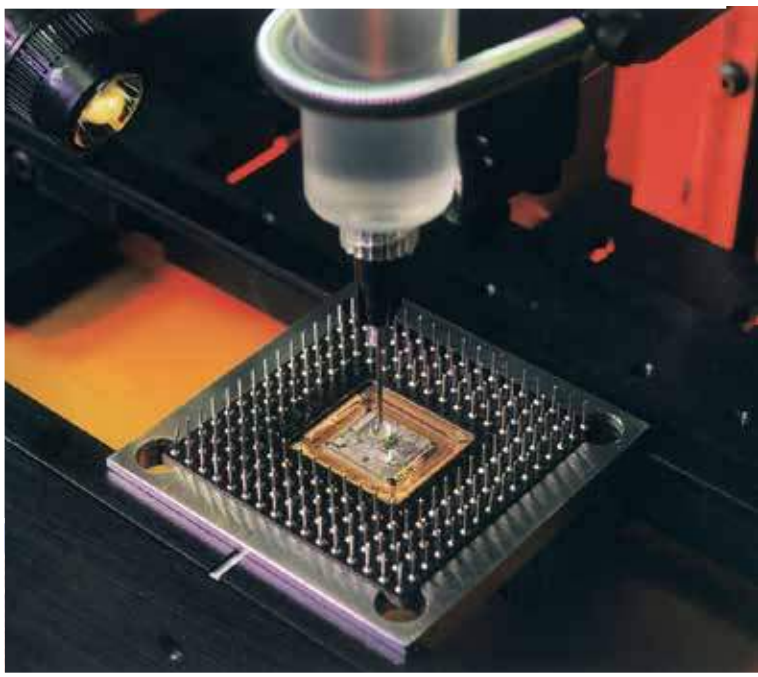
Selection Guide

Innovative Thermally Conductive Silicone Solutions

DOWSIL™

Enhancing the Performance and Reliability of Your PCB System Assemblies



Imagine

Heat Is the Enemy of Devices

The reasons why may vary from application to application. Yet, improved thermal management is increasingly critical to maintaining the long-term performance and reliability of PCB system assemblies in virtually every industry.

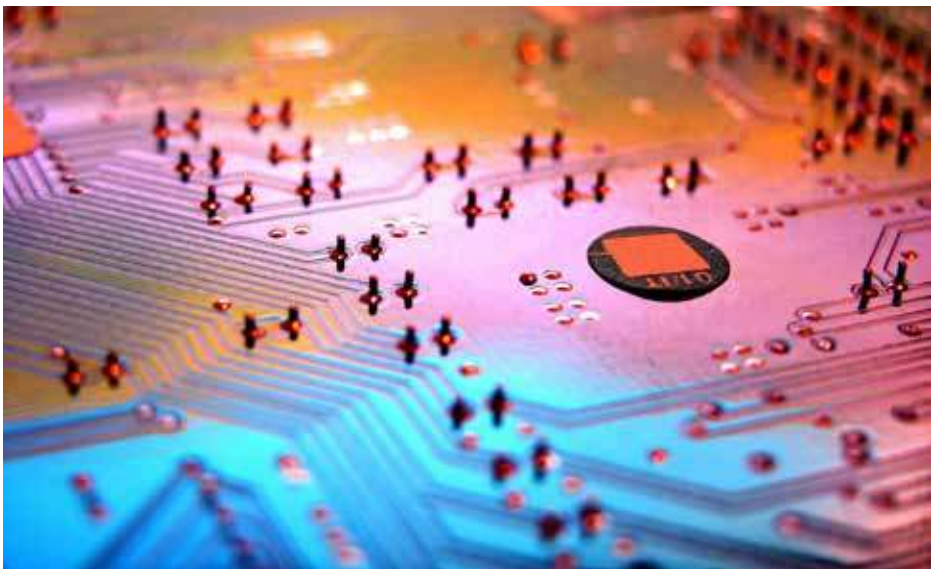
Transportation: From rail to road, vehicles are increasingly reliant on PCB system assemblies for everything from optimized fuel consumption and safety to propulsion and braking. As this trend accelerates, it will drive demand for higher performance and more cost-effective thermal management solutions.

Heat Management: The trend toward smaller devices with more densely packed PCB system components is converging with expanded use of flip chip and stacked die architectures. As a result, new thermal management solutions are needed to effectively dissipate heat and deliver greater device reliability.

Solid-State Lighting: Unlike conventional light sources, the ability to manage the temperature of an LED module has a direct impact on the reliability, output quality, lifetime and system cost of the device. Moreover, thermal management is becoming an increasingly important performance metric for the entire LED value chain, as solid-state lighting competes with conventional illumination for high-intensity and high-temperature applications.

