Text and Font Comparison

Documents Compared

Old_Information About Dow Corning® Brand Dielectric Gels.pdf

New_Sylgard® 537 One Part Dielectric Gel.pdf

Summary

296 word(s) added

4820 word(s) deleted

1040 word(s) matched

1040 word(s) differ in font

To see where the changes are, please scroll down.

Information About *Dow Corning*® Brand 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 gels retain much of the stress relief and self-healing qualities of a liquid while providing the dimensional stability of an elastomer. Gels have been used to isolate circuits from the harmful effects of moisture and other contaminants and provide electrical insulation for high voltages. 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 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.

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, but cure slightly harder than standard gels. 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 percent 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.)

Product Information

DOW CORNING

Gels

Sylgard® 537 One Part Dielectric Gel

1-part, clear gel

FEATURES

- 1-part gel with no mixing required
- Low viscosity
- Heat cure

BENEFITS

- No mixing required
- Low viscosity allows good flow under components

TYPICAL PROPERTIES

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

Property	Unit	Value
Viscosity	cP	375
	mPa-sec	375
	Pa-sec	0.4
Heat cure time @120C	minutes	60
Gel Hardness	grams	290
Penetration	1/10 mm	20
Shelf Life at 5ºC	months	9

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

DESCRIPTION

One-part gels feature long room-temperature storage lives but require heat exposure to cure and have generally longer curing times. These gels have been used extensively to seal and protect by coating, encapsulating or potting various electronic devices, especially those with delicate components. 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 gels retain much of the stress relief and self-healing qualities of a liquid while providing the dimensional stability of an elastomer which is increasingly needed for delicate components. Gels have been used to isolate circuits from the harmful effects of moisture and other contaminants and provide electrical insulation for high voltages. 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.

MIXING AND DE-AIRING

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 supersaturated 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. Gels can be dispensed manually or by using one of the available types of meter mix equipment. 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 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.

POT LIFE AND CURE RATE

Working time (or pot life) is the time required for the initial mixed viscosity to double at room temperature (RT). For one-part products the viscosity either increases at a much lower rate or does not change significantly at RT. Cure conditions 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. Additional time should be allowed for heating the part to near oven temperature. Cure schedules should be verified in each new application.

USEFUL TEMPERATURE RANGES

For most uses, silicone elastomers should be operational over a temperature range of -45 to 200°C (-49 to 392°F) for long periods of time. However, at both the low- and high temperature ends of the spectrum, behavior of the materials and performance in particular applications can become more complex and require additional considerations. For low-temperature performance, thermal cycling to conditions such as -55°C (-67°F) may be possible, but performance should be verified for your parts or assemblies. Factors that may influence performance are configuration and stress sensitivity of components, cooling rates and hold times, and prior temperature history. At the high-temperature end, the durability of the cured silicone elastomer is time and temperature dependent. As expected, the higher the temperature, the shorter the time the material will remain useable.

COMPATIBILITY

Certain materials, chemicals, curing agents and plasticizers can inhibit the cure of addition cure adhesives. Most notable of these include: Organotin and other organometallic compounds, Silicone rubber containing organotin catalyst, Sulfur, polysulfides, polysulfones or other sulfur containing materials, unsaturated hydrocarbon plasitcizers, and some solder flux residues. If a substrate or material is questionable with respect to potentially causing inhibition of cure, it is recommended that a small scale compatibility test be run to ascertain suitability in a given application. The presence of liquid or uncured product at the interface between the questionable substrate and the cured gel indicates incompatibility and inhibition of cure.

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.

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.

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, cured gels have a wide operating range (-45 to 150°C/ -49 to 302°F)

Potential Uses: Sealing and protecting (by coating, encapsulating, or potting) various electronic devices, especially those with delicate components

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)

Potential Uses: Sealing and protecting (by coating, encapsulating, or potting) various electronic devices, 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, good dimensional stability, cure rate controllable via cure temperature, cured gels have a wide operating range (-45 to 150°C/-49 to 302°F)

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, 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, specially adapted for special requirements such as delicate components, low extractables, UV cure, or resistance to solvents and fuels

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 3-4237 Dielectric Firm Gel, even more time at elevated temperature should be allowed to develop full adhesion strength, which builds after the material has cured to a solid gel. The other

continues on page 10

STORAGE AND SHELF LIFE

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

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.

