Thermal Solutions

P-THERM® Thermal Management Solutions for the Electric Vehicle and Solar Power Industries

POLYMER SCIENCE, INC.

Custom Solutions

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ISO 9001:2015

Our Solutions

P-THERM® Gap Fillers

Polymer Science is dedicated to being the most innovative thermal management material supplier in the world. We are excited to launch our newly formulated, improved performance P-THERM® thermal gap filler materials. These new products are available in 1 - 3 W/m K with hyper-soft, ultra soft and soft versions for a variety of compression characteristics to decrease thermal resistance. Our new gap fillers offer many features that are required in today's evolving markets including:

- Economical and more cost effective
- Low outgassing
- Low leaching

P-THERM® Phase Change Materials

PS-1595 is thermally conductive and performs like a thermal grease with the convenience of a thermal pad. At 55°C materials begin to soften and flow, filling in irregular areas of the thermal interface surfaces reducing the natural thermal resistance. PS-1595 is corrosion resistant and has excellent converting properties.

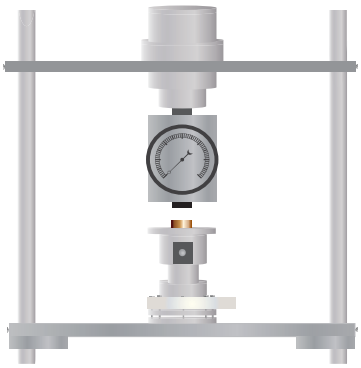
P-THERM® Flame Barrier Products

P-THERM® gap fillers are highly customizable and can be laminated with flame barrier products making them ideal for use in electric vehicles. Our flame barrier products feature excellent electric and dielectric properties and have a proven reliability for a wide range of electrical insulation applications.

Thermal Properties and Test Methods

Durometer Testing

Durometer, like many other hardness tests, measures the depth of an indentation in the material created by a given force on a standardized presser foot. This depth is dependent on the hardness of the material, its viscoelastic properties, the shape of the presser foot, and the duration of the test. ASTM D2240 durometers allow for a measurement of the initial hardness or the indentation hardness after a given period of time. The basic test requires applying the force in a consistent manner, perpendicular to the surface being tested without shock, and measuring the hardness (depth of the indentation). If a timed hardness is desired, force is applied for the required time and then read.

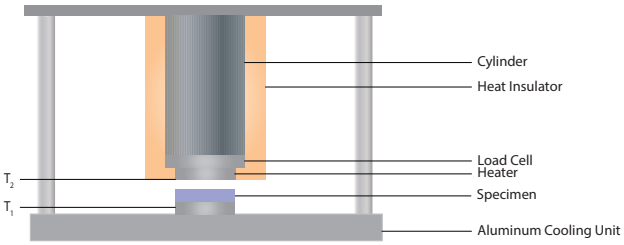


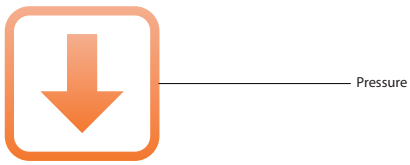
Thermal Resistance - Standard

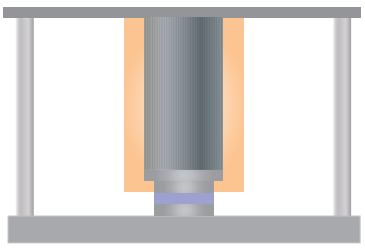
Thermal resistance by definition is a heat property or a measurement of a temperature difference by which an object or material resists a heat flow. Thermal resistance is the reciprocal of thermal conductance.

$$Rt = \frac{T_2 - T_1}{Q} \cdot A = \frac{L}{k}$$

Rt = Thermal Resistance (K m^2/W)
T_1 = Cooling Plate Temperature (K)
T_2 = Heater Temperature(K)
Q = Heat Flow (W)
A = Area of the Compressed Specimen (m^2)
L = Thickness of Specimen (m)
k = Thermal Conductivity (W/m K)







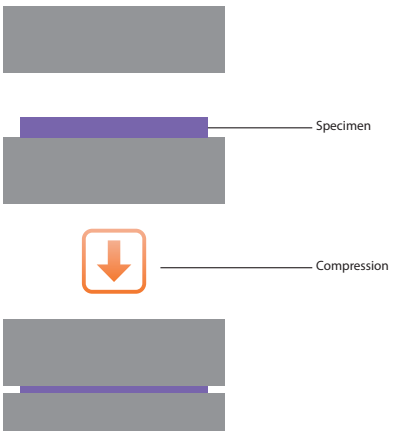
*The measurement by the load.

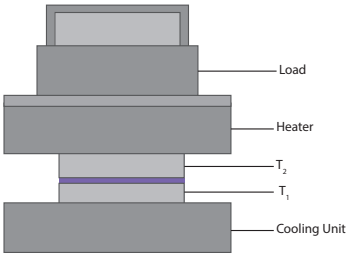
Thermal Conductivity - Modified

Thermal Conductivity - ASTM D5470

$$k = \frac{t_2 - t_1}{R_{t2} - R_{t1}}$$

k = Thermal Conductivity (W/m K)
t_2 = Thickness of Specimen 2 (m)
($t_2 > t_1$)
t_1 = Thickness of Specimen 1 (m)
R_{t2} = Thermal Resistance of Specimen 2 (K m^2/W)
R_{t1} = Thermal Resistance of Specimen 1 (K m^2/W)

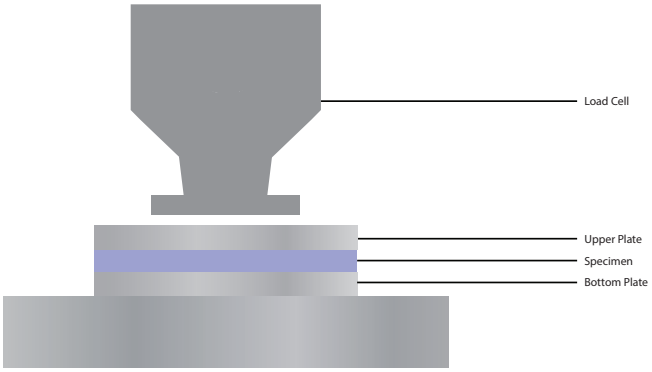




*The measurement by the quantity of compression.

Compression Force

ASTM D575 test method A is a procedure for determining the compression-deflection of rubber compounds (except hard rubber and sponge rubber). ASTM D575 test method A is a compression test in which the force required to cause a specified deflection is determined. Deflection can be described as the change in thickness of the specimen upon application of a compressive force.



