°F)

Product	Product Form	Features
Toughened Gels		
Dow Corning® 3-4207 Dielectric Tough Gel Kit[1]	2-part, translucent green, 1:1 mix ratio, fast room-temperature-cure tough gel with UV indicator, conditional primerless adhesion and good flame resistance	Fast room-temperature cure; blue and yellow parts turn green when mixed; conditional primerless adhesion at room temperature; mechanical strength; UL 94 V-1 Flammability Rating; UV indicator for inspection
Dow Corning® 3-4222 Dielectric Firm Gel Kit[1]	2-part, translucent green, 1:1 mix ratio, fast room-temperature-cure gel with conditional primerless adhesion	Fast room-temperature cure; blue and yellow parts turn green when mixed; conditional primerless adhesion at room temperature
Dow Corning® 3-4237 Dielectric Firm Gel Kit	2-part, translucent green, 1:1 mix ratio, primerless adhesion	Heat cure; blue and yellow parts turn green when mixed; with heat, chemical primerless adhesion develops; long working time
Dow Corning® 3-4241 Dielectric Tough Gel Kit[1]	2-part, translucent green, 1:1 mix ratio, fast heat cure tough gel with UV indicator, conditional primerless adhesion and good flame resistance	Fast heat cure; blue and yellow parts turn green when mixed; conditional primerless adhesion at room temperature; mechanical strength; UL 94 V-1 Flammability Rating; UV indicator for inspection; long working time
Sylgard® 528 Firm Gel Parts A & B	2-part, clear, 1:1 mix ratio, firm gel	Heat cure; long working time and low viscosity aid process flexibility and impregnation potentially without vacuum; mechanical strength
Specialty Gels		
Dow Corning® 3-4130 Dielectric Gel Kit	2-part, clear, 1:1 mix ratio, firm gel with low volatility	Fast heat cure; long working time; low volatility and weight loss
Dow Corning® CY 52-276 Kit	2-part, clear, 1:1 mix ratio, gel with controlled volatility	Low-temperature cure; controlled silicone volatility
Sylgard® 535 Thixotropic Dielectric Gel	1-part, translucent, thixotropic gel	1-part heat cure gel with no mixing required; thixotropic to allow selective and cost-effective protection
Dow Corning® EG-3000 Thixotropic Gel Parts A & B	2-part, translucent, 1:1 mix ratio, thixotropic gel	Heat cure gel; thixotropic to allow selective and cost effective protection
Dow Corning® 3-6371 UV Gel	1-part, very soft, translucent, UV cure, low-temperature gel	1-part UV cure with moisture secondary cure; requires no mixing; suitable for very low temperatures
Dow Corning® X3-6211 Encapsulant	1-part, clear, UV cure, low-temperature gel	1-part UV-cure gel with mo mixing required; suitable for very low temperatures
Fluorogel™ Q3-6679 Dielectric Gel Kit	2-part, clear, 1:1 mix ratio, solvent-resistant gel	Room-temperature or heat cure; long working time; resistant to fuels and solvents
Fluorogel™ 4-8022	1-part, translucent, solvent-resistant gel	1- part heat-curing gel with no mixing required; resistant to fuels and solvents

[1]Under certain conditions in specific designs or applications, *Dow Corning*® 3-4207, 3-4222 and 3-4241 Dielectric Firm Gels may lose adhesion. Full environmental exposure testing is recommended.