LIMITATIONS

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

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.

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.

For More Information

To learn more about these and other products available from Dow Corning, please visit the Dow Corning Electronics website at www.dowcorning.com/ electronics.

DOW CORNING

Electronics
Solutions

 Form No. 11-1275A-01

PRODUCT INFORMATION

Dow Corning® Brand Product	Product Form	Features
Standard Gels		
3-4118 Gel A & B	Two-part, RT/heat cure, clear, high viscosity	Extremely soft or firm, thermal/mechanical shock and vibration damping, excellent dielectric properties, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-45 to 150°C/-49 to 302°F)
3-4150 Dielectric Gel Kit	Two-part, fast RT or heat cure, transparent green	
3-4154 Dielectric Gel Kit	Two-part, RT or heat cure, clear	
3-4170 Dielectric Gel Kit	Two-part, heat cure, clear, long working time	
3-4190 Dielectric Silicone Gel Kit	Two-part, RT or heat cure, transparent green, low viscosity, long shelf life	
3-4680 Silicone Gel Kit	Two-part, fast RT or heat cure, transparent blue, low viscosity	
3-6512 A & B Elastomer	Two-part, heat cure, red, long working time	
SE 1886 Kit	Two-part good working time; transparent	
SE 1896 FR	Two-part, heat cure, translucent	
3-4133 Dielectric Gel	Two-part, RT or heat cure, clear, long working time	
Sylgard® 527 A & B Silicone Dielectric Gel Clear & Red	Two-part, room temperature (RT) or heat cure, clear or red	
Sylgard® 537 One Part Dielectric Gel	One-part, clear, low viscosity gel	
Sylgard® 3-6636 Silicone Dielectric Gel Kit	Two-part, RT or heat cure, clear, high viscosity	
Low Temperature Gels		
3-4155 HV Dielectric Gel Kit	Two-part, fast RT or heat cure, transparent green, UV indicator, high viscosity, low-temperature (-80°C/-112°F) stability	Extremely soft to medium hardness, thermal/mechanical shock and vibration damping, excellent dielectric properties, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wider temperature range (-80 to 200°C/-112 to 392°F) than the other types of gels
3-6635 Dielectric Gel	One-part, heat cure, clear, low-temperature (-80°C/-112°F) stability	
Q3-6575 Dielectric Gel A/B Kit	Two-part RT or heat cure, clear, low-temperature (-80°C/-112°F) stability	
SE 1880 Clear & Blue	One-part, clear, heat cure material, low-temperature (-80°C/-112°F) stability	Controlled volatility gel, content of low molecular weight siloxane (D4-D10) 0.8%
SE 1885 Kit	Two-part, clear, 1:1 low-temp heat cure material, low-temperature (-80°C/-112°F) stability, low viscosity	
SE 1885 M Kit	Two-part, clear, 1:1 low-temperature heat-cure material, low-temperature (-80°C/-112°F) stability, low viscosity, good working time	Extremely soft to medium hardness, thermal/mechanical shock and vibration damping, excellent dielectric properties, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wider temperature range (-80 to 200°C/-112 to 392°F) than the other types of gels

