# Thermal Interface Materials

With electronic circuits becoming smaller and more powerful, thermal management has become a critical design parameter to prevent overheating and circuit failure. Thermal Interface Materials (TIMs) work by displacing air gaps between heat-generated components and heat sinks to help conduit heat out of the system.

## Thermally Conductive Adhesives

Thermally conductive and electrically insulating epoxy systems efficiently dissipate heat while providing a durable and structural permanent bond.

**One-part** 9460TC

**Two-part** 8329TFF, 8329TFS, 8349TFM, 8329TCS, 8329TCM, 8329HTC

## Thermal Pastes

Thermal pastes create a non-permanent bond between heat-generating components and heat sinks.

**Silicone** 860

**Non-Silicone** 8616, 8617A, 8618

## Thermal Gap Fillers

Silicone-based materials cure to a putty-like consistency that perfectly conform to gaps at the interface between heat-generating components and cooling plates.

**High Thermal Conductivity** TIA225GF

**Extreme Thermal Conductivity** TIA241GF

## Thermal Potting Compounds

Thermally conductive epoxy potting compounds protects printed circuit boards and electronic devices while offering heat dissipation from the system.

**Non-Flame Retardant** 832TC

**Flame Retardant** 834B, 834HTC, 834FX

## Liquid Thermal Gels

One-part, silicone-free gels for energy intensive devices. These products have very high thermal conductivity,