PS-1511

Product Description:

P-THERM® PS-1511 is a hyper-soft silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

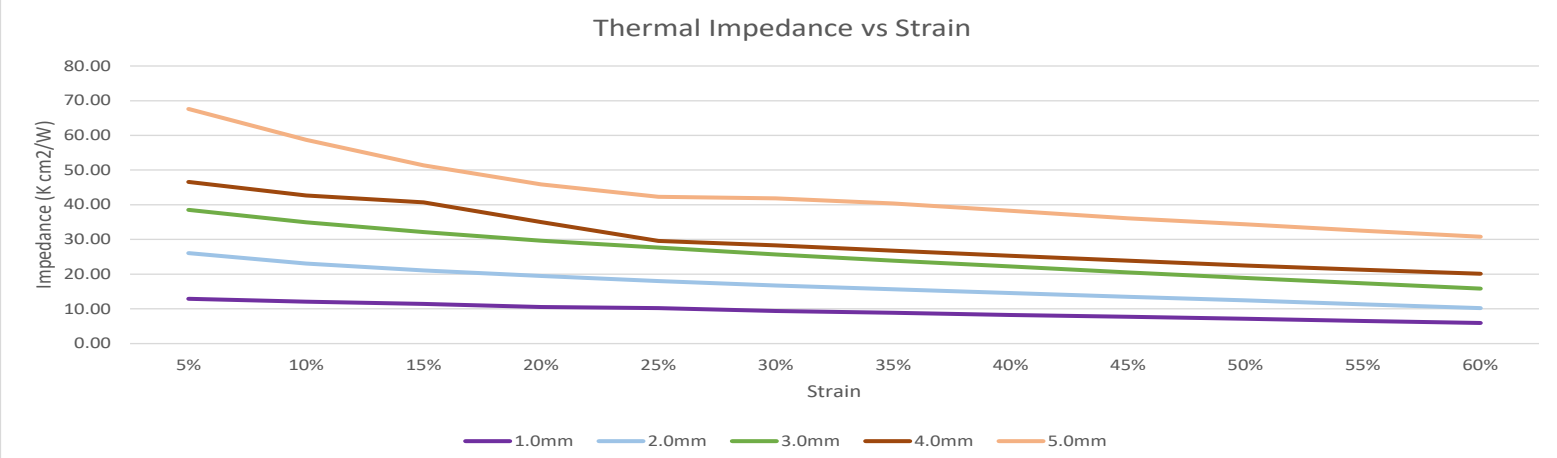
Construction / Properties:

	Property	Value	Test Method
General	Color	Gray	Visual
	Thickness Range	0.5 mm - 5.0 mm	ASTM D374
	Reinforcement Carrier Type	Fiberglass	--
	Density (g/cc)	1.21	ASTM D792
	Heat Capacity (J/g K) @ 50 C	1.43	ASTM E1269
	Hardness (Shore 00)	<0	ASTM D2240
	Total Mass Loss (@ 125 C/24 hrs)	0.19%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	-60 - 200 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	8.66	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+18	ASTM D257

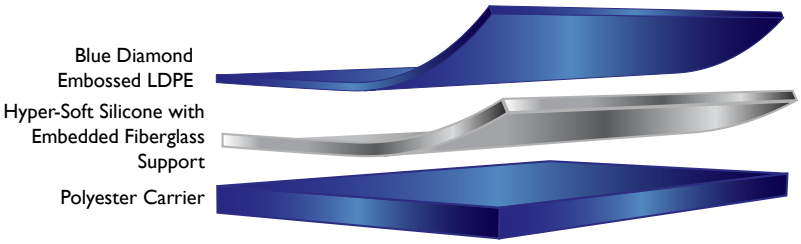
	Property	Value			Test Method
Thermal	Thermal Conductivity	1 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm²/W) @ 1mm	12.08	10.56	9.41	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



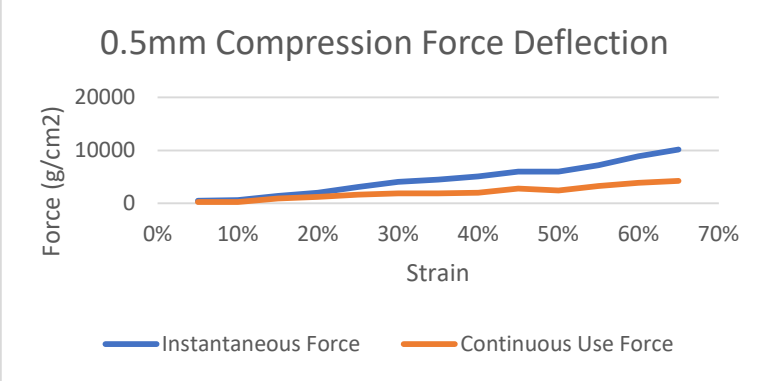
Features:

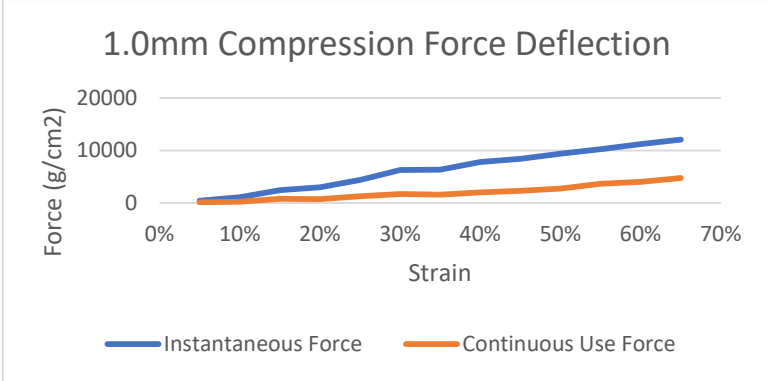
- Good Thermal Conductivity
- Excellent Compression Characteristics
- Excellent Wet-Out
- Superb Flexibility
- Excellent Converting Properties
- RoHS and HF Compliant

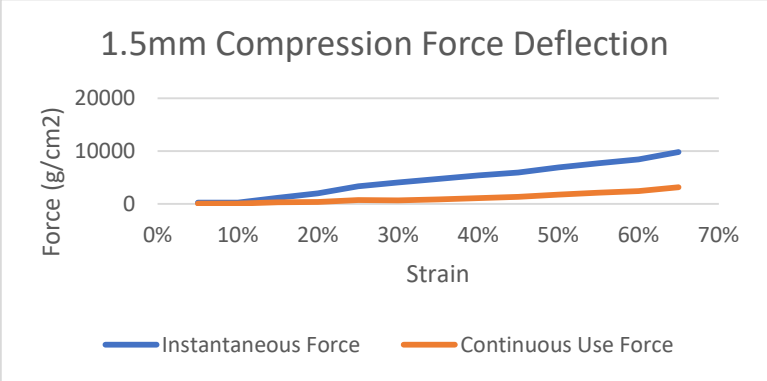


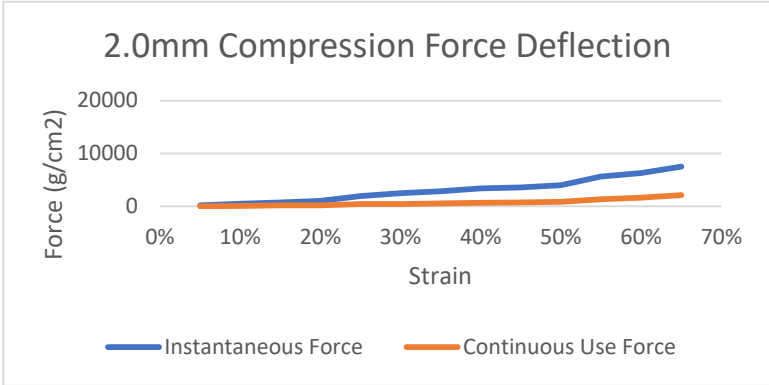
Applications:

