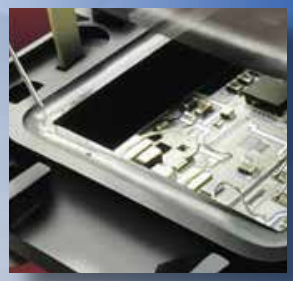
DOW CORNING

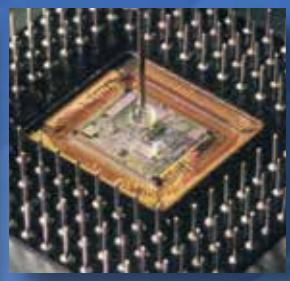
Electronics
Solutions

Proven, effective silicone solutions from Dow Corning

IMAGINE

Improved reliability and durability of smart utility meters





SMART METERS

Long-term durability in uncertain and harsh environments.

Powerful thinking. As the world's energy demands increase and alternate energy options become widely available, most every industrialized nation is shaping smart grid strategies to keep pace. Utility infrastructure is undergoing dramatic change. Leading the way, smart meter technologies for monitoring, reporting and billing usage rates for electricity, gas and water are key elements in the emerging strategies and intelligent changes.

Proven dependability. Lasting efficiency and accuracy of smart electricity, gas and water meters are critical. Smart meters are being woven into the Internet of Things for more than just meter-to-cash opportunities. Warranted service and extended lifetime performance are key cost considerations that drive demand for optimized reliability. Silicone solutions can outperform polyurethanes, epoxies and other competitive materials and thus help improve the reliability of these devices.

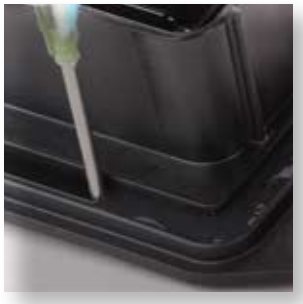
Turn challenges into opportunities. With in-depth experience in driving smart innovation at every level of the electronics value chain, Dow Corning provides smart meter manufacturers a reliable source of proven, effective silicone solutions that can help meet your key design and performance challenges.

SMART SILICONE SOLUTIONS

Problem-solving collaboration drives smart meter innovation.

Challenges have solutions. Protecting the reliability and durability of smart meters in harsh environments *and* addressing fire-safety and health concerns are challenging design needs. Yet, innovative silicone solutions from Dow Corning can deliver the right results with proven high-performance properties and specialized material options. Identify your critical challenges, consider how our capabilities can help, and add us to your problem-solving team. Working together, our collaboration can develop exactly what you need.

IMAGINE
THE POSSIBILITIES



Silicone Adhesive and Sealant Solutions

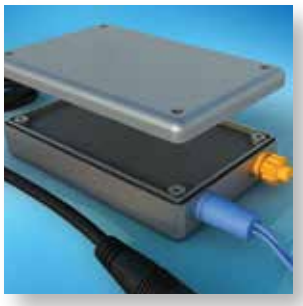
For improving smart meter module sealing to prevent water and contaminant ingress, *Dow Corning*® brand silicone sealants are widely used. These self-priming, versatile materials offer a range of viscosities and cure mechanisms to match process productivity needs. Specialties provide high strength and elongation, stress relief, low VOCs and good flammability ratings. Hot-melt silicone adhesives offer both processing and application advantages.

Silicone adhesives and sealants provide reliable sealing and protection from water ingress and other environmental contaminants.

Silicone Conformal Coating Solutions

Dow Corning® brand silicone conformal coatings can be used to protect printed circuit boards (PCBs) in smart utility meters. These tough yet flexible silicone materials provide excellent adhesion to protect electronics from humidity, contaminants and potential corrosion. They offer process choices, specialty performance properties and flammability resistance.

Silicone conformal coatings offer significant benefits for protecting electronic PCBs from corrosion in smart electricity and gas meters.



Silicone Encapsulant Solutions

For an even greater level of protection than conformal coatings can deliver, *Dow Corning*® and *Sylgard*® brand silicone encapsulants can provide flexible yet resilient potting materials. These two-part, easily mixed elastomer materials offer processing choices without solvents or cure by-products and are especially suited for protecting sensitive electronics from water ingress. Different grades offer low viscosity, low stress, good thermal conductivity and flammability certification.

Silicone encapsulants provide strong bonding and low shrinkage when used as potting materials to protect sensitive electronic components in smart utility meters.

Silicone Dielectric Gel Solutions

For devices with even more sensitivity to thermal stress, gels present excellent self-healing properties while also offering the dimensional stability typically found in an elastomer, plus an even greater level of stress relief. These unique materials can provide excellent protection from moisture, contaminants and thermal-cycling stress. They offer a range of options for processing versatility, firm or soft hardness, enhanced dielectric or mechanical strength, and resistance to thermal-cycling stress.

Silicone dielectric gels provide excellent protection against corrosion and thermal-stress damage on electronics for smart water and gas meters.

Silicone Thermal Management Solutions

Dow Corning® brand thermally conductive adhesives are especially well-suited for dissipating generated heat from the electronic circuitry used in smart electricity meters. These effective thermal interface materials provide good process efficiency with flowable or nonflowable options and fast tack-free room-temperature or heat curing. They have good thermal conductivity, dielectric strength and flame resistance.

Silicone thermally conductive materials can dissipate heat in smart electricity meters to protect against damage to sensitive communications electronics.

