Technical Data Sheet

DOWSIL™ TC-4535 CV Thermal Conductive Gap Filler

Two parts, 3.4 W/m·K thermally conductive silicone gap filler, room temperature curing with accelerated heat curing option.

Features & Benefits

- Thermal conductivity 3.4 W/m·K.
- Room temperature cure or heat accelerated cure.
- Long term performance stability during temperature cycling up to 150°C – peak at 175°C.
- Holds vertical position.
- UL 94 V0 recognition.
- Controlled silicone volatility.

Applications

- DOWSIL™ TC-4535 CV Thermally Conductive Gap Filler is a soft and compliant material once cured, designed to dissipate the heat from PCB module assemblies mounted on printed circuit board to heat sink providing a reliable cooling solution for modules like an engine or transmission control unit.

Typical Properties

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

Test[1]	Property	Unit	Result
CTM 0176	One or Two-part		Two
CTM 0176	Mix Ratio (Weight or Volume)		1:1
CTM 0176, ASTM E284	Color - Part A/B		White/ blue
CTM 1094, ASTM D4287	Viscosity at 10 s^{-1}, Part A	Pa·s	200
CTM 1094, ASTM D4287	Viscosity at 10 s^{-1}, Part B	Pa·s	230
CTM 1094, ASTM D4287	Viscosity at 10 s^{-1}, Mixed	Pa·s	205
CTM 1094, ASTM D4287	Thixotropic Index, Mixed (1 s^{-1}/10 s^{-1})		3.6
CTM 1094, ASTM D4287	Working Time at 25°C	Min	60
CTM 0022, ASTM D792	Specific Gravity, Cured		3.1
CTM 0099, ASTM D 2240	Cure Time at 25°C	Min	120
CTM 0099, ASTM D 2240	Durometer	Shore 00	52

1. CTM: Corporate Test Method. Available by request.
ASTM: American Society for Testing and Materials.

Form No. 80-8558-01-1221 S2D

Typical Properties (Cont.)

Test	Property	Unit	Result
CTM 1163, ISO[2] 22007-2	Thermal Conductivity (Hot disk)	W/m·K	3.4
ASTM D5470	Thermal Resistance at 120 µm	°C·cm²/W	0.45
	at 501 µm		1.52
	at 1500 µm		4.47
ASTM E1269	Heat Capacity at 20°C	J/g·°C	0.823
	at 80°C		0.962
	at 150°C		1.071
CTM 1470	Minimum Bond Line Thickness (BLT)	µm	
	at 0.14 MPa		95
	at 0.42 MPa		61
CTM0839, ASTM F2466	Volatile Siloxane Content (D4-D10)	ppm	8
CTM 0114, ASTM D149	Dielectric Strength (Cured)	kV/mm	22
CTM 0249, ASTM D257	Volume Resistivity	Ohm·cm	3 E+13
CTM 0112, ASTM D150	Dielectric Constant at 1 M HZ		6.5
CTM 0112, ASTM D150	Dissipation Factor at 1 M HZ		0.005
UL[3] 94	UL Flame Classification		UL 94 V0
	Shelf Life at 25°C.	days	360

2. ISO: International Organization for Standardization.
3. UL: Underwriters Laboratories.

Description

DOWSIL™ TC-4535 CV Thermally Conductive Gap Filler is 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.

DOWSIL™ thermally conductive elastomers require no post-cure and can be placed in service immediately at operating temperatures of -45 to 175°C (-49 to 347°F) following the completion of the cure schedule. Electronic devices are continually designed to deliver higher performance. Especially in the area of consumer electronics, there is also a continual trend towards smaller, more compact designs. In combination these factors typically mean that more heat is generated in the device. Thermal management of electronic devices is a primary concern of design engineers. A cooler device allows for more efficient operation and better reliability over the life of the device. As such, thermally conductive compounds play an integral role here. Thermally conductive materials act as a thermal “bridge” to remove heat from a heat source (device) to the ambient via a heat transfer media (i.e. heat sink). These materials have properties such as low thermal resistance, high thermal conductivity, and can achieve thin Bond Line Thicknesses (BLTs) which can help to improve the transfer of heat away from the device.

Application Methods

Two-part materials should be mixed in the proper ratio either by weight or volume. Static Mixer is recommended for manual and automated dispensing.

Mixing and De-airing

DOWSIL™ dispensable thermal material exhibit minor polymer separation during transportation. Before each use ensure the material is homogeneous. Recommendations for re-homogenization can be found in the application guides. 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 silicones can be cured at room temperature or with heat. The cure rate is rapidly accelerated with heat (see heat-cure times in Typical Properties table). Heat-cure time generally do not include part warm up 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.

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 dispensable thermal pads 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.

Solvent Exposure

In general, the product is resistance to minimal or intermittent solvent exposure, however best practice is to avoid solvent exposure altogether.

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 DOW.COM, OR FROM YOUR DOW SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CUSTOMER SERVICE.

Usable Life and Storage

The product should be stored in its original packaging with the cover tightly attached to avoid any contamination. Store in accordance with any special instructions listed on the product label. The product should be used by the indicated Exp. Date found on the label.

Packaging Information

Multiple packaging sizes are available for this product. Please contact your local distributor or Dow.

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, dow.com or consult your local Dow representative.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

How Can We Help You Today?

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

For more information about our materials and capabilities, visit **dow.com**.

To discuss how we could work together to address your specific needs, go to **dow.com** for a contact close to your location. Dow has customer service teams, science and technology centers, application support teams, sales offices, and manufacturing sites around the globe.

dow.com

NOTICE: No freedom from infringement of any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. The product shown in this literature may not be available for sale and/or available in all geographies where Dow is represented. The claims made may not have been approved for use in all countries. Dow assumes no obligation or liability for the information in this document. References to "Dow" or the "Company" mean the Dow legal entity selling the products to Customer unless otherwise expressly noted. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.