**Flame Retardant** 8327GL3, 8327GL5, 8327GL6

## Applications

Thermal management

Heat dissipation

Bonding heat-sensitive components

Gap filling

## Industries

Battery modules and battery packs

Consumer electronics

LED manufacturing

Automotive

Aerospace

Defense

Instrumentation

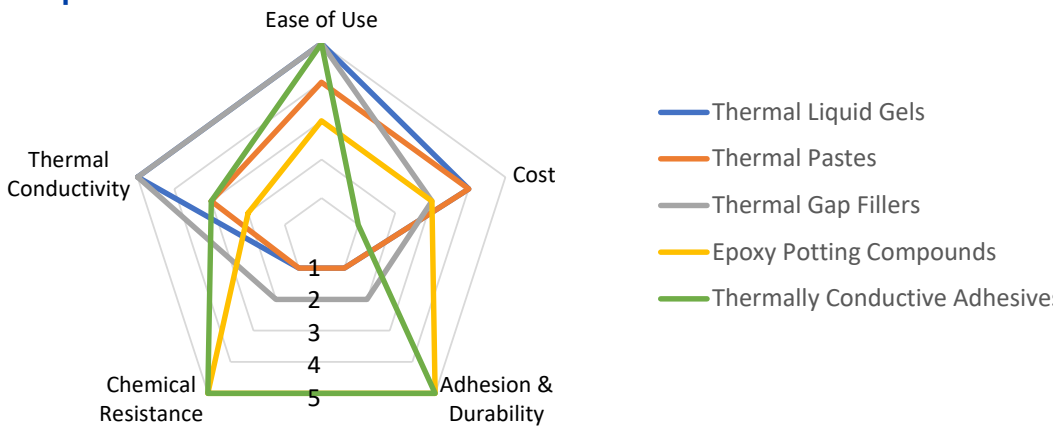
Medical equipment

Research

# Thermal Interface Materials

| | TC [W/(m·K)] | Working Time [min] | Mix Ratio by Vol. [A:B] | Service Temp. [°C] | Mixed Viscosity [Pa·s] |
|---|---|---|---|---|---|
| **THERMALLY CONDUCTIVE ADHESIVES** | | | | | |
| 9460TC | 0.8 | Unlimited | 1-part | -65 to 150 | Thixotropic paste |
| 8329TFF | 0.8 | 5 | 1:1 | -40 to 150 | Thixotropic paste |
| 8349TFM | 1.1 | 20 | 1:1 | -50 to 150 | 260 |
| 8329TCM | 1.4 | 45 | 1:1 | -40 to 150 | Thixotropic paste |
| 8329TFS | 1.2 | 240 | 1:1 | -40 to 150 | Thixotropic paste |
| 8329TCS | 1.4 | 240 | 1:1 | -40 to 150 | Thixotropic paste |
| 8329HTC | 2.7 | 90–120 | 1:1 by wt. | -55 to 160 | 80–120 |
| **THERMAL PASTES** | | | | | |
| 860 | 0.7 | — | 1-part | -40 to 200 | 490 |
| 8616 | 2.0 | — | 1-part | -70 to 165 | 365 |
| 8617A | 3.0 | — | 1-part | -55 to 200 | 220 |
| 8618 | 6.0 | — | 1-part | -55 to 200 | 700 |
| **THERMAL GAP FILLERS** | | | | | |
| TIA225GF | 2.5 | 240 | 1:1 | -45 to 200 | 100 |
| TIA241GF | 4.1 | 180 | 1:1 | -45 to 200 | 130 |
| **EPOXY POTTING COMPOUNDS** | | | | | |
| 832TC | 0.7 | 120 | 1:1 | -30 to 175 | 27 |
| 834B | 0.8 | 60 | 2:1 | -40 to 175 | 16 |
| 834FX | 0.6 | 150 | 1:1 | -50 to 125 | 15 |
| 834HTC | 0.9 | 90 | 5:1 | -50 to 150 | 10 |
| **THERMAL LIQUID GELS** | | | | | |
| 8327GL3 | 3.5 | — | 1-part | -55 to 120 | 7 000 |
| 8327GL5 | 5.1 | — | 1-part | -55 to 150 | 3 500–5 000 |
| 8327GL6 | 6.0 | — | 1-part | -55 to 120 | 7 000 |

## Comparison Graph



# Adhesives

MG Chemicals Adhesives line is consisted of 1-part and 2-part epoxy systems. Our 1-part epoxies offer unlimited working time, do not require mixing, and can be stored at room temperature. 2-part epoxies are 1:1 mix ratio and are available in a variety of working times (*w.t.*).

## Applications

- Electrical connections
- Thermal management
- Bonding heat sensitive components
- Providing structural support
- Bonding similar and dissimilar substrates
- Repairing circuits
- Sealing
- Potting
- Gap filling

## Industries

- Battery modules and battery packs
- Consumer electronics
- Transportation
- Automotive
- Aerospace
- Defense
- Instrumentation
- Medical equipment
- Research

## General Bonding

| | | |
|---|---|---|
| One-part | 9310 | • Surface mount adhesive |
| Two-part | 8332 | • Fast set epoxy, 5 min *w.t.* |
| | 9200 | • Structural, standard, 30 min *w.t.* |
| | 9200FR | • Structural, 30 min *w.t.*, UL 94V-0 rated |

## Electrically Conductive

| | | |
|---|---|---|
| One-part | 9410 | • Resistivity of 1.8 x $10^{-3}$ Ω·cm, $T_g$ of 96˚C |
| Two-part | 8331D | • Resistivity of 1.8 x $10^{-3}$ Ω·cm, 20 min *w.t.* |
| | 8330D | • Resistivity of 5.3 x $10^{-4}$ Ω·cm, 20 min *w.t.* |
| | 8331S | • Resistivity of 6.0 x $10^{-3}$ Ω·cm, 4 hours *w.t.* |
| | 8330S | • Resistivity of 7.0 x $10^{-4}$ Ω·cm, 4 hours *w.t.* |