TYPICAL PROPERTIES

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

Product	Cure System	Color	Viscosity, centipoise or mPas	Penetration, 1/ 10 of mm	Gel Hardness, g	Specific Gravity[1]	Shelf Life, months[2]
Standard Gels							
Dow Corning® 3-4118 Gel A & B	Addition cure	Clear	6,925	105	50	0.97	12
Dow Corning® 3-4133 Dielectric Gel	Addition cure	Clear	425	10	600	0.97	12
Dow Corning® 3-4150 Dielectric Gel Kit	Addition cure	Transparent green	480	50	115	0.97	12
Dow Corning® 3-4154 Dielectric Gel Kit	Addition cure	Clear	550	50	110	0.97	12
Dow Corning® 3-4170 Dielectric Gel Kit	Addition cure	Clear	475	65	85	0.97/0.96	12
Dow Corning® 3-4190 Dielectric Silicone Gel Kit	Addition cure	Transparent green	250	45	130	0.97/0.96	24
Dow Corning® 3-4680 Silicone Gel Kit	Addition cure	Transparent blue	275	60	90	0.97	12
Dow Corning® 3-6512 A & B Elastomer	Addition cure	Red	950	43 Shore 00	—	—	24
Sylgard® 3-6636 Silicone Dielectric Gel Kit	Addition cure	Clear	3,250	55	110	0.99	12
Dow Corning® SE 1896 FR A/B	Addition cure	Translucent	375	60	90	0.99/0.98	15
Sylgard® 527 A & B Silicone Dielectric Gel Clear & Red	Addition cure	Clear or red	475	45	120	0.95	12
Sylgard® 537 One-Part Dielectric Gel	Addition cure	Clear	375	20	290	0.98	4 @ 10°C
Low-Temperature Gels							
Dow Corning® 3-4155 HV Dielectric Gel Kit	Addition cure	Transparent green	1,925	90	60	1.00	12
Dow Corning® 3-6635 Dielectric Gel	Addition cure	Clear	700	85	70	1.00	6
Dow Corning® Q3-6575 Dielectric Gel A/B Kit	Addition cure	Clear	750	80	75	1.02	12
Dow Corning® SE 1880	Addition cure	Clear	775	85	65	0.97	12 @ 10°C
Dow Corning® SE 1885 Kit	Addition cure	Clear	500	90	60	0.97	17
Dow Corning® SE 1885 M Kit	Addition cure	Clear	450	95	60	0.97	15

Key: Room Temperature = 23 ±3°C and 50 ±5% RH
N/A = Not applicable; — = not tested.
[1]Cured or uncured A & B.
[2]Shelf life from date of manufacture for material in the original, unopened container, stored at less than 35°C, unless otherwise noted.