COMPETITIVE COMPARISON: SILICONE ADVANTAGES

Selected silicone solutions from Dow Corning can provide technical advantages over polyurethanes, epoxies or other competitive materials:

- Silicone RTV and hot-melt adhesives outperform competitive materials, offering better elongation and flexibility to handle thermal expansion.
- Silicones cause less stress on electronic components during thermal cycling than epoxies and absorb less moisture than polyurethanes.
- Silicone thermal interface materials offer a superior combination of thermal conductivity, dielectric strength and low thermal stress compared to competitive materials.
- Because substrates do not need to be dried and because there is no damage from exotherms, silicones can help simplify processing and speed production compared to polyurethanes and epoxies.
- A number of silicone materials have been tested to meet regulatory fire-safety certifications in different global regions.

IMAGINE
THE DIFFERENCE SILICONES CAN MAKE

Dow Corning offers an extensive range of proven, effective silicone solutions for leading manufacturers of smart metering equipment. *We are ready to help you!* Explore our advanced silicone technologies. Rely on our materials innovation, application expertise and broad technical support for help. And expect to get the right answers to meet your challenging process needs and performance requirements.

Design Challenges	Smart Meters	Required Solutions	Product Family	Potential Silicone Solutions	Features/Advantages
Thermal cycling: Withstand high stress and strain from excessive CTE differences Water and moisture exposure: Reduce potential corrosion	Gas, Water	Low-stress materials with durable sealing and adhesion performance	Gels	*Sylgard*® 527 Silicone Dielectric Gel	• Room-temperature or heat cure • Available in clear or red • Long working time, very soft/low hardness
				Dow Corning® 3-4150 Dielectric Gel	• Transparent green • Fast room-temperature cure • Very soft/low hardness
				Dow Corning® 3-4207 Dielectric Tough Gel	• Primerless adhesion • Fast room-temperature cure • Added mechanical strength • UL 94 V-1 recognition
Effective thermal management: Dissipate data-communications heat to reduce potential for hot-spot electronic failures	Electricity	Good thermal conductivity coupled with flexibility	Thermal interface materials	*Dow Corning*® SE 4420 Thermally Conductive Adhesive	• One-part, white • Fast room-temperature cure • Good unprimed adhesion • Efficient heat-transfer capabilities
				Dow Corning® SE 4486 Thermally Conductive Adhesive	• One-part, white, moisture cure • Semiflowable, good adhesion • Tack-free in 4 min @ 25°C
				Dow Corning® SE 9184 White RTV Thermally Conductive Adhesive	• Nonflowing; controlled volatility • Enhanced thermal conductivity • UL 94 V-0 recognition

Design Challenges	Smart Meters	Required Solutions	Product Family	Potential Silicone Solutions	Features/Advantages
Harsh environments: Prevent water and contaminant ingress Exposure to high humidity and extreme temperatures: Reduce potential for corrosion and loss of electronics design integrity Mechanical shock/ vibration: Strengthen assembly to prevent potential sealing failures and/or electrical faults	Gas, Water, Electricity	Durable module assembly sealing and reparability	Adhesives and sealants; all are one-part, room-temperature-cure, noncorrosive	*Dow Corning*® 739 RTV Adhesive	• Available in white, gray and black • 25 Shore A durometer • UL 94 V-1 recognition
				Dow Corning® 744 RTV Sealant	• White • 35 Shore A durometer • High strength, high elongation • UL 94 HB flammability rating
				Dow Corning® 748 Noncorrosive Sealant	• White • Shore A durometer • Broad adhesion to plastics • UL 94 HB flammability rating
				Dow Corning® HM-2500 Assembly Adhesive Sealant	• Reactive hot-melt, neutral-cure RTV • Instant green strength, low VOCs • Very high elongation • Adhesion to most metals and plastics • UL 94 HB flammability rating
		Improved circuit board sealing with durable adhesion	Conformal coatings; all are one-part, moisture-cure, noncorrosive	*Dow Corning*® 1-2577 Low VOC Conformal Coating	• Transparent, abrasion-resistant • Shore D hardness • UL 94 V-0 recognition
				Dow Corning® 3-1953 Conformal Coating	• Solventless • Low viscosity • Easy rework/repair • UL 94 V-0 recognition
				Dow Corning® 3-1944 RTV Coating	• Higher viscosity for spot protection on tall components • UL 746 flame resistance
		Increased environmental and shock protection	Encapsulants	Silicone dielectric gels	(See specific product highlights)
				Sylgard® 160 Silicone Elastomer Encapsulant	• Two-part, dark gray, medium-low viscosity • Moderate thermal conductivity • UL 94 V-0 flammability rating
				Sylgard® 170 Silicone Elastomer Encapsulant	• Two-part, black • Low viscosity, mild thermal conductivity

These examples of proven, effective silicones for smart meter applications are provided as a quick starting point for evaluating the advantages of silicones over polyurethanes, epoxies and other competitive materials. More silicone solutions are available to help meet your design and performance challenges. Contact your Dow Corning Electronics Solutions distributor for further details.

How Can We Help You Today?

Tell us about your performance, design and manufacturing challenges for smart electricity, gas and water meters. 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 **dowcorning.com/electronics**.

To discuss how we could work together to meet your specific needs, email **electronics@dowcorning.com** or go to **dowcorning.com/ContactUs** for a contact close to your location. Dow Corning has customer service teams, science and technology centers, application support teams, sales offices, and manufacturing sites around the globe.

Images: Cover - AV23129, AV06076, AV01159, AV21745; Page 2 - AV23751, AV23750; Page 3 - AV23748, AV12087, AV23683; Page 4 - AV23288, AV01782, AV21377; Page 5 - AV02725, AV08414; Page 6 - AV03138, AV04387; Page 7 - AV23749, AV12786; Page 8 - AV14412, AV23126

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

TO THE FULLEST EXTENT PERMITTED BY APPLICABLE LAW, DOW CORNING SPECIFICALLY DISCLAIMS ANY OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

DOW CORNING DISCLAIMS LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

AGP14147 Form No. 11-3567-01

DOW CORNING

We help you invent the future.™