Technical Data Sheet

DOWSIL™ SE 4410 Encapsulant

Composition

- Two-part
- Polydimethylsiloxane encapsulant

Typical Properties

Specification Writers: These values are not intended for use in preparing specifications.

Property	Unit	Result
Mix Ratio		1:1
Viscosity (Mixed)	cP mPa – sec Pa – sec	3000 3000 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 MPa kg/cm^2	1030 7.1 72
Elongation	%	50
Unprimed Adhesion – Lap Shear (Al)	psi MPa N/cm^2	580 4 400
Dielectric Strength	volts/mil kV/mm	600 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 W/mK	0.532 0.92
Shelf Life @ 32°C	months	12
UL Flammability Classification	NA	94 V-0

Description

Dow 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 PCB systems applications where heat dissipation is critical. These elastomers cure without exotherm at a constant rate regardless of sectional thickness or degree of confinement. Dow 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 PCB systems applications. With the increase in processing power and the trend toward smaller, more compact PCB system 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 DOWSIL™ SE 4410 Encapsulant Part A and DOWSIL™ SE 4410 Encapsulant Part 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.

Handling Precautions

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW WEBSITE AT CONSUMER.DOW.COM, OR FROM YOUR DOW SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CUSTOMER SERVICE.

Usable Life and Storage

Shelf life is indicated by the “Use By” date found on the product label. For best results, Dow 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.

Limitations

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

Health and Environmental Information

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of product safety and regulatory compliance specialists available in each area.

For further information, please see our website, consumer.dow.com or consult your local Dow representative.

How Can We Help You Today?

Tell us about your performance, design and manufacturing challenges. Let us put our silicon-based materials expertise, application knowledge and processing experience to work for you.

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