Technical Data Sheet

DOWSIL™ TC-2035 Adhesive

DOWSIL™ TC-2035 Adhesive is a two-part heat cure silicone thermally conductive adhesive with low bond line thickness

Features & Benefits

- High thermal conductivity
- Adhesion to various substrates
- Low bond line thickness
- Stable performance at high temperature (up to 200°C)
- Excellent thermal performance at various BLT
- Mechanical reliability – maintain stable elastomeric properties after accelerated aging test
- Adhesive reliability – adhesion stable or improves after accelerated aging test
- Excellent dielectric properties

Composition

- Two-part adhesive

Applications

- Designed to provide long term bonding and efficient thermal flow, especially where low bond line thickness is required to enhance thermal conductivity.
- Typical applications include: bonding organic and ceramic substrates (i.e. PCB, HDI, DBC) to heat sinks for transmission modules, power modules and conversion modules.

Typical Properties

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

Test	Property	Unit	Result
CTM[1] 0176 B	One or Two-Part		Two
CTM 0176 B	Color: Part A		White
	Color: Part B		Reddish Brown
	Mix Ratio (Weight or Volume)		1 to 1
CTM 1094 C	Viscosity at 10 (1/s) (Part A)	cP	130,000
		Pa.sec	130
CTM 1094 C	Viscosity at 10 (1/s) (Part B)	cP	118,000
		Pa.sec	118
CTM 1094 N	Viscosity at 10 (1/s) (Mixed)	cP	125,000
		Pa.sec	125

1. CTM: Corporate Test Method, copies of CTMs are available upon request.

Typical Properties (Cont.)

Test	Property	Unit	Result
	Thixotropy Mixed Steady Shear $1s^{-1}/10s^{-1}$		2.8
CTM 0022 B	Density (Wet)	g/cm^3	3.0
	Working Time at 25°C (Viscosity After 4 Hour)	hours	4
CTM 0243 T	Open Time at 25°C (Lap Shear Adhesion)	hours	2
	Heat Cure Time at 125°C	minutes	30
	Heat Cure Time at 150°C	minutes	10
CTM 0099 M	Hardness Shore A	JIS Type A	95
CTM 0793 D ASTM[2] D2240	Hardness Shore D	Shore D	45
CTM 0137	Tensile Strength	psi MPa kg/cm^2	522 3.6 36.7
CTM 0137 AAH	Elongation	%	43
CTM 0243 A	Adhesion – Lap Shear (Al)	psi mPa N/cm^2	381 2.63 263
CTM 0243 A	Adhesion – Lap Shear (Copper)	psi mPa N/cm^2	416 2.87 287
CTM 0114 A	Dielectric Strength at 1 mm	volts/mil kV/mm	533 21
CTM 0112 A	Dielectric Constant at 100 Hz		6
CTM 0112 C	Dielectric Constant at 100 kHz		5.9
CTM 0249 A	Volume Resistivity	Ohm.cm	5.5 E+15
CTM 0112 B	Dissipation Factor at 100 Hz		7 E-03
CTM 0112 D	Dissipation Factor at 100 kHz		4 E-03
ASTM E 831	Linear CTE (by TMA -50 to 200°C)	ppm/K	92
CTM 1163 A	Thermal Conductivity by Transient Method	W/m.K	3.3
ASTM D 5470	Thermal Resistivity at 50 µm at 100 µm	 °C/W	 0.25 0.44
	Minimum BLT	microns	
DIN[3] 51007	Heat Capacity at 25°C at 100°C at 150°C	 J/g.°C	 0.83 0.98 1.09

2. ASTM: American Society for Testing and Materials.
3. DIN: Deutsche Industrie Norm.

Description

The heat-cure, thermally conductive adhesives produce no by-products in the cure process, allowing their use in deep section and complete confinement. These adhesives will develop good, primerless adhesion to a variety of common substrates including metals, ceramics, epoxy laminate boards, reactive materials and filled plastics. PCB system assemblies are continually designed to deliver higher performance. Especially in the area of consumer devices, 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 PCB system assemblies 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 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.

Substrate Testing

To ensure maximum bond strength for adhesives on a particular substrate, 100 percent cohesive failure of the adhesive in a lap shear or similar adhesive strength test is needed. This ensures compatibility of the adhesive with the substrate being considered. Also, this test can be used to determine minimum cure time or to detect the presence of surface contaminants such as mold release agents, oils, greases and oxide films.

Mixing And De-Airing

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 should be cured at 100°C (212°F) or above. The cure rate is rapidly accelerated with eat (see heat-cure times in Typical Properties table). 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 products 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.

Adhesion

Dow silicone adhesives are specially formulated to provide unprimed adhesion to many reactive metals, ceramics and glass, as well as to selected laminates, resins and plastics. However, good adhesion cannot be expected on non-reactive metal substrates or non-reactive plastic surfaces such as Teflon, polyethylene or polypropylene. Special surface treatments such as chemical etching or plasma treatment can sometimes provide a reactive surface and promote adhesion to these types of substrates. Dow primers can be used to increase the chemical activity on difficult substrates. For best results, the primer should be applied in a very thin, uniform coating and then wiped off after application. After application, primers should be thoroughly cured prior to application of the silicone elastomer. Poor adhesion can be experienced on plastic or rubber substrates that are highly plasticized, since the mobile plasticizers act as release agents. Small-scale laboratory evaluation of all substrates is recommended before production trials are made. In general, increasing the cure temperature and/or cure time will improve the ultimate adhesion.

Useful Temperature Ranges

For most uses, silicone adhesives 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 silicone elastomer 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 CONSUMER.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.

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.

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

To discuss how we could work together to meet your specific needs, go to **consumer.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.

consumer.dow.com