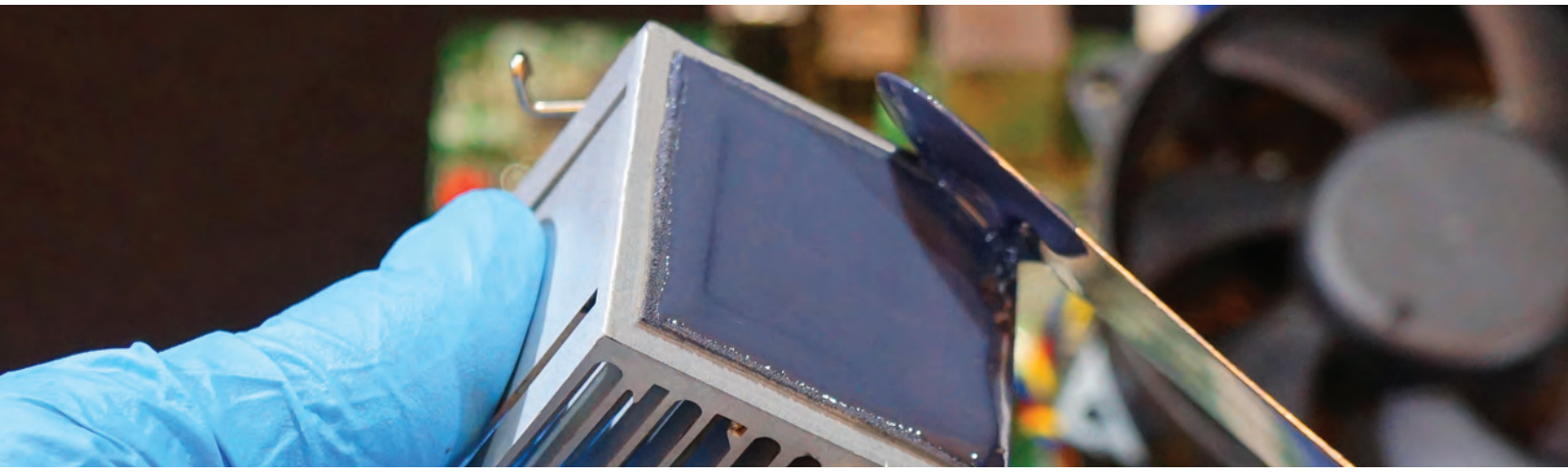
## Thermally Conductive

| | | |
|---|---|---|
| One-part | 9460TC | • *TC* of 0.8 W/(m·K) |
| Two-part | 8329TFF | • *TC* of 0.8 W/(m·K), 5 min *w.t.*, dispensable, UL 94V-0 rated |
| | 8349TFM | • *TC* of 0.9 W/(m·K), 20 min *w.t.*, dispensable, meets UL 94V-0 |
| | 8329TCM | • *TC* of 1.4 W/(m·K), 45 min *w.t.*, non-sagging |
| | 8329TFS | • *TC* of 1.2 W/(m·K), 4 hours *w.t.*, dispensable |
| | 8329TCS | • *TC* of 1.4 W/(m·K), 4 hours *w.t.*, non-sagging |
| | 8329HTC | • *TC* of 0.9 W/(m·K), 80–120 min *w.t.*, dispensable |

*TC* = Thermal Conductivity *w.t.* = working time

*We are also the authorized master distributor for Momentive RTV silicone products. RTV silicones are desirable because of their high heat resistance, wide operating temperature range and low modulus. The silicone adhesives portfolio covers a host of options to meet your requirements like consistency, adhesive strength, flame retardancy, outgassing, thermal conductivity and more.*

# Thermally Conductive Adhesives



## Maximum Heat Dissipation from Electronic Assemblies

MG Chemicals offers thermally conductive epoxy adhesives for bonding heat sinks, LEDs, and other heat generating electronic components.

### Features & Benefits

- Creates strong permanent thermal bonds
- Eliminates need for mechanical fasteners
- Excellent thermal conductivity (*TC*)
- Provides strong electrical insulation
- Room temperature storage
- Maintains bonds in severe environments
- Excellent chemical resistance
- Excellent mechanical stability
- A wide variety of working times (*w.t.*)

### Applications

- Bonding heat sinks
- Power semiconductor devices
- Flip chip BGA heat spreaders
- Battery modules and battery packs
- LED lighting
- Power Supplies
- Automotive lighting
- Appliances

### One-part

9460TC • *TC* of 0.8 W/(m·K), unlimited *w.t.*, no mixing, heat cure only

### Two-part

8329TFF • *TC* of 0.8 W/(m·K), 5 min *w.t.*, dispensable, UL 94V-0 rated - flame retardant

8349TFM • *TC* of 0.9 W/(m·K), 20 min *w.t.*, dispensable, meets UL 94V-0 - flame retardant