Product	Working Time, min[3]	Room Temperature Cure Time[4]	Heat Cure Time, min	Dielectric Strength		Dielectric Constant at 100 Hz/100 kHz	Volume Resistivity, ohm-cm	Dissipation Factor at 100 Hz/100 kHz	Linear Coefficient of Thermal Expansion, µm/(m·°C)
				volts/mil	kV/mm				
Standard Gels									
Dow Corning® 3-4118 Gel A & B	30	—	60 @ 125°C	450	18	—	4.60E+15	—	—
Dow Corning® 3-4133 Dielectric Gel	360	—	4.0 @ 100°C, 2.0 @ 125°C, 1.6 @ 150°C	475	19	2.87/2.86	4.70E+15	0.0004/ 0.000067	350
Dow Corning® 3-4150 Dielectric Gel Kit	7	90 min	—	375	15	2.85/2.85	7.00E+15	0.002/ 0.0001	—
Dow Corning® 3-4154 Dielectric Gel Kit	30	4 hr/–	180 @ 80°C, 105 @ 100°C	450	18	2.87/2.87	1.00E+15	0.003/ 0.0001	—
Dow Corning® 3-4170 Dielectric Gel Kit	>24 hr	N/A	9.0 @ 100°C, 5.0 @ 125°C, 3.0 @ 150°C	500	20	2.85/2.85	9.50E+14	0.0016/ 0.00007	425
Dow Corning® 3-4190 Dielectric Silicone Gel Kit	>60	25 hr/30 hr	7.0 @ 100°C, 5.0 @ 125°C, 4.0 @ 150°C	500	19	2.86/2.87	1.50E+15	0.0007/ 0.0001	430
Dow Corning® 3-4680 Silicone Gel Kit	<10	15 min/30 min	1.5 @ 125°C	400	16	2.75/2.75	3.60E+15	0.0004/ <0.00006	435
Dow Corning® 3-6512 A & B Elastomer	24 hr	N/A	—	525	21	—	4.30E+14	—	—
Sylgard® 3-6636 Silicone Dielectric Gel Kit	<10	3 hr/24 hr	180 @ 70°C, 45 @ 100°C	425	16	2.85/2.86	1.10E+15	0.0027/ 0.00006	730
Dow Corning® SE 1896 FR A/B	> 4 hr	—	60 @ 70°C	500	20	3.1 @ 1 MHz	3.00E+15	<0.001/–	—
Sylgard® 527 A & B Silicone Dielectric Gel Clear & Red	90	24 hr/>1 week	210 @ 100°C, 75 @ 125°C, 35 @ 150°C	385	15	2.85/2.85	7.00E+15	0.002/ 0.0001	—
Sylgard® 537 One-Part Dielectric Gel	N/A	N/A	60 @ 150°C	559	22	—	1.90E+15	—	—
Low-Temperature Gels									
Dow Corning® 3-4155 HV Dielectric Gel Kit	8	12 min/60 min	—	400	16	2.96/2.96	2.80E+14	0.02/ <0.0001	—
Dow Corning® 3-6635 Dielectric Gel	N/A	N/A	50 @ 125°C	520	20	2.83/2.84	4.80E+13	0.0002	—
Dow Corning® Q3-6575 Dielectric Gel A/B Kit	20	24 hr	40 @ 70°C, 20 @ 100°C	450	18	2.82/2.83	1.20E+14	0.002/ <0.0001	405
Dow Corning® SE 1880	N/A	N/A	30 @ 150°C	500	20	2.75 @ 1 MHz	6.40E+14	0.0002 @ 1 MHz	—
Dow Corning® SE 1885 Kit	60	—	30 @ 70°C	432	17	2.7 @ 1 MHz	4.00E+14	0.0007 @ 1 MHz	—
Dow Corning® SE 1885 M Kit	360	—	30 @ 150°C	508	20	2.75 @ 1 MHz	9.30E+14	0.0002 @ 1 MHz	—

[3]Time to double initial viscosity (initial mixed viscosity for two-part products) at room temperature. This property is sometimes referred to as pot life.
[4]Time to non-flow/full cure.

TYPICAL PROPERTIES (Continued)

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

Product	Cure System	Color	Viscosity, centipoise or mPas	Penetration, 1/ 10 of mm	Gel Hardness, g	Specific Gravity[1]	Shelf Life, months[2]
Toughened Gels							
Dow Corning® 3-4207 Dielectric Tough Gel Kit	Addition cure	Translucent green	425	59 Shore OO[5]	9,500	0.98	6
Dow Corning® 3-4222 Dielectric Firm Gel Kit	Addition cure	Translucent green	325	39 Shore OO[5]	270	0.97	12
Dow Corning® 3-4237 Dielectric Firm Gel Kit	Addition cure	Translucent green	275	29 Shore OO[5]	N/A	0.96	12
Dow Corning® 3-4241 Dielectric Tough Gel Kit	Addition cure	Translucent green	400	63 Shore OO[5]	N/A	0.97/0.98	12
Sylgard® 528 Firm Gel Parts A & B	Addition cure	Clear	400	95	55	0.97	9
Specialty Gels							
Dow Corning® 3-4130 Dielectric Gel Kit	Addition cure	Clear	750	35	150	0.97	12
Dow Corning® CY 52-276 Kit	Addition cure	Clear	900	75	70	0.98	18
Sylgard® 535 Thixotropic Dielectric Gel	Addition cure	Translucent	2,925	60	85	0.97	9 @ 10°C
Dow Corning® EG-3000 Thixotropic Gel Parts A & B	Addition cure	Clear/hazy	2,300	60	90	1.00	12
Dow Corning® 3-6371 UV Gel	Addition cure	Translucent amber	900	140	40	0.98	12 @ 5°C
Dow Corning® X3-6211 Encapsulant	UV cure	Clear	925	50	105	0.99	12
Fluorogel™ Q3-6679 Dielectric Gel Kit	Addition cure	Clear	1,100	30	180	1.26	12
Fluorogel™ 4-8022	Addition cure	Translucent	725	105	50	1.23	9 @ 4°C

[5]Measured by durometer rather than penetration.