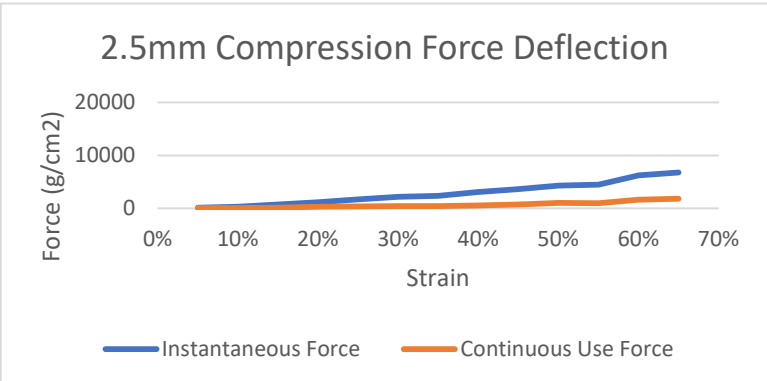
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

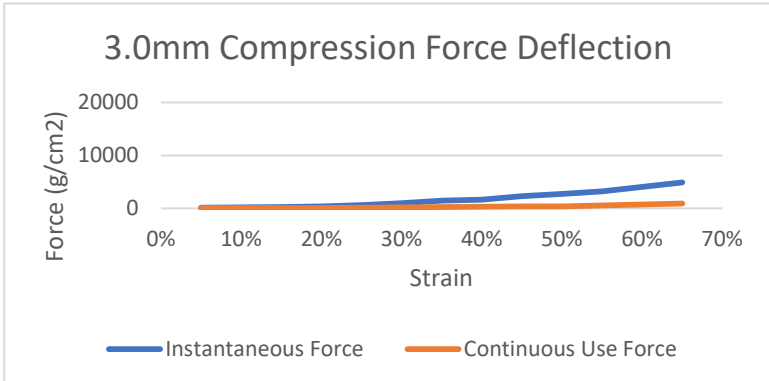












PS-1513

Product Description:

P-THERM® PS-1513 is a hyper-soft silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

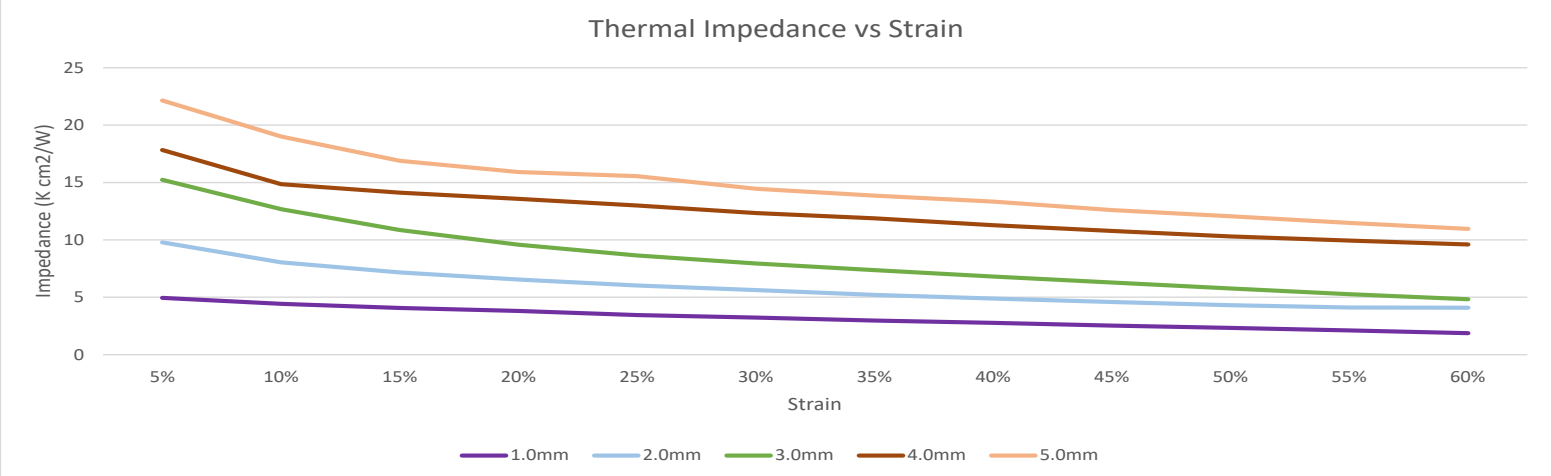
Construction / Properties:

	Property	Value	Test Method
General	Color	Green	Visual
	Thickness Range	0.5 mm - 5.0 mm	ASTM D374
	Reinforcement Carrier Type	Fiberglass	--
	Density (g/cc)	2.51	ASTM D792
	Heat Capacity (J/g K) @ 50 C	0.84	ASTM E1269
	Hardness (Shore 00)	14	ASTM D2240
	Total Mass Loss (@ 125 C/24 hrs)	0.06%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	-60 - 200 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	9.88	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+18	ASTM D257

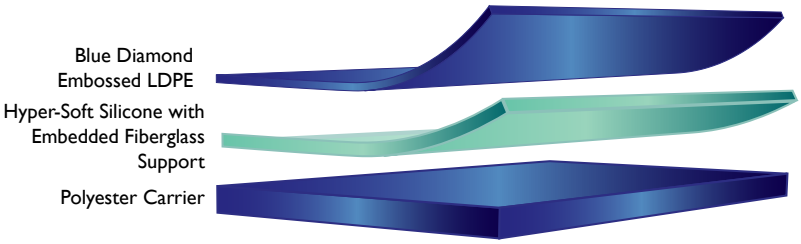
	Property	Value			Test Method
Thermal	Thermal Conductivity	3 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm²/W) @ 1mm	4.42	3.81	3.23	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



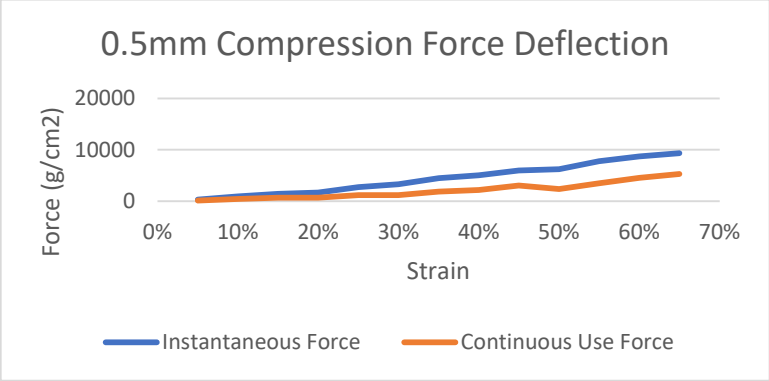
Features:

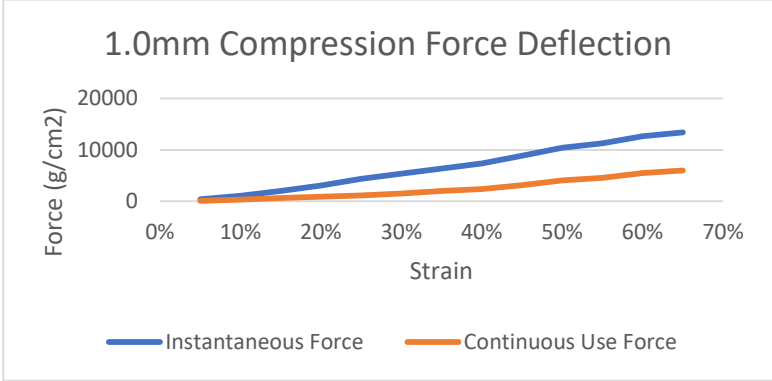
- Good Thermal Conductivity
- Excellent Compression Characteristics
- Excellent Wet-Out
- Superb Flexibility
- Excellent Converting Properties
- RoHS and HF Compliant

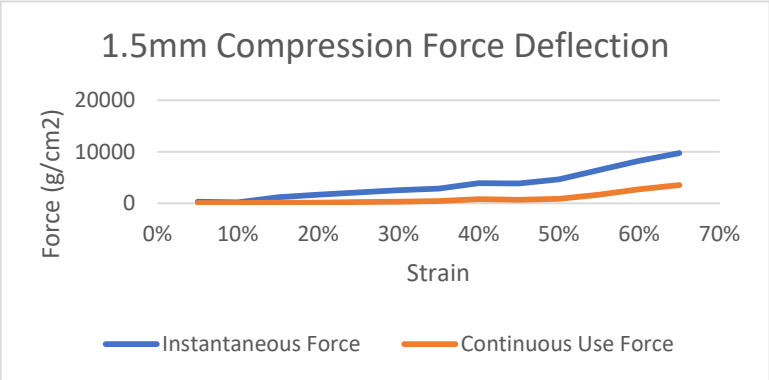


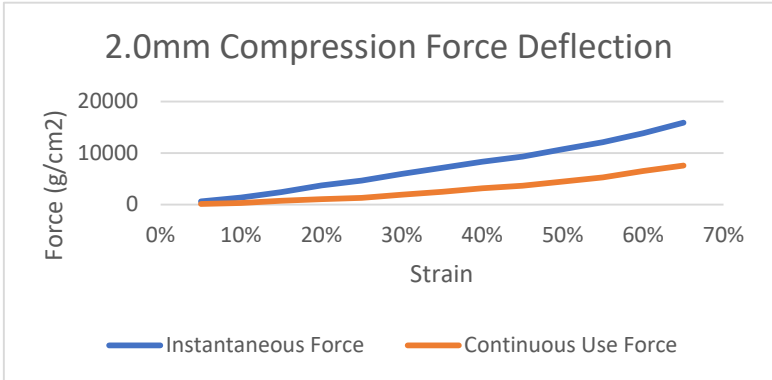
Applications:

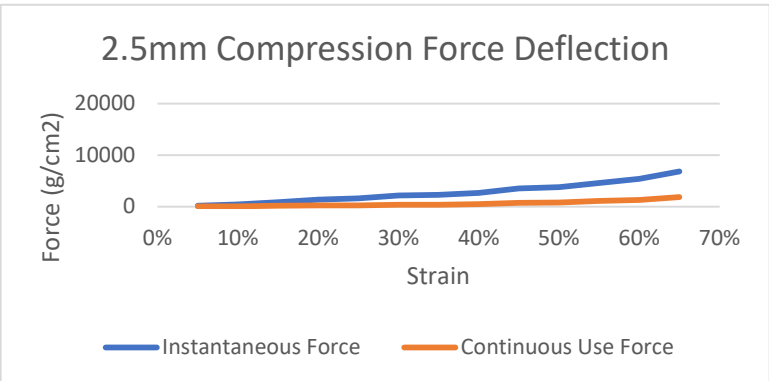
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

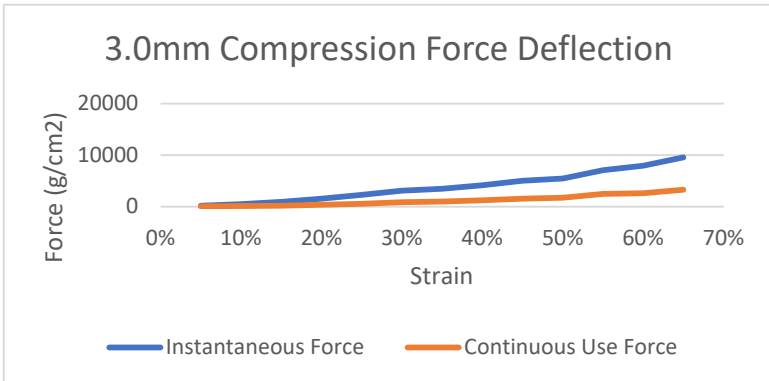












PS-2505

Product Description:

P-THERM® PS-2505 is a soft silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