Dow Corning® Brand Product	Product Form	Features
Toughened Gels		
3-4207 Dielectric Tough Gel Kit	Two-part, fast RT or heat cure, translucent green, UV indicator, tough, primerless chemical adhesion, UL 94 V-1 flammability classification	Firm or tough, thermal/mechanical shock and vibration damping, primerless chemical adhesion at room temperature (except 3-4237 Dielectric Firm Gel, which requires heat to develop chemical adhesion), excellent dielectric properties, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-45 to 150°C/-49 to 302°F)
3-4222 Dielectric Firm Gel Kit	Two-part, fast RT or heat cure, translucent green, firm, primerless chemical adhesion	
3-4237 Dielectric Firm Gel Kit	Two-part, heat cure, translucent green, firm, exceptionally long working time, primerless chemical adhesion	
3-4241 Dielectric Tough Gel Kit	Two-part, RT or heat cure, translucent green, UV indicator, long working time, tough, primerless chemical adhesion, UL 94 V-1 flammability classification	
Sylgard® 528 Firm Gel Parts A & B	Two-part, heat cure, clear, firm gel	
Specialty Gels		
3-4130 Dielectric Gel Kit	Two-part, heat cure, clear, low extractables	Extremely soft, thermal/mechanical shock and vibration damping, excellent dielectric properties, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-45 to 150°C/-49 to 302°F)
CY 52-276 Kit	Two-part, clear, low-temperature cure, low-viscosity, controlled-volatility	Controlled-volatility gel, content of low-molecular-weight siloxane (D4-D10) 0.005%
Sylgard® 535 Thixotropic Dielectric Gel	One-part, translucent, heat cure thixotropic gel	Extremely soft or firm, thermal/mechanical shock and vibration damping, excellent dielectric properties, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-45 to 150°C/-49 to 302°F)
EG-3000 Thixotropic Gel Parts A & B	Two-part, heat cure, thixotropic gel	Translucent, soft, thixotropic gel, long RT shelf life, no preconditioning, provides thermal/mechanical shock and vibration dampening, excellent dielectric properties, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-45 to 170°C/-49 to 338°F)
3-6371 UV Gel	One-part, UV cure, moisture secondary cure (for shadow areas), translucent amber	Extremely soft, thermal/mechanical shock and vibration damping, excellent dielectric properties, UV cure, reversion resistant, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-80 to 150°C/-112 to 302°F)
X3-6211 Encapsulant	One-part, UV cure, clear	
3-4112 UV Cure Gel	One-part, UV cure, blue gel that changes to clear upon cure	
Fluorogel™ 3-6679 Dielectric Gel	Two-part, RT or heat cure, clear, solvent and fuel resistant	Extremely soft, thermal/mechanical shock and vibration damping, excellent dielectric properties, solvent and fuel resistant, flexible cure schedule, reversion resistant, thick section cure, compatible with automated dispensing equipment, and physical and electrical stability over a wide temperature range (-70 to 150°C/-94 to 302°F)
Fluorogel™ 4-8022	One-part, translucent, heat cure material, fuel and solvent resistant	

TYPICAL PROPERTIES

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

Dow Corning® Brand 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							
3-4118 Gel A & B	Addition cure	Clear	6,400	105	50	0.97	12
3-4133 Dielectric Gel	Addition cure	Clear	420	7	440	0.97/0.96	12
3-4150 Dielectric Gel Kit	Addition cure	Transparent green	480	50	105	0.97	12
3-4154 Dielectric Gel Kit	Addition cure	Clear	550	45	120	0.97	12
3-4170 Dielectric Gel Kit	Addition cure	Transparent green	500	60	80	0.97/0.96	12
3-4190 Dielectric Silicone Gel Kit	Addition cure	Clear	260	46	120	0.97/0.96	24
3-4680 Silicone Gel Kit	Addition cure	Transparent blue	265	65	85	0.97	12
3-6512 A & B Elastomer	Addition cure	Red	850	48	105	0.97	24
SE 1886 Kit	Addition cure	Clear	1,100	50	105	0.98	17
SE 1896 FR	Addition cure	Translucent	380	53	105	0.99/0.98	15
Sylgard® 527 A & B Silicone Dielectric Gel Clear & Red	Addition cure	Clear or red	430	45	115	0.95	12
Sylgard® 537 One-Part Dielectric Gel	Addition cure	Clear	390	20	200	0.98	4 @ 10°C
Sylgard® 3-6636 Silicone Dielectric Gel Kit	Addition cure	Clear	3,300	55	100	0.99	12
Low-Temperature Gels							
3-4155 HV Dielectric Gel Kit	Addition cure	Transparent green	1,900	85	62	1.00	12
Q3-6575 Dielectric Gel A/B Kit	Addition cure	Clear	750	80	70	1.02	12
3-6635 Dielectric Gel	Addition cure	Clear	720	70	75	1.02	6
SE 1880 Clear & Blue	Addition cure	Clear or blue	800	85	65	0.97	Clear 12 @ 10°C Blue: 9 @ 5°C
SE 1885 Kit	Addition cure	Clear	400	90	50	0.97	17
SE 1885 M Kit	Addition cure	Clear	800	85	65	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.
[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.