Power Devices: Power supplies and controls for industry, computer servers, and solar and wind energy are all managing higher electrical loads and, with them, increasing temperatures. The trend is creating a need for improved thermal management to dissipate heat in these devices, as this translates into improved performance, reliability and lifetime. Improved thermal management also offers needed design flexibility.

Consumer Devices and Telecommunications: Form factor optimization is one of the challenges facing this industry. Thin is in for consumer devices, requiring compact, multifunctional thermal management solutions.



With Dow, You Have a Powerful Ally for Thermal Management

Offering an innovative and growing portfolio of thermally conductive silicone adhesives, compounds, encapsulants and dispensable pads, Dow can help you identify a thermal management solution for your most sensitive devices. Combining materials knowledge, application expertise, collaborative innovation and a global presence, we can help you meet your design goals for heat dissipation, processability and low cost of ownership.

As a class of materials, silicones from Dow maintain consistently high physical, electrical and optical performance at high temperatures. Available in a broad range of viscosities, cure chemistries and delivery formats, our products can help expand design and manufacturing latitudes.

ADHESIVES

Strong Bonds That Dissipate Heat

Thermally conductive silicone adhesives from Dow are suitable for bonding and sealing hybrid circuit substrates, semiconductor components, heat spreaders and other applications that demand broad design, flexible processing options and excellent thermal management.

These high-performance materials range from low-viscosity liquids to non-slump formulations and encompass two cure chemistries:

- One-part moisture-cure grades offer simple room-temperature processing to minimize costs
- One- or two-part heat-cure solutions help accelerate processing to speed time to market

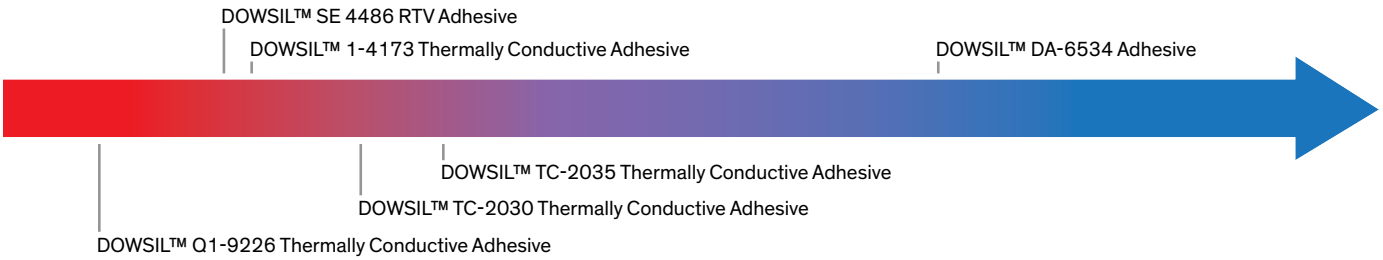
They develop no significant by-products during processing, allowing use as structural adhesives without mechanical fasteners, even in complete confinement.

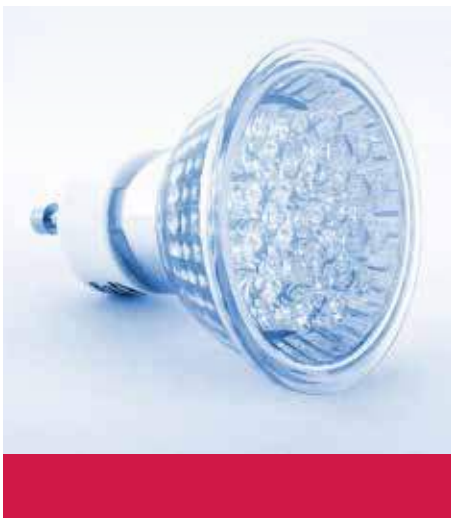
Expanded design and process flexibility

Dow's thermally conductive silicone adhesives enhance design flexibility by filling oddly-shaped gaps and generating large contact areas to maximize heat transfer. Similarly, they can ease manufacturing challenges when part planarity and fit tolerances cannot be tightly controlled.

The surface contact of our thermally conductive adhesives helps reduce interfacial resistance. Specific formulations even incorporate microscopic spacer beads to achieve extremely uniform bond lines, while compensating for board deviation and minor warping.

After cure, these advanced materials convert into a strong yet flexible elastomer and deliver good unprimed adhesion to a variety of common substrates including metals, ceramics and filled plastics. The highest-performing grades deliver thermal conductivity as high as 6.8 W/mK.