Product	Working Time, min[3]	Room Temperature Cure Time[4]	Heat Cure Time, min	Dielectric Strength		Dielectric Constant at 100 Hz/100 kHz	Volume Resistivity, ohm-cm	Dissipation Factor at 100 Hz/100 kHz	Linear Coefficient of Thermal Expansion, µm/(m·°C)
				volts/mil	kV/mm				
Toughened Gels									
Dow Corning® 3-4207 Dielectric Tough Gel Kit	10	15 min/90 min	10 @ 50°C, 5 @ 75°C, 3 @ 100°C[7,8]	425	17	2.85/2.86	7.10E+13	0.03/ <0.0001	325
Dow Corning® 3-4222 Dielectric Firm Gel Kit	3	30 min/60 min	2.0 @ 100°C, 1.0 @ 125°C	350	14	2.64/2.64	1.00E+15	0.0007/ 0.0002	320
Dow Corning® 3-4237 Dielectric Firm Gel Kit	9 days	N/A	35 @ 100°C, 12 @ 125°C, 7 @ 150°C[8]	480	19	2.96/2.96	9.00E+14	0.002/ 0.0007	330
Dow Corning® 3-4241 Dielectric Tough Gel Kit	>60	8 hr/11 hr	2.0 @ 125°C[8]	450	17	2.6/2.61	3.30E+14	0.021/ 0.0002	325
Sylgard® 528 Firm Gel Parts A & B	6.4 hours	—	80 @ 120°C	—	—	—	—	—	—
Specialty Gels									
Dow Corning® 3-4130 Dielectric Gel Kit	5.5 hours	48 hr	7.0 @ 100°C, 5.0 @ 125°C, 4.0 @ 150°C	475	18	2.88/2.88	2.90E+14	0.0013/ 0.0007	440
Dow Corning® CY 52-276 Kit	30	—	30 @ 70°C	356	14	2.5 @ 1 MHz	1.00E+15	0.0001/ 0.0001	200
Sylgard® 535 Thixotropic Dielectric Gel	—	—	60 @ 150°C	280	11	—	6.00E+14	—	—
Dow Corning® EG-3000 Thixotropic Gel Parts A & B	6 hours	—	60 @ 150°C	550	22	–/2.7	2.70E+14	—	—
Dow Corning® 3-6371 UV Gel	7 days[6]	25 seconds @ 4000 mJ/cm^2	N/A	300	12	2.81/2.81	1.90E+12	0.0047/ 0.00006	385
Dow Corning® X3-6211 Encapsulant	N/A	5 seconds @ 3000 mJ/cm^2	N/A	420	17	—	—	—	430
Fluorogel™ Q3-6679 Dielectric Gel Kit	>240	24 hr/>1wk	120 @ 100°C	—	—	7.35/7.27	4.00E+12	0.0373/ 0.0041	—
Fluorogel™ 4-8022	12 days	N/A	60 min @125°C, 30 min@150°C	375	15	7.09/7.1	1.20E+12	0.06/ 0.003	540

[6]Moisture secondary cure converts a 5-mm-thick layer to a nonflow gel after 7 days at ambient conditions.
[7]Time to cure material to 90% of final properties; additional time may be required for a part to warm to oven temperature.
[8]Time to adhesion may take longer.

at elevated temperature should be allowed to develop full adhesion strength, which builds after the material has cured to a solid gel. The other toughened gels do not require heat to develop adhesion. UV-cure silicone gels may be cured using an H bulb from *Fusion UV Systems, Inc.*®, or bulbs with similar spectral distributions. If shadow cure is required, *Dow Corning*® 3-6371 UV Gel features a secondary moisture cure that will convert a 5-mm-thick layer to a nonflow gel after approximately seven days, depending on ambient conditions. Cure schedules should be verified in each new application.

