

## Information About *HIPEC*<sup>®</sup> Q1-4939 Semiconductor Protective Coating

### Type

Two-component solventless silicone gel or elastomer

### Physical Form

#### – As Supplied

Pourable liquid

#### – As Cured

Soft, thermoset gel to compliant elastomer

### Color

Clear

### Special Properties

High purity, stress relief, protection from moisture and other environmental contaminants

### Primary Uses

Sealing, preserving and protecting complex, integrated circuits

### DESCRIPTION

*HIPEC*<sup>®</sup> Q1-4939 Semiconductor Protective Coating is a high purity, two-part, solventless silicone designed for the protection of semiconductor junction surfaces that have higher levels of integration. It is chemically compatible with most device surfaces, provides physical protection of the chip and inter-connecting wires, and provides stress relief for delicate device leads and the die. Other secondary features include protection against contamination of the junction surface, shielding against alpha particle penetration and stabilization of device characteristics. The product can be cured to a soft gel or a compliant elastomer by varying the mix ratio used – see “Mixing” in “How to Use” section.

### FEATURES

Significant features of *HIPEC* Q1-4939 Semiconductor Protective Coating include:

- High purity
- Solventless silicone gel or elastomer
- Protection from mechanical stress and strain
- Protection from thermo-mechanical shock
- Excellent adhesion to common electronic device and circuit substrates with superior moisture resistance
- Flexibility from high to extremely low temperatures
- Excellent electrical properties over a wide operating temperature range
- Protection from moisture, dirt and other atmospheric contaminants
- Exertion of minimum stress to the chip and the bonding wires in gel form
- Shields against alpha particle radiation and is itself a low alpha particle generator

### TYPICAL USES

*HIPEC* Q1-4939 Semiconductor Protective Coating is specially suited for the protection of microelectronic devices. Potential applications for this material include coatings for integrated circuit devices in various package designs (DIP, PGA and cavity packs), hybrid circuits, LED coatings and light pipes in octocoupler devices.

### HOW TO USE

#### Mixing

*HIPEC* Q1-4939 Semiconductor Protective Coating is a two-component product that consists of a base and curing agent. The product is engineered to allow the user to vary the mix ratio to provide different cured consistencies. Cured, clear films ranging from a soft gel to a compliant elastomer are possible.

Table I may be used to determine the mix ratio needed to achieve a desired consistency.

Although *HIPEC* Q1-4939 Semiconductor protective coating is carefully controlled to minimize impurities, care must be exercised when selecting equipment for mixing and dispensing to prevent contamination.

When hand mixing, a clean glass container should be used. It should have a volume four times that of the material placed in it to allow for expansion during de-airing.

Thoroughly mix the two components, taking care to minimize air entrapment. Allow the mixture to stand for a few minutes, then subject it to a vacuum of approximately 28 inches of mercury until bubble formation has nearly stopped. This normally takes approximately 30 minutes. The vacuum should be released and re-established several times during the first 5 minutes to help break bubbles that have formed. Allow the de-aired mixture to stand for 5 to 10 minutes

before use, to allow any remaining small surface bubbles to disappear. (Airless mixing, metering and dispensing equipment is recommended for production processing.)

If thinner films are desired, *HIPEC* Q1-4939 Semiconductor Protective Coating can be diluted with *HIPEC*® Q2-1345 Diluent. (See MSDS and Product Information on *HIPEC* Q2-1345 Diluent, Form No. 10-668-96.)

#### Pot Life and Cure Schedule

Once mixed, the pot life of all mix ratios of *HIPEC* Q1-4939 Semiconductor Protective Coating is 7 days or greater at room temperature. The suggested cure schedule is 2 hours at 150°C. Cure schedules may be optimized to meet specific applications where shorter times or lower temperatures are desired.

Air circulating ovens exhausted to the outside should be used to prevent exhaust from re-circulating into the semiconductor production process area.

#### Cure Inhibition

*HIPEC* Q1-4939 Semiconductor Protective Coating may be susceptible to cure inhibition when in contact or contaminated by the following chemical materials. In order to avoid inhibition, all tools, equipment and substrates that come into contact with *HIPEC* Q1-4939 Semiconductor Protective Coating should be cleaned or pre-tested to ensure that they are compatible and free of the following cure inhibitors:

- Sulfur and sulfur-containing compounds
- Phosphor and phosphorous-containing compounds
- Amines
- Organo tin compounds
- Plasticizers

### TYPICAL PROPERTIES

These values are not intended for use in preparing specifications.

