

## Thermal Interface - Wet Dispensed

# *Dow Corning*<sup>®</sup> SE 4410 Encapsulant

### TYPICAL PROPERTIES

Specification Writers: These values are not intended for use in preparing specifications. Please contact your local Dow Corning sales office or your Global Dow Corning Connection before writing specifications on this product.

### COMPOSITION

---

- 2-part
- Polydimethylsiloxane encapsulant

Property	Unit	Value
Mix Ratio	-	1:1
Viscosity (Mixed)	cP	3000
	mPa-sec	3000
	Pa-sec	3
Specific Gravity (Cured)	-	2.15
Working Time at 25°C (Pot Life - hours)	hr	6
Heat Cure Time @ 150°C	minutes	60
Durometer Shore A (JIS)	-	88
Tensile Strength	psi	1030
	MPa	7.1
	kg/cm <sup>2</sup>	72
Elongation	%	50
Unprimed Adhesion - Lap Shear (Al)	psi	580
	MPa	4
	N/cm <sup>2</sup>	400
Dielectric Strength	volts/mil	600
	kV/mm	24
Dielectric Constant at 1 MHz	-	4.4
Volume Resistivity	ohm*cm	4E+15
Dissipation Factor at 1 MHz	-	2E-03
Thermal Conductivity	btu/hr ft degF	0.532
	W/mK	0.92
Shelf Life @ 32C	months	12
UL Flammability Classification	NA	94 V-0

---

## DESCRIPTION

Dow Corning thermally conductive silicone encapsulants are supplied as two-part liquid component kits. When the liquid components are thoroughly mixed, the mixture cures to a flexible elastomer, suitable for the protection of electrical/ electronic applications where heat dissipation is critical. These elastomers cure without exotherm at a constant rate regardless of sectional thickness or degree of confinement. Dow Corning thermally conductive elastomers require no post-cure and can be placed in service immediately at operating temperatures of -45 to 200°C (-49 to 392 °F) following the completion of the cure schedule. Long-term, reliable protection of sensitive circuits and components is important in many of today's delicate and demanding electronic applications. With the increase in processing power and the trend toward smaller, more compact electronic modules, the need for thermal management is growing. Thermally conductive silicones function as heat transfer media, durable dielectric insulation, barriers against environmental contaminants and as stress-relieving shock and vibration absorbers over a wide temperature and humidity range. In addition to sustaining their physical and electrical properties over a broad range of operating conditions, silicones are resistant to ozone and ultraviolet degradation and have good chemical stability. Good heat transfer is dependent on a good interface between the heat producing device and the heat transfer media. Silicones have a low surface tension that enables them to wet most surfaces, which can lower the thermal contact resistance between the substrate and the material.

## MIXING AND DE-AIRING

Upon standing, some filler may settle to the bottom of the liquid after several weeks. To ensure a uniform product mix, the material in each container should be thoroughly mixed prior to use. Two-part materials should be mixed in the proper ratio

either by weight or volume. The presence of light-colored streaks or marbling indicates inadequate mixing. Automated airless dispense equipment can be used to reduce or avoid the need to de-air. If de-airing is required to reduce voids in the cured elastomer, consider a vacuum de-air schedule of > 8 inches Hg (or a residual pressure of 10- 0 mm of Hg) for 10 minutes or until bubbling subsides.

## PROCESSING/CURING

Addition-cure adhesives should be cured at 100°C (212 °F) or above. The cure rate is rapidly accelerated with heat (see heat-cure times in Typical Properties table). Thin sections of less than mils may be cured in 15 minutes at 150°C (30 °F). For thicker sections, a pre-cure at 70°C (158°F) may be necessary to reduce voids in the elastomer. Length of pre-cure will depend on section thickness and confinement of adhesive. It is recommended that 30 minutes at 70°C (158°F) be used as a starting point for determining necessary pre-cure time. Addition-curing materials contain all the ingredients needed for cure with no by-products from the cure mechanism. Deep-section or confined cures are possible. Cure progresses evenly throughout the material. These adhesives generally have long working times.

## POT LIFE AND CURE RATE

Cure reaction begins with the mixing process. Initially, cure is evidenced by a gradual increase in viscosity, followed by gelation and conversion to its final state. Pot life is defined as the time required for viscosity to double after Parts A and B (base and curing agent) are mixed.

## USEFUL TEMPERATURE RANGES

For most uses, silicone encapsulants 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 for most products, 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 silicones is time and temperature dependent. As expected, the higher the temperature, the shorter the time the material will remain useable.

## REPAIRABILITY

When repairing an area using an encapsulant, roughen the exposed surfaces of the cured encapsulant with an abrasive paper and rinse with a suitable solvent. This will enhance adhesion and permit the repaired material to become an integral matrix with the existing encapsulant.

## SOLVENT EXPOSURE

Although highly filled silicones such as those discussed in this data sheet are generally more resistant to solvent or fuel exposure, standard silicones are intended only to survive splash or intermittent exposures. Testing should be done to confirm performance of the adhesives in the application and under the specified environmental conditions.

## USABLE LIFE AND STORAGE

Shelf life is indicated by the "Use By" date found on the product label. For best results, Dow Corning thermally conductive materials should be stored at or below the maximum specified storage temperature. Special precautions must be taken to prevent moisture from contacting these materials. Containers should be kept tightly closed and head or air space minimized. Partially filled containers

should be purged with dry air or other gases, such as nitrogen. Any special storage and handling instructions will be printed on the product containers.

**HANDLING  
PRECAUTIONS  
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](http://www.dowcorning.com) or consult your local Dow Corning representative.

**LIMITATIONS**

This product is 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 our 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 our products will meet the 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.**

*We help you invent the future.™*

**[dowcorning.com](http://dowcorning.com)**