Dow Corning® Brand Product	Working Time, min	Room Temperature Cure Time	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, mm/(mm °C)
				volts/mil	kV/mm				
Standard Gels									
3-4118 Gel A & B	30	—	60 @ 120°C	450	18	—	4.60E+15	—	—
3-4133 Dielectric Gel	>360	—	3.5 @ 100°C; 2.5 @ 125°C; 1.5 @ 150°C	485	19	2.87/2.86	4.70E+15	0.001/ <0.0001	355
3-4150 Dielectric Gel Kit	5	45 min/ 90 min	—	385	15	2.85/2.85	7.00E+15	0.002/ 0.0001	400
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	350
3-4170 Dielectric Gel Kit	>24 hr	N/A	9.0 @ 100°C; 5.0 @ 125°C; 3.5 @ 150°C	500	20	2.85/2.85	9.50E+14	0.002/ 0.0001	420
3-4190 Dielectric Silicone Gel Kit	>60	25 hr/30 hr	6.5 @ 100°C; 5.5 @ 125°C; 4.0 @ 150°C	500	20	2.86/2.87	1.50E+15	0.001/ 0.0001	430
3-4680 Silicone Gel Kit	<10	15 min/30 min	1.5 @ 125°C	400	16	2.75/2.75	3.60E+15	<0.001/ <0.0001	435
3-6512 A & B Elastomer	24 hr	N/A	120 @ 70°C	525	21	—	4.00E+14	—	—
SE 1886 Kit	180	—	60 @ 130°C	457	18	2.7 @ 1 MHz	3.00E+15	<0.0001 @ 1 MHz	—
SE 1896 FR	> 4 hr	—	60 @ 70°C	508	20	3.1 @ 1 MHz	3.00E+15	<0.001/—	—
Sylgard® 527 A & B Silicone Dielectric Gel Clear & Red	90	24 hr/> 1 week	200 @ 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	—	—
Sylgard® 3-6636 Silicone Dielectric Gel Kit	20	3 hr/24 hr	180 @ 70°C; 45 @ 100°C	415	16	2.85/2.86	1.10E+15	0.003/ <0.0001	730
Low-Temperature Gels									
3-4155 HV Dielectric Gel Kit	5	12 min/60 min	—	400	16	2.96/2.96	2.80E+14	0.02/ <0.0001	—
Q3-6575 Dielectric Gel A/B Kit	20	5 hr/24 hr	40 @ 70°C; 20 @ 100°C	450	18	2.82/2.83	1.20E+14	0.002/ <0.0001	405
3-6635 Dielectric Gel	N/A	N/A	50 @ 125°C	520	20	2.83/2.84	4.80E+13	<0.001/ <0.0001	—
SE 1880 Clear & Blue	N/A	N/A	30 @ 150°C	508	20	2.75 @ 1 MHz	9.30E+14	0.0002 @ 1 MHz	—
SE 1885 Kit	60	—	30 @ 70°C	432	17	2.7 @ 1 MHz	4.00E+14	0.0007 @ 1 MHz	—
SE 1885 M Kit	—	—	30 @ 150°C	508	20	2.75 @ 1 MHz	9.30E+14	0.0002 @ 1 MHz	—

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.