		Mix Ratio	
		1:1	10:1
<b>Physical Properties – Uncured</b>			
CTM <sup>1</sup> 0176	Appearance .....	Pass	Pass
	Cure Mechanism .....	Addition	Addition
CTM 0005	Color, APHA .....	Clear	Clear
CTM 0004	Viscosity at 25°C, centipoise .....	4900-5800	4900-5800
CTM 0055	Pot Life at 25°C, hours minimum .....	168	168
<b>Physical Properties – Cured</b>			
CTM 0001A	Specific Gravity at 25°C .....	1.03	1.03
CTM 0208	Nonvolatile Content, percent .....	>99	>99
CTM 0526	Refractive Index .....	1.409	1.409
CTM 0099	Hardness, durometer A .....	48	N/A
CTM 0137A	Tensile Strength, psi .....	1000	N/A
CTM 0137A	Elongation, percent .....	115	N/A
CTM 0155	Penetration, 10 <sup>-1</sup> , mm .....	N/A	55
CTM 0585	Coefficient of Linear Thermal Expansion in µm/m °C,		
	Transition temperature, °C .....	-100	N/A
	Below transition temperature .....	105	N/A
	Above transition temperature .....	260	N/A
CTM 1163	Coefficient of Thermal Conductivity <sup>2</sup> W/m °K, sec .....	0.11	N/A
CTM 0248	Water Absorption, percent weight gain after immersion 24 hours at room temperature .....	0.1	0.3
<b>Electrical Properties – Cured</b>			
CTM 0112	Dielectric Constant, at 10 <sup>2</sup> Hz .....	2.72	2.72
	10 <sup>5</sup> Hz .....	2.71	2.71
CTM 0112	Dissipation Factor, at 10 <sup>2</sup> Hz .....	0.0007	0.0007
	10 <sup>5</sup> Hz .....	<.0002	<.0002
CTM 0114	Dielectric Strength, Thickness, mils .....	75	75
	Volts/mil .....	470	470
CTM 0249	Volume Resistivity, ohm-cm x 10 <sup>15</sup> .....	>1	>1
<b>Ionic Purity Levels</b>			
CTM 0088	Na, ppm .....	<2	<2
CTM 0088	K, ppm .....	<2	<2
CTM 0018	Cl, ppm .....	<4	<4

<sup>1</sup>CTMs (Corporate Test Methods) correspond to standard ASTM tests in most instances. Copies of CTMs are available upon request.

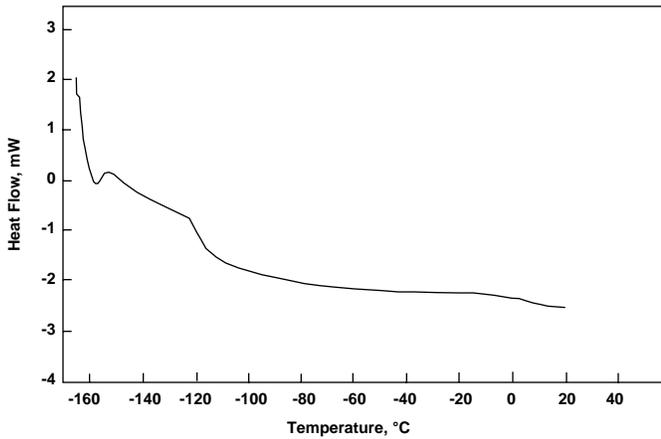
<sup>2</sup>Determined using colora thermo-conductometer with trichloroethane and water as boiling liquids.

**Specification Writers: Please obtain a copy of the Dow Corning Sales Specification for this product and use it as a basis for your specifications. It may be obtained from any Dow Corning Sales Office, or from Dow Corning Customer Service in Midland, MI. Call (517) 496-6000.**

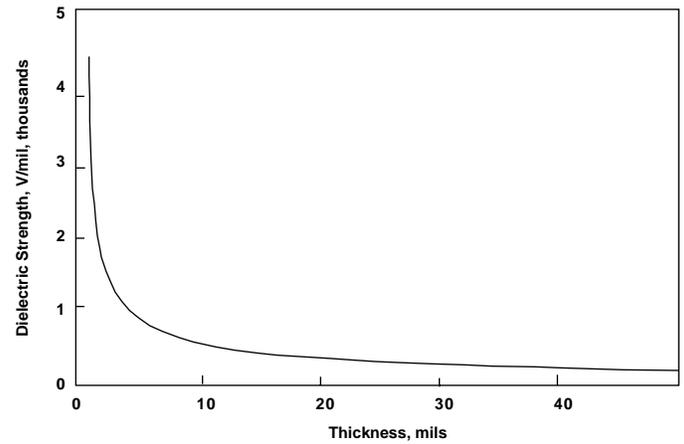
**Table I: *HIPEC* Q1-4939 Semiconductor Protective Coating, Parts by Weight**