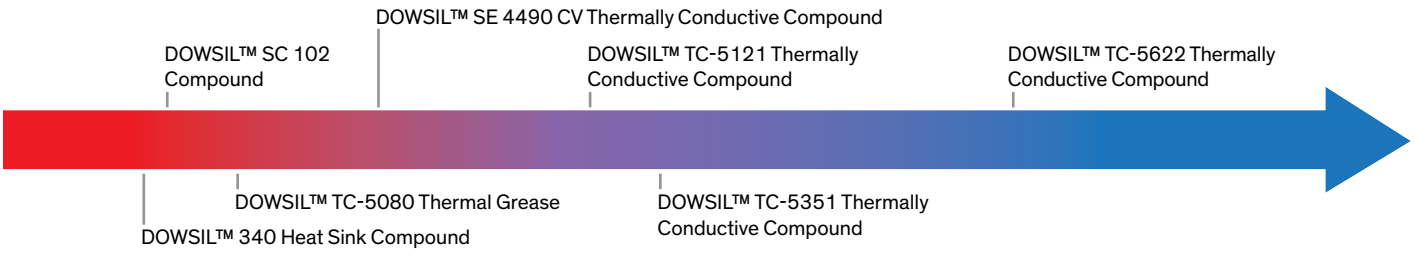
COMPOUNDS

Extending Thermal Management to the Smallest Gap

Dow's thermally conductive compounds serve as a thermal bridge that draws heat away from a device's sensitive PCB module components and dissipates it into the ambient environment. Our broad and versatile portfolio of solutions encompasses both thermal silicone compounds and greases.

These no-cure materials share common properties, such as low thermal resistance, high thermal conductivity and the ability to achieve very thin bond line thickness. They offer relatively low cost, ease of application onto heat sinks via screen-printing and ease of re-work. They are designed to maintain their consistency at high temperatures to form a positive seal with heat sinks to ensure reliable device performance. Our thermally conductive compounds and greases are particularly suitable for applications in which heat sinks are removed and reattached later, or where the PCB systems assembly favors no-cure processes.

Select grades from this family of products offer thermal conductivity as high as 4.3 W/mK.



ELASTOMERS AND GELS

Managing Heat in Complex Architectures

Dow's thermally conductive silicone elastomers and gels encompass an adaptable selection of products for encapsulation and potting applications. This broad family of material technologies offers versatile thermal management solutions with a variable level of hardness or stress relief to fit your PCB system application need.

The low viscosity before cure of these products enables them to process easily and fully embed tall components, delicate wires and solder joints, making them particularly suitable for managing high heat in complicated PCB system architectures. Plus, due to their extremely low modulus after cure, these materials offer superb stress relief.

Imagine

Next-Generation Thermal Management Materials … Today!

Dow listens closely to its customers and continuously innovates across product technologies to deliver next-generation thermal solutions when you need them – today.

From thermal greases that dissipate heat in computer and telecom applications, to dispensable thermal pads for more cost-competitive LED lighting, to adhesives for more reliable transportation PCB system assembly, Dow continues to pioneer advanced solutions for your thermal management needs.

Some of our most advanced thermal management innovations include:

DOWSIL™ TC-5622 Thermally Conductive Compound

Our decades of expertise in silicone technology and thermally conductive fillers enabled development of this advanced new silicone grease. In addition to delivering the highest thermal conductivity in our portfolio, DOWSIL TC-5622 Thermally Conductive Compound also offers new options for reducing total systems cost for PCB systems applications.

DOWSIL™ Dispensable Thermal Pads

Our dispensable thermal pad solutions enable you to quickly and precisely dispense or print a layer of thermally conductive silicone compound in controllable thicknesses on complex substrate shapes, helping to ensure excellent thermal management and lower cost of ownership compared to prefabricated thermal pads. Select grades offer varying levels of thermal conductivity: DOWSIL™ TC-4015 and TC-4016 Dispensable Thermal Pads offer thermal conductivity of 1.5 W/mK, while DOWSIL™ TC-4025 and TC-4026 Dispensable Thermal Pads offer higher 2.5 W/mK thermal conductivity. DOWSIL™ TC-4016 and TC-4026 Dispensable Thermal Pads incorporate glass beads to offer improved control over bond line thickness.

DOWSIL™ TC-2030 and TC-2035 Adhesives

These advanced materials can help inspire new designs and opportunities for effective heat management. DOWSIL TC-2030 Adhesive delivers good heat transfer and excellent adhesion to copper and aluminum substrates commonly used in PCB system assemblies for transportation.