8329TCM • *TC* of 1.4 W/(m·K), 45 min *w.t.*, non-sagging

8329TFS • *TC* of 0.8 W/(m·K), 4 hours *w.t.*, dispensable, heat cure only

8329TCS • *TC* of 1.4 W/(m·K), 4 hours *w.t.*, non-sagging, heat cure only

8329HTC • *TC* of 0.9 W/(m·K), 80 min *w.t.*, dispensable

### Dispensing accessories

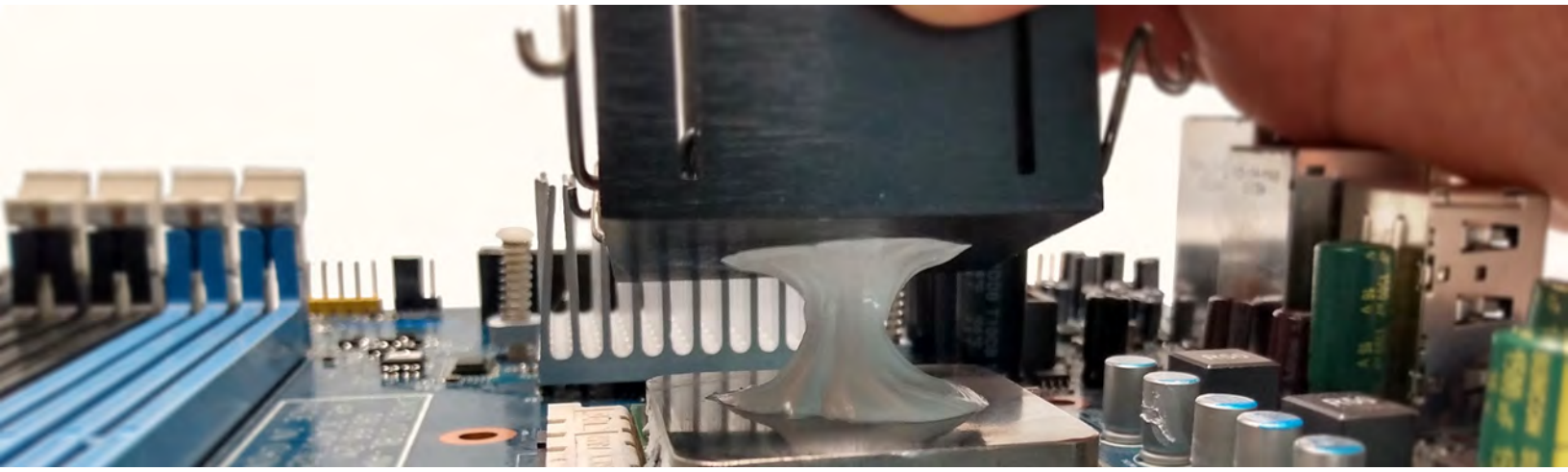
Dispensing gun • 8DG-50-1-1

Mixing tips • 8MT-50 (standard)
• 8MT-50-FT (fine flow)