Base	Curing Agent	Consistency	Hardness/Softness
1.0	1.0	Firm	48 ± 4 Durometer A
3.0	1.0	Medium Firm	18 ± 3 Durometer A
10.0	1.0	Soft Gel	50 ± 15x10 <sup>-1</sup> mm Penetration

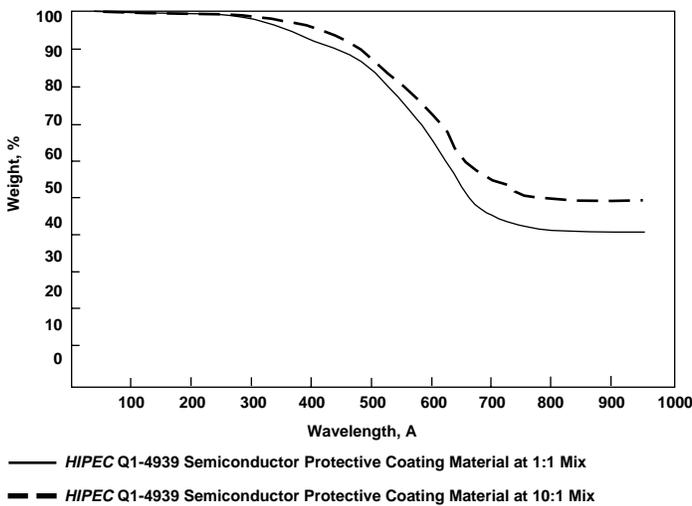
**Figure 1: Differential Scanning Calorimetry of *HIPEC Q1-4939* Semiconductor Protective Coating**



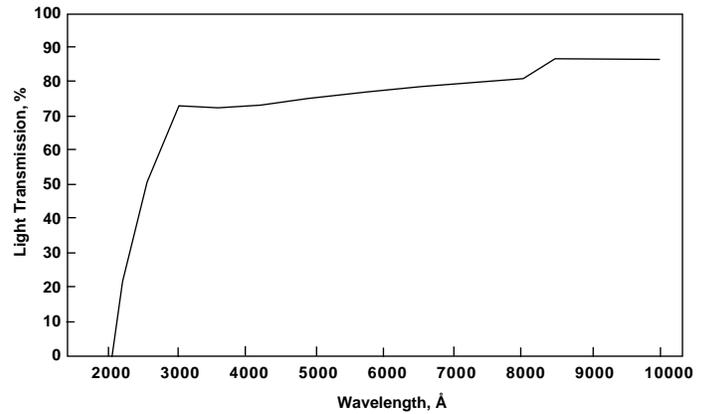
**Figure 2: Dielectric Strength of *HIPEC Q1-4939* Semiconductor Protecting Coating**



**Figure 3: Thermal Stability of *HIPEC Q1-4939* Semiconductor Protecting Coating Measured by TGA**



**Figure 4: Light Transmission of *HIPEC Q1-4939* Semiconductor Protecting Coating**



**LIMITATIONS**

Not intended for medical use.

**SHIPPING LIMITATIONS**

None.

**STORAGE AND SHELF LIFE**

When stored in closed containers at or below 30°C, *HIPEC Q1-4939* Semiconductor Protective Coating (base and

curing agent) has a shelf life of 24 months from date of manufacture.

**PACKAGING**

*HIPEC Q1-4939* Semiconductor Protective Coating is supplied in 2-lb units in the 1:1 mix ratio and 1.1-lb units in the 10:1 mix ratio.

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**SAFE HANDLING INFORMATION**  
PRODUCT SAFETY INFORMATION  
REQUIRED FOR SAFE USE IS NOT  
INCLUDED. BEFORE HANDLING,  
READ PRODUCT AND MATERIAL  
SAFETY DATA SHEETS AND CON-  
TAINER LABELS FOR SAFE USE,  
PHYSICAL AND HEALTH HAZARD  
INFORMATION. THE MATERIAL  
SAFETY DATA SHEET IS AVAILABLE  
FROM YOUR DOW CORNING REP-  
RESENTATIVE, OR DISTRIBUTOR,  
OR BY WRITING TO DOW CORNING  
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Printed in U.S.A.      SMG 7644      Form No. 10-669B-96

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