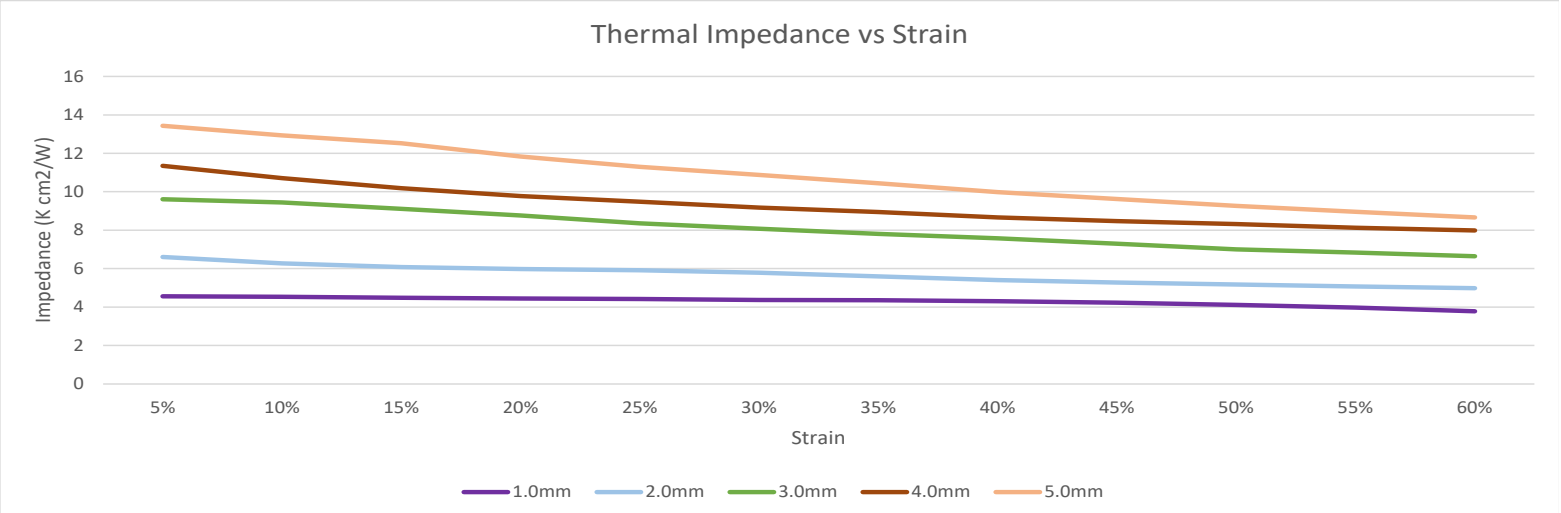
Construction / Properties:

	Property	Value	Test Method
General	Color	Light Gold	Visual
	Thickness Range	0.5 mm - 5.0 mm	ASTM D374
	Reinforcement Carrier Type	Fiberglass	--
	Density (g/cc)	2.77	ASTM D792
	Heat Capacity (J/g K) @ 50 C	0.84	ASTM E1269
	Hardness (Shore 00)	54	ASTM D2240
	Total Mass Loss (@ 125 C/24 hrs)	0.13%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	-60 - 200 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	18.00	ASTM D149
	Volume Resistivity (ohm-cm)	1.0E+12	ASTM D257

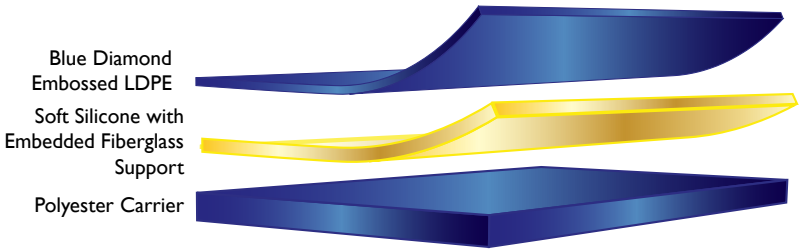
	Property	Value			Test Method
Thermal	Thermal Conductivity	5 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm²/W) @ 1mm	4.54	4.45	4.37	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



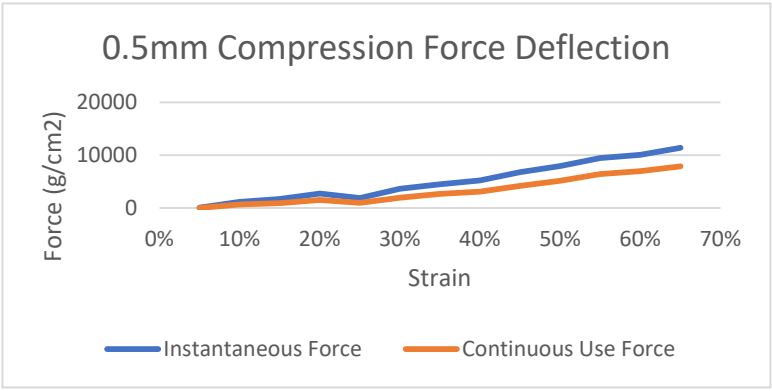
Features:

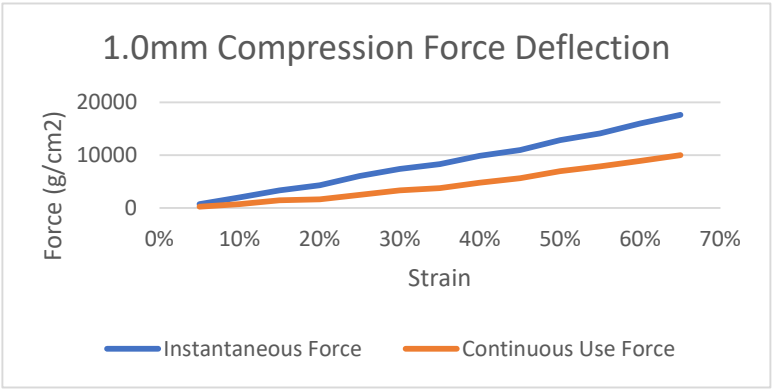
- Superior Thermal Conductivity
- Excellent Compression Characteristics
- Excellent Wet-Out
- Superb Flexibility
- Excellent Converting Properties
- RoHS and HF Compliant

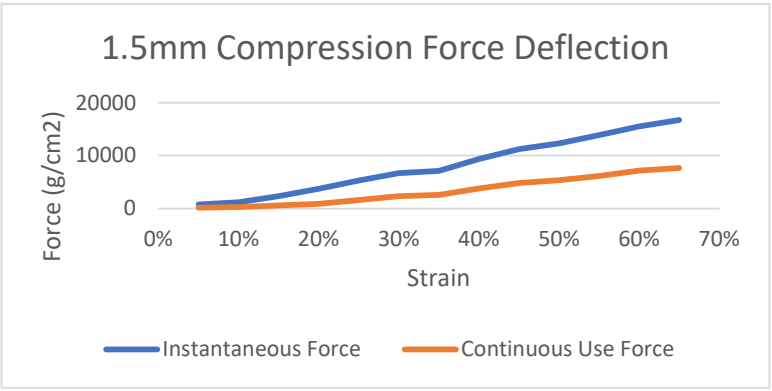


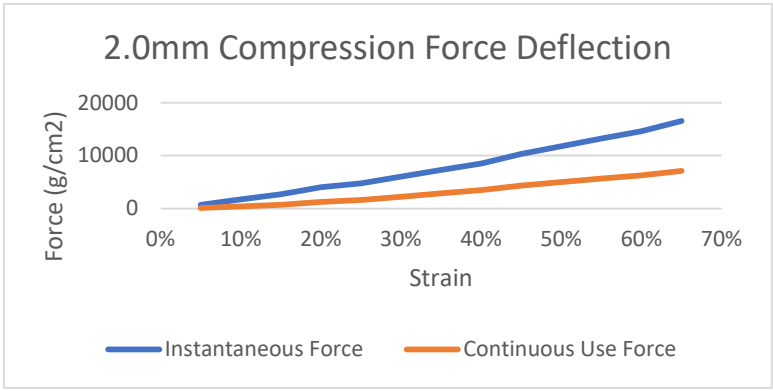
Applications:

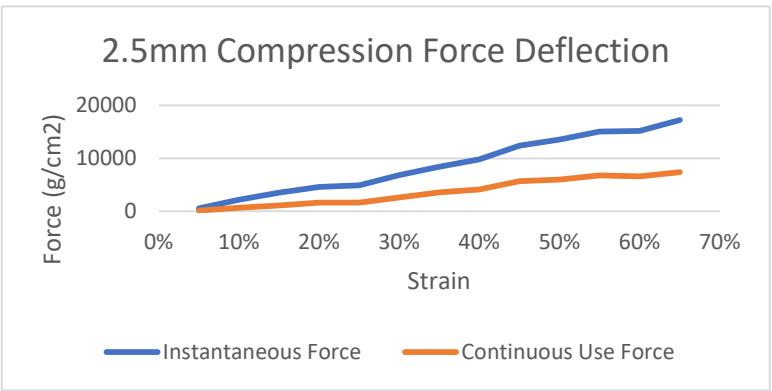
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

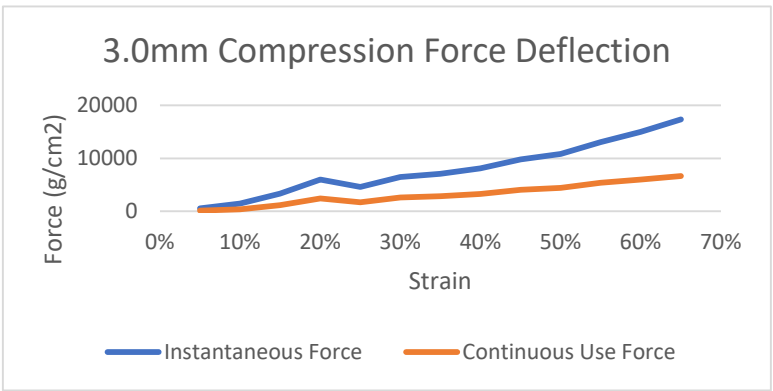












PS-2622

Product Description:

P-THERM® PS-2622 is a soft silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

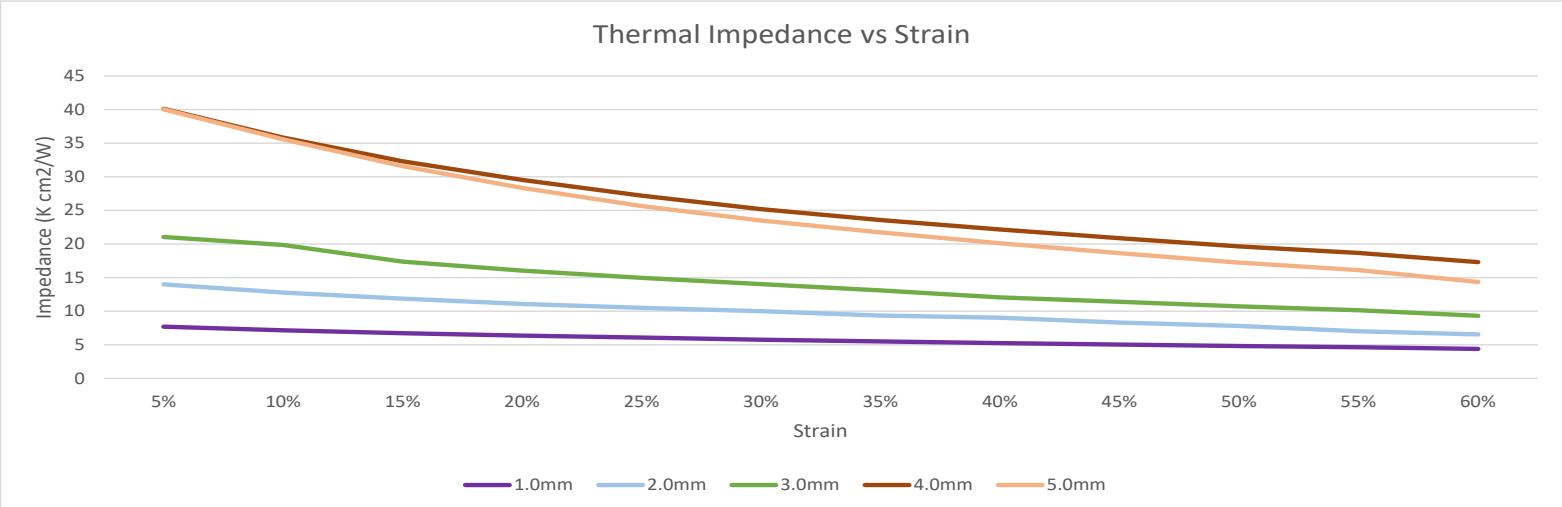
Construction / Properties:

	Property	Value	Test Method
General	Color	Light Blue	Visual
	Thickness Range	0.5 mm - 5.0 mm	ASTM D374
	Reinforcement Carrier Type	Fiberglass	--
	Density (g/cc)	1.67	ASTM D792
	Heat Capacity (J/g K) @ 50 C	0.78	ASTM E1269
	Hardness (Shore 00)	29	ASTM D2240
	Total Mass Loss (@ 125 C/24 hrs)	0.06%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	-60 - 200 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	17.00	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+10	ASTM D257

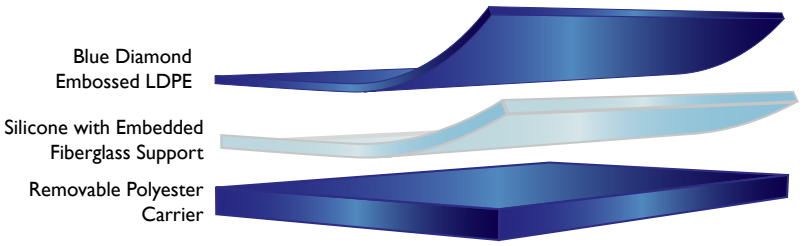
	Property	Value			Test Method
Thermal	Thermal Conductivity	1.8 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm²/W) @ 1mm	7.17	6.36	5.77	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



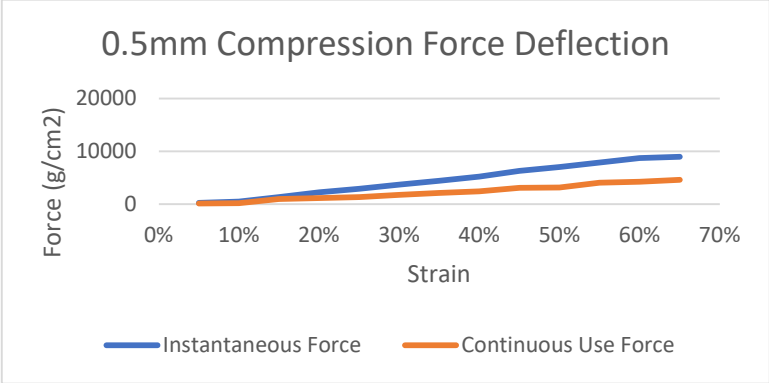
Features:

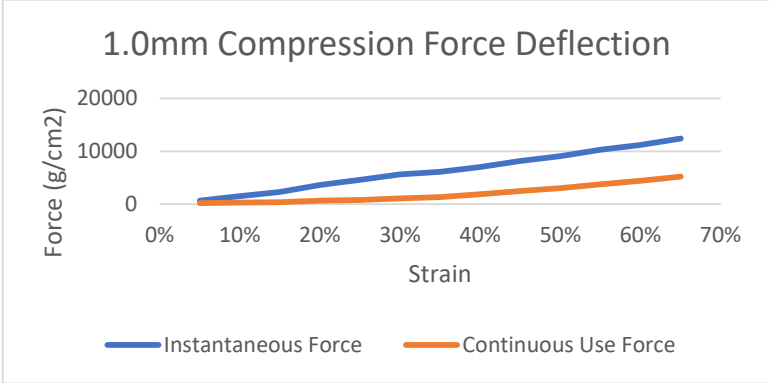
- Excellent Compression Characteristics
- Excellent Wet-Out
- Excellent Converting Properties
- RoHS and HF Compliant

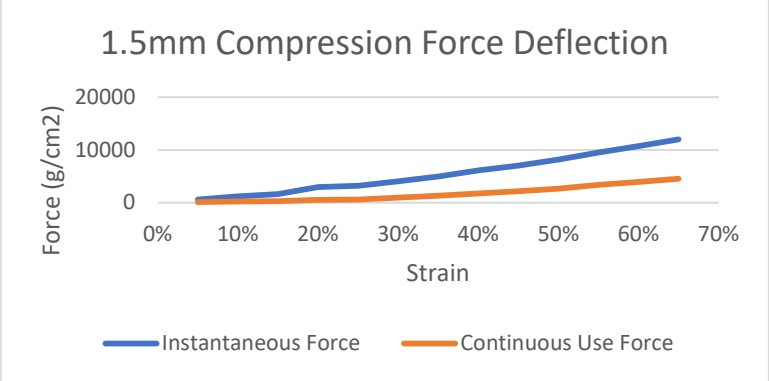


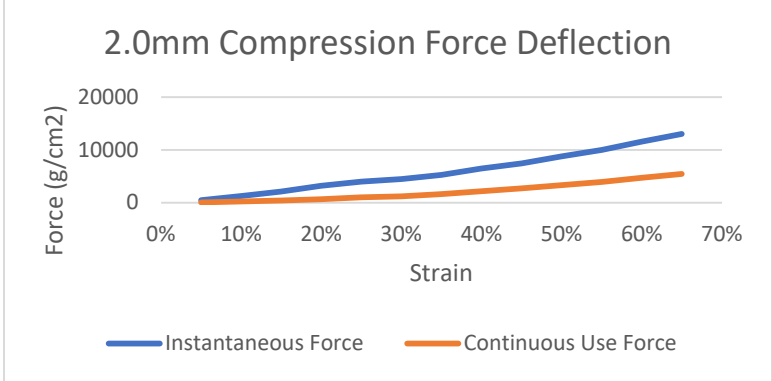
Applications:

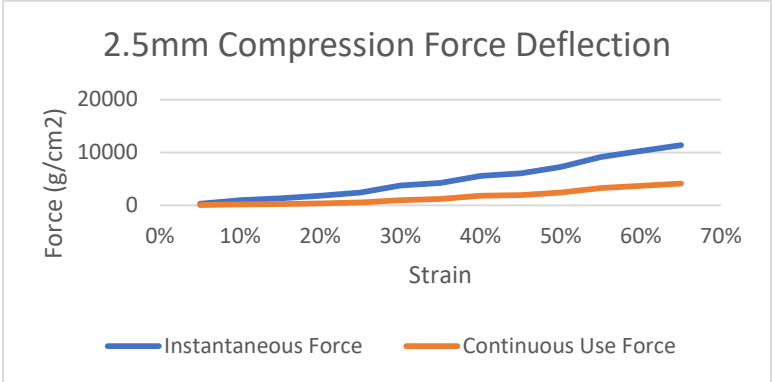
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

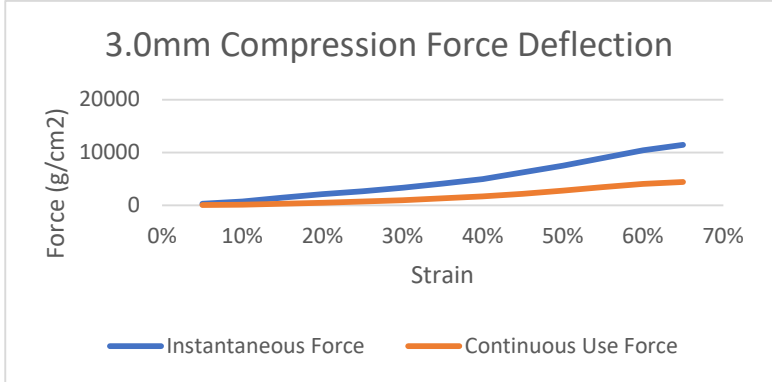












PS-2641

Product Description:

P-THERM® PS-2641 is a silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

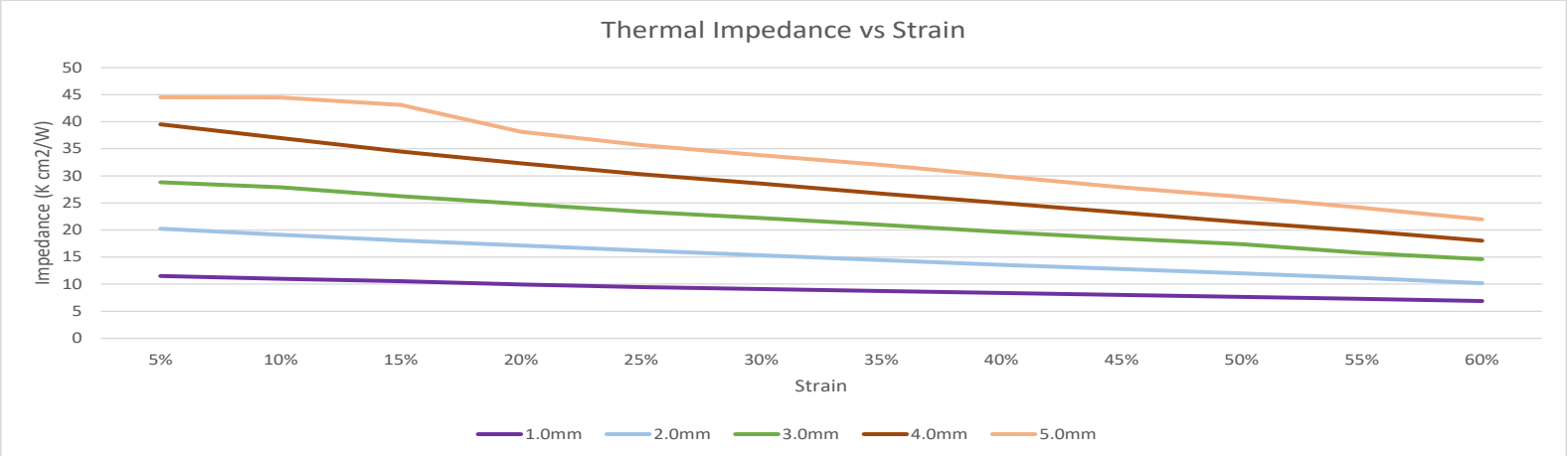
Construction / Properties:

	Property	Value	Test Method
General	Color	Gray	Visual
	Thickness Range	0.5 mm - 5.0 mm	ASTM D374
	Reinforcement Carrier Type	Fiberglass	--
	Density (g/cc)	1.82	ASTM D792
	Heat Capacity (J/g K) @ 50 C	0.97	ASTM E1269
	Hardness (Shore 00)	22	ASTM D2240
	Total Mass Loss (@ 125 C/24 hrs)	0.15%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	-60 - 200 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	12.00	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+09	ASTM D257

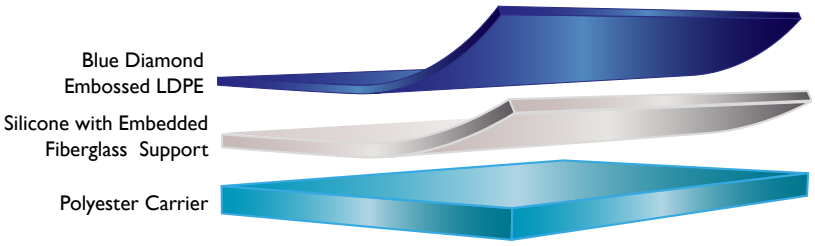
	Property	Value			Test Method
Thermal	Thermal Conductivity	1 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm²/W) @ 1mm	10.99	9.94	9.08	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



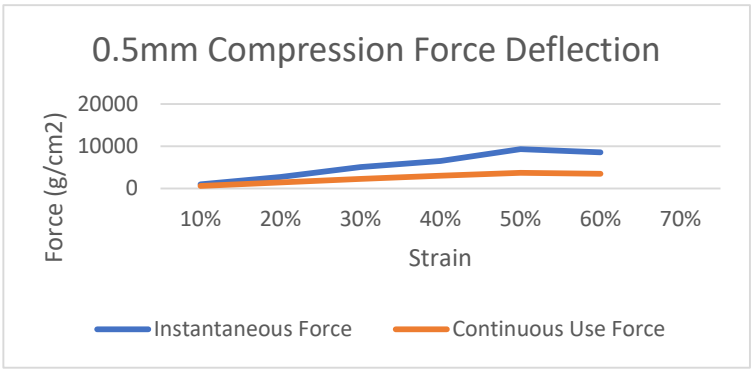
Features:

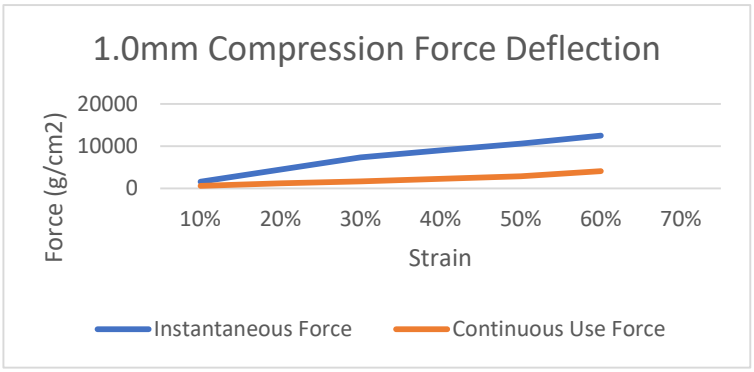
- Good Thermal Conductivity
- Excellent Compression Characteristics
- Excellent Wet-Out
- Superb Flexibility
- Excellent Converting Properties
- RoHS and HF Compliant

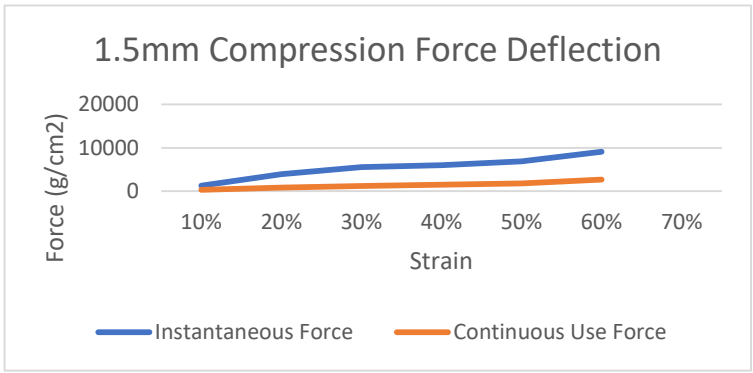


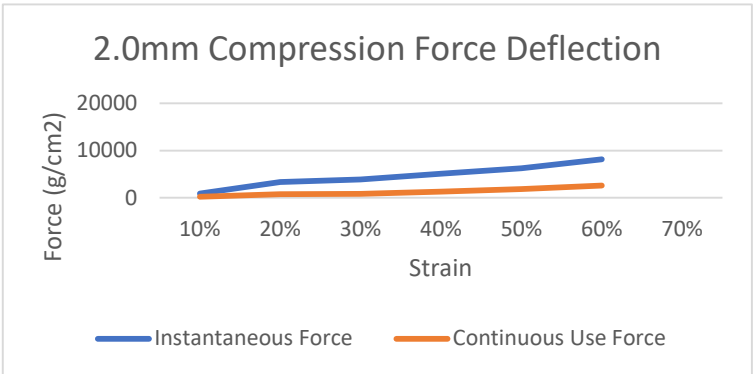
Applications:

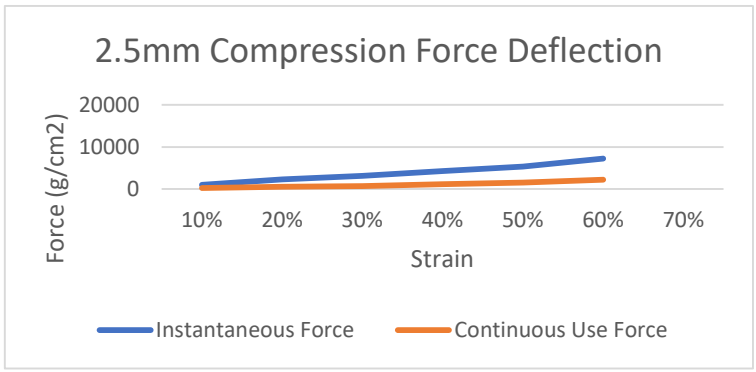
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