USEFUL TEMPERATURE RANGES

For most uses, silicone gels should be operational over a temperature range of -45 to 150°C (-49 to 302°F) for long periods of time. However, at both the low and high ends of the temperature range, behavior of the materials and performance in particular applications can become more complex and require additional considerations. For low-temperature performance, thermal cycling to conditions such as -55°C (-67°F) may be possible, but performance should be verified for specific parts and assemblies. Factors that may influence performance are configuration and stress sensitivity of components, cooling rates and hold times, and prior temperature history. Specialized products, such as the low-temperature gels, can perform at -65°C (-85°F) and below. At the high-temperature end, durability of cured silicone gels is time and temperature dependent. As expected, the higher the temperature, the shorter the time the material will remain usable.

REPAIRABILITY

In the manufacture of electronic devices, salvage or rework of damaged or defective units is often required. Removal of *Dow Corning* dielectric gels to allow necessary repairs can be assisted by using *Dow Corning*® OS Fluids. Additional information regarding these products is available from Dow Corning. Digestive stripping agents, such as SU100 from Silicones Unlimited, can also be used. In addition, if only one component needs to be replaced, a soldering iron may be applied directly through the gel to remove the component. After work has been completed, the repaired area should be cleaned with forced air or a brush, dried, and patched with additional silicone gel.

CURE COMPATIBILITY

Certain materials, chemicals, curing agents and plasticizers can inhibit the cure of Dow Corning dielectric gels. Most notable of these include:

- Organotin and other organometallic compounds
- Silicone rubber containing organotin catalyst
- Sulfur, polysulfides, polysulfones or other sulfur-containing materials
- Amines, urethanes or amine-containing materials
- Phosphorous or phosphorous-containing materials
- Unsaturated hydrocarbon plasticizers
- Acidic materials (usually organic acids)
- Some solder flux residues

If a substrate or material is questionable with respect to potentially causing inhibition of cure, a small-scale compatibility test should be run to ascertain suitability in a given application. The presence of liquid or uncured product at the interface between the questionable substrate and the cured gel indicates incompatibility and inhibition of cure. In certain situations, toughened gels may appear fully cured but have reduced or no adhesion. This may result from slight inhibition at the interface.

STORAGE AND SHELF LIFE

Storage conditions and shelf life (“Use By” date) are indicated on the product label.

LIMITATIONS

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

Use of these products must be based on the results of your product testing, manufacturing processes and end applications. Full environmental exposure testing is recommended for all applications.

PACKAGING

In general, *Dow Corning* dielectric gels are available in batch-matched kits containing both Part A and Part B components. Packages that are typically available include 210-mL dual cartridges, one-gallon pails, five-gallon pails and 55-gallon drums. Not all gels may be available in all packages, and some additional packages and package sizes may be available.

SAFE HANDLING INFORMATION

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND MATERIAL SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE MATERIAL SAFETY DATA SHEET IS AVAILABLE ON THE DOW CORNING WEBSITE AT WWW.DOWCORNING.COM, OR FROM YOUR DOW CORNING REPRESENTATIVE, OR DISTRIBUTOR, OR BY CALLING YOUR GLOBAL DOW CORNING CONNECTION.

HEALTH AND ENVIRONMENTAL INFORMATION

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

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

LIMITED WARRANTY INFORMATION – PLEASE READ CAREFULLY

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

Dow Corning's sole warranty is that the product will meet the Dow Corning sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

DOW CORNING

Electronics
Solutions

Printed in USA AGP9186 Form No. 10-905I-01