For PCB system transmission, power and conversion modules, DOWSIL TC-2035 Adhesive was designed to deliver reliable long-term bonding and efficient thermal flow. It is particularly suitable for applications that demand thin bond lines to enhance thermal conductivity. This high-performance material effectively bonds either organic or ceramic substrates to heat sinks and sustains reliable performance at temperatures reaching 200°C.

Dow is your source for collaborative innovation of new thermal management solutions. If you do not see what you need in our expansive product offering, call us today to discuss your application or processing challenge.

Product	Thermal Conductivity (W/mK)	Adhesive	Thin BLT TIM (<100 µm)	Gap Filler (>100 µm) Large Joint Movement and Dampening Needs	Encapsulant/Pottant
NON-CURABLE					
DOWSIL™ 340 Heat Sink Compound	Increasing TC		☑		
DOWSIL™ SC 102 Compound			☑		
DOWSIL™ TC-5080 Thermal Grease			☑	☑	
DOWSIL™ SE 4490 CV Thermally Conductive Compound			☑		
DOWSIL™ TC-5121 Thermally Conductive Compound			☑		
DOWSIL™ TC-5351 Thermally Conductive Compound				☑	
DOWSIL™ TC-5622 Thermally Conductive Compound	4.3		☑		
ONE-PART CURABLE ELASTOMER					
DOWSIL™ SE 9184 White RTV†	Increasing TC	☑	☑		
DOWSIL™ SE 4422 RTV Sealant†		☑	☑	☑	
DOWSIL™ SE 4420 RTV Sealant†		☑	☑	☑	
DOWSIL™ SE 4486 RTV Sealant†		☑	☑		
DOWSIL™ 3-6752 Thermally Conductive Adhesive		☑	☑		
DOWSIL™ 3-1818 Thermally Conductive Adhesive		☑	☑		
DOWSIL™ 1-4174 Thermally Conductive Adhesive*		☑	☑		
DOWSIL™ 1-4173 Thermally Conductive Adhesive		☑	☑		
DOWSIL™ DA 6523**		☑	☑		
DOWSIL™ DA-6534 Adhesive**	6.8	☑	☑		
TWO-PART CURABLE ELASTOMER					
SYLGARD™ 170 Fast Cure Silicone Elastomer	Increasing TC				☑
SYLGARD™ 170 Silicone Elastomer					☑
SYLGARD™ 160 Silicone Elastomer					☑
DOWSIL™ CN-8760					☑
DOWSIL™ Q1-9226 Thermally Conductive Adhesive		☑	☑		
SYLGARD™ Q3-3600 Thermally Conductive Encapsulant		☑			☑
SYLGARD™ 3-6605 Thermally Conductive Elastomer		☑	☑		☑
DOWSIL™ 3-6753 Thermally Conductive Adhesive*		☑	☑		
DOWSIL™ 3-6751 Thermally Conductive Adhesive		☑	☑		
DOWSIL™ TC-4016 Dispensable Thermal Pad*				☑	
DOWSIL™ TC-4015 Dispensable Thermal Pad				☑	
DOWSIL™ TC-4026 Dispensable Thermal Pad*				☑	
DOWSIL™ TC-4025 Dispensable Thermal Pad				☑	
DOWSIL™ TC-2030 Adhesive		☑		☑	
DOWSIL™ TC-2035 Adhesive	3.2	☑	☑		

* Contains glass spacer beads for Bond Line Thickness (BLT) control
** Provides electrical conductivity
† Moisture-cure product

This list is not all-inclusive. If you do not see a product that meets your needs, please contact your Dow representative.

Compounds are defined as non-curable materials. They also are commonly called greases.

Gels are defined as curable, lightly cross-linked materials with very low modulus where the hardness is on or below the Shore 00 scale.

Elastomers are defined as curable materials typically with a durometer on the Shore A scale. In some cases, a very soft elastomer can have a Shore 00 durometer.

Encapsulants are defined as curable materials that deliver protective/hiding/impact protection functions. They typically have a hardness in the mid-upper Shore A range.

Pottants are defined as curable materials that deliver protective/extreme stress relief functions. They typically have a hardness below a low Shore A value.

Adhesives are defined as materials that adhere or seal. They typically have a hardness in the mid-upper Shore A range.

Learn More

We bring more than just an industry-leading portfolio of advanced silicone-based materials. As your dedicated innovation leader, we bring proven process and application expertise, a network of technical experts, a reliable global supply base and world-class customer service. To find out how we can support your applications, visit **consumer.dow.com/pcb**.

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

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'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.

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