# Thermally Conductive Adhesives

| | TWO-PART | | | | | | ONE-PART |
|---|---|---|---|---|---|---|---|
| | 8329TCS | 8329TCM | 8329TFS | 8349TFM | 8329TFF | 8329HTC | 9460TC |
| **UNCURED PROPERTIES** | | | | | | | |
| Number of components | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| Mix Ratio by Volume | 1:1 | 1:1 | 1:1 | 1:1 | 1:1 | 1:1 by wt. | — |
| Mixed density [g/mL] | 2.3 | 2.4 | 2.1 | 1.6 | 1.6 | 1.7 | 1.6 |
| Working time | 4 h | 45 min | 4 h | 20 min | 5 min | 80–120 min | Unlimited |
| Room temperature cure [h] | Heat cure | 24 | Heat cure | 16 hours | 4 h | 48 h | Heat cure |
| Heat cure [min @ °C] | 120 @ 65 | 60 @ 65 | 180 @ 65 | 20 @ 65 | 15 @ 65 | 60 @ 65 | 120 @ 80 |
| | 60 @ 80 | 45 @ 80 | 80 @ 80 | 10 @ 80 | 10 @ 80 | 45 @ 80 | 60 @ 100 |
| | 20 @ 100 | 20 @ 100 | 30 @ 100 | — | — | — | 30 @ 120 |
| **CURED PROPERTIES** | | | | | | | |
| Resistivity [Ω·cm] | $2 \times 10^{13}$ | $9 \times 10^{12}$ | $1.0 \times 10^{12}$ | $6.5 \times 10^{12}$ | $7.9 \times 10^{12}$ | $10^{11}$ | $7.4 \times 10^{16}$ |
| Service temperature range [°C] | -40 to 150 | -40 to 150 | -40 to 150 | -65 to 120 | -40 to 150 | -55 to 160 | -65 to 150 |
| Glass transition temperature ($T_g$) [°C] | 8.8 | 46 | 9 | 80 | 25 | 90 | 106 |
| CTE prior $T_g$ [ppm/°C] | 36 | 71 | 47 | 20 | 34 | 60 | 36 |
| CTE after $T_g$ [ppm/°C] | 173 | 131 | 164 | 120 | 146 | 150 | 72 |
| Thermal conductivity @ 25 °C [W/(m·K)] | 1.4 | 1.4 | 1.2 | 0.9 | 0.8 | 0.9 | 0.8 |
| Thermal diffusivity @ 25 °C [$mm^2/s$] | 0.7 | 0.6 | 0.6 | 0.4 | 0.3 | — | 0.5 |
| Specific heat capacity @ 25 °C [J/(g·K)] | 0.9 | 0.9 | 1.0 | 1.4 | 1.4 | — | 1.2 |
| Color | Silver grey | Silver grey | Silver grey | Black | Beige | Gray | White |
| Hardness | 62D | 77D | 68D | 92D | 82D | 86D | 86D |
| Tensile strength [$N/mm^2$] | 11 | 10 | 4.2 | 25 | 13 | 34 | 9.1 |
| Compressive strength [$N/mm^2$] | 43 | 34 | 42 | 115 | 65 | 160 | 78 |
| Lap shear (stainless steel) [$N/mm^2$] | 4.7 | 6.4 | 5.0 | 6.7 | 7.1 | 15 | 6.0 |
| Lap shear (aluminum) [$N/mm^2$] | 4.4 | 6.1 | 6.3 | 4.4 | 8.3 | 17 | 3.2 |
| **AVAILABLE PACKAGING** | | | | | | | |
| Net contents | 6 mL (2 syringe kit) | 6 mL (2 syringe kit) | 25 mL (Dual-syringe) | 25 mL (Dual-syringe) | 25 mL (Dual-syringe) | 50 mL (Dual-cartridge) | 3 mL (Syringe) |
| | 50 mL (2 jar kit) | 50 mL (2 jar kit) | 45 mL (Dual-cartridge) | 45 mL (Dual-cartridge) | 45 mL (Dual-cartridge) | 400 mL (Dual-cartridge) | 10 mL (Syringe) |

# Thermal Pastes



MG Chemicals offers a full line of thermal pastes with a range of operating temperatures and thermal conductivities that enable the end-user to select the best thermal paste based on their needs. When placed between heat-generating components and heat sinks, a thermal paste displaces air pockets, which ensures full contact between the two surfaces, and prevents overheating

## Features & Benefits

- High thermal conductivity
- Non-electrically conductive
- Excellent corrosion resistance
- Thixotropic, non-sagging
- Odorless

## Applications

- Thermal management for computers and game system consoles
- Heat-dissipation for motors and LEDs

## Silicone

860
- Service temperature range of -40 to 200 °C
- Thermal conductivity of 0.7 W/(m·K)

## Silicone-Free

8616
- Service temperature range of -70 to 165 °C
- Thermal conductivity of 2.0 W/(m·K)