Dow Corning® Brand Product	Cure System	Color	Viscosity, centipoise or mPa·s	Penetration, 1/10 of mm	Gel Hardness,[2] g	Specific Gravity	Shelf Life, months[3]
Toughened Gels							
3-4207 Dielectric Tough Gel Kit	Addition cure	Translucent green	430	62 Shore OO[4]	9490	0.98	6
3-4222 Dielectric Firm Gel Kit	Addition cure	Translucent green	340	35 Shore OO[4]	270	0.97/0.98	12
3-4237 Dielectric Firm Gel Kit	Addition cure	Translucent green	300	30 Shore OO[4]	N/A	1.00/0.96	12
3-4241 Dielectric Tough Gel Kit	Addition cure	Translucent green	440	60 Shore OO[4]	N/A	0.97/0.98	12
Sylgard® 528 Firm Gel Parts A & B	Addition cure	Clear	390	20	200	0.97	9
Specialty Gels							
3-4130 Dielectric Gel Kit	Addition cure	Clear	760	25	155	0.97	12
CY 52-276 Kit	Addition cure	Clear	1,000	75	70	0.98	18
Sylgard® 535 Thixotropic Dielectric Gel	Addition cure	Translucent	2,900	60	80	0.97	9 @ 10°C
EG-3000 Thixotropic Gel Parts A & B	Addition cure	Clear/hazy	2,200	91	50	0.98/1.01	12
3-6371 UV Gel	Addition cure	Translucent amber	910	140	40	0.98	12 @ 5°C
X3-6211 Encapsulant	UV cure	Clear	930	45	120	0.99	12
3-4112 UV Cure Gel	UV cure	Blue, changes to clear upon cure	690	155	40	0.99	12
Fluorogel™ 3-6679 Dielectric Gel	Addition cure	Clear	1,200	30	185	1.26	12
Fluorogel™ 4-8022	Addition cure	Translucent	700	110	50	1.22	9 @ 4°C

[1]Measured by durometer rather than penetration.
[2]Moisture secondary cure converts a 5-mm-thick layer to a nonflow gel after 7 days at ambient conditions.
[3]Time to cure material to 90% of final properties; additional time may be required for a part to warm to oven temperature.
[4]Time to adhesion may take longer.

Dow Corning® Brand Product	Working Time, min[3]	Room Temperature Cure Time	Heat Cure Time, min	Dielectric Strength		Dielectric Constant at 100 Hz/1 kHz	Volume Resistivity, ohm-cm	Dissipation Factor at 100 Hz/1 kHz	Linear Coefficient of Thermal Expansion, µm/(m·°C)
				volts/mil	kV/mm				
Toughened Gels									
3-4207 Dielectric Tough Gel Kit	10	15 min/90 min	10 @ 50°C, 5 @ 75°C, 3 @ 100°C[7]	420	17	2.85/2.86	7.10E+13	0.03/ <.0001	325
3-4222 Dielectric Firm Gel Kit	<5	12 min/60 min	2.0 @ 100°C, 1.5 @ 125°C, 1.0 @ 150°C[7]	350	14	2.64/2.64	1.00E+15	<0.001/ 0.0002	320
3-4237 Dielectric Firm Gel Kit	9 days	N/A	35 @ 100°C, 12 @ 125°C, 7.5 @ 150°C[7]	480	19	2.96/2.96	9.00E+14	<0.001/ <0.0001	330
3-4241 Dielectric Tough Gel Kit	> 60	8 hr/11 hr	2.5 @ 125°C[7]	440	17	2.6/2.61	3.30E+14	0.021/ <0.0002	325
Sylgard® 528 Firm Gel Parts A & B	6 hr	—	80 @ 120°C	—	—	—	—	—	—
Specialty Gels									
3-4130 Dielectric Gel Kit	5.5 hours	48 hr	7.5 @ 100°C, 5.5 @ 125°C, 4.0 @ 150°C	470	19	2.88/2.88	2.90E+14	0.001/ <0.0001	440
CY 52-276 Kit	120	—	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	279	11	—	6.00E+14	—	—
EG-3000 Thixotropic Gel Parts A & B	12 hours	—	60 @ 150°C	559	22	—/2.7	2.70E+14	—	—
3-6371 UV Gel	7 days[5]	> 4000 mJ/cm^2 for 15 mm thick layer	N/A	300	12	2.81/2.81	1.90E+12	0.005/ <0.0001	385
X3-6211 Encapsulant	N/A	> 3000 mJ/cm^2 for 12 mm thick layer	N/A	420	17	—	—	—	430
3-4112 UV Cure Gel	—	—	N/A	—	—	—	—	—	—
Fluorogel™ 3-6679 Dielectric Gel	> 240	24 hr/> 1 wk	120 @ 100°C	—	—	7.6/7.12	2.00E+12	0.009/ 0.004	690
Fluorogel™ 4-8022	1 month	N/A	60 min @125°C, 30 min@150°C	375	15	7.09/7.1	1.20E+12	0.06/ 0.003	540

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*® *brand* 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.

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.

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.

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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.

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