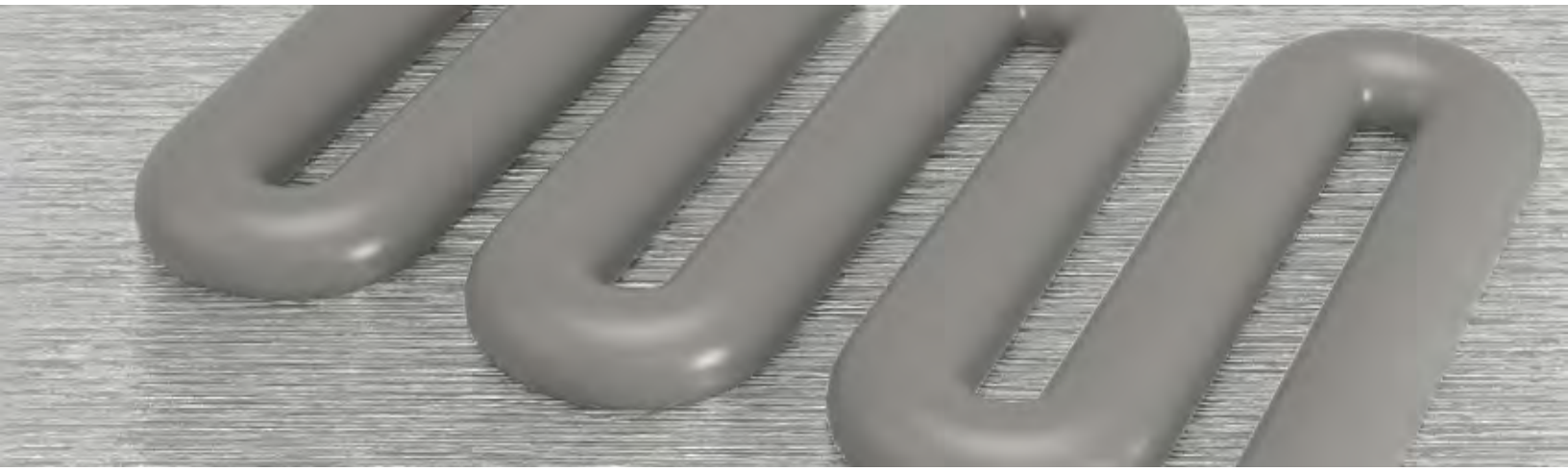
8617A
- Service temperature range of -55 to 200 °C
- Thermal conductivity of 3.0 W/(m·K)

8618
- Service temperature range of -55 to 200 °C
- Thermal conductivity of 6.0 W/(m·K)

# Thermal Pastes

| | SILICONE | SILICONE-FREE | | |
|---|---|---|---|---|
| | 860 | 8616 | 8617A | 8618 |
| **PROPERTIES** | | | | |
| Color | White | White | White | Grey |
| Filler | Zinc oxide | Zinc oxide, alumina, boron nitride | — | — |
| Base Material | Silicone oil | Synthetic oil | Synthetic oil | Synthetic oil |
| Density | 2.4 g/mL | 2.6 g/mL | 2.7 g/mL | 2.4 g/mL |
| Viscosity | 490 Pa·s | 365 Pa·s | 220 Pa·s | 700 Pa·s |
| Resistivity | $1.5 \times 10^{15}$ Ω·cm | $1.8 \times 10^{11}$ Ω·cm | $10^{14}$ Ω·cm | $10^{9}$ Ω·cm |
| Thermal Conductivity @ 25 °C | 0.7 W/(m·K) | 2.0 W/(m·K) | 3.0 W/(m·K) | 6.0 W/(m·K) |
| Dissipation Factor | 0.003 @ 1 000 cps | 0.01 @ 1 000 cps | 0.017 @ 1 kHz | 0.12 @ 1 kHz |
| Service Temperature | -40 to 200 °C | -70 to 165 °C | -55 to 200 °C | -55 to 200 °C |
| **AVAILABLE PACKAGING** | | | | |
| Net contents | 860-4G, 1.7 mL (Pouch) | 8616-3ML, 3 mL (Syringe) | 8617A-3ML, 3 mL (Syringe) | 8618-3ML, 3 mL (Syringe) |
| | 860-60G, 25 mL (Jar) | 8616-25ML, 25 mL (Jar) | 8617A-10ML, 10 mL (Syringe) | 8618-10ML, 10 mL (Syringe) |
| | 860-150G, 62.5 L (Tube) | 8616-85ML, 86 L (Tube) | 8617A-85ML, 85 mL (Tube) | 8618-85ML, 85 mL (Tube) |
| | 860-1P, 470 mL (Jar) | 8616-1P, 483 mL (Jar) | 8617A-300ML, 300 mL (Cartridge) | 8618-300ML, 300 mL (Cartridge) |
| | 860-3.78L, 3.78 L (Pail) | 8616-1G, 3.78 L (Pail) | | |

# Liquid Thermal Gels



MG Chemicals offers 1-part, silicone-free, thermally conductive gels for exceptional thermal management of energy intensive devices. These products have very high thermal conductivity, flame retardancy and an ideal viscosity for form-in-place application.

The low modulus of these gels makes them an ideal material for placing near delicate components or aggressive thermal cycling applications. These gels do not cure so devices can be powered up for use immediately following application.

## Features & Benefits

- Flame retardant—meets UL94 V-0
- Low bond line thickness
- Low modulus—ideal for delicate components
- Wide operating temperature range
- Tack adhesion—does not run
- Reworkable

## Applications

- Bonding heat sinks
- Power semiconductor devices
- Flip chip BGA heat spreaders
- Battery modules and battery packs
- LED lighting, power supplies, telecommunication towers, data servers, PCs for gamers

## Thermal Gels

**8327GL3**

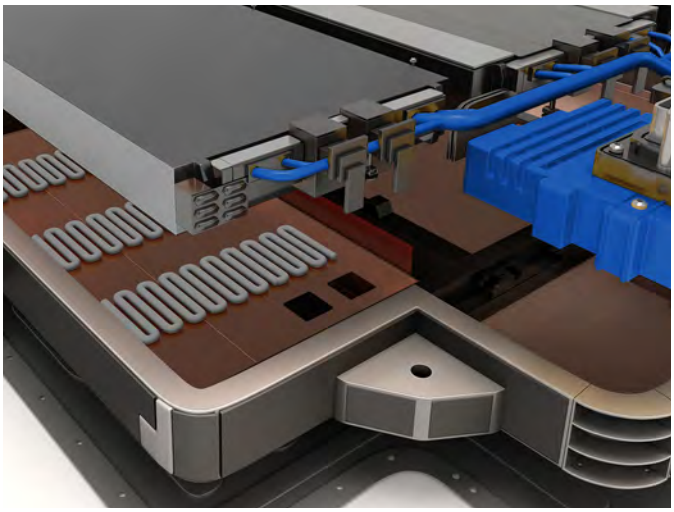
- Thermal conductivity of 3.5 W/(m·K)
- Service temperature range of -55 to 120 °C

**8327GL5**

- Thermal conductivity of 5.1 W/(m·K)
- Service temperature range of -55 to 150 °C

**8327GL6**

- Thermal conductivity of 6.0 W/(m·K)
- Service temperature range of -55 to 120 °C



# Liquid Thermal Gels

| | 8327GL3 | 8327GL5 | 8327GL6 |
|---|---|---|---|
| **PROPERTIES** | | | |
| Color | White | Grey | Grey |
| Density | 2.5 g/mL | 2.3 g/mL | 2.3 g/mL |
| Viscosity | 7 000 Pa·s | 3 500–5 000 Pa·s | 7 000 Pa·s |
| Resistivity | $10^{13}$ Ω·cm | $10^{9}$ Ω·cm | $10^{9}$ Ω·cm |
| Thermal Conductivity @ 25 °C | 3.5 W/(m·K) | 5.1 W/(m·K) | 6.0 W/(m·K) |
| Breakdown Volage @ 2.2 mm | 14 000 V | 3 200 V | 3 200 V |
| Dissipation Factor @ 1 kHz | 0.005 | 0.005 | 0.005 |
| Service Temperature | -55 to 120 °C | -55 to 150 °C | -55 to 120 °C |
| Intermittent Temperature | 150 °C | 180 °C | 150 °C |
| **AVAILABLE PACKAGING** | | | |
| Net contents | | | |
| | 26.4 mL (Cartridge) | 28.7 mL (Cartridge) | 28.7 mL (Cartridge) |
| | 117 mL (Cartridge) | 127 mL (Cartridge) | 127 mL (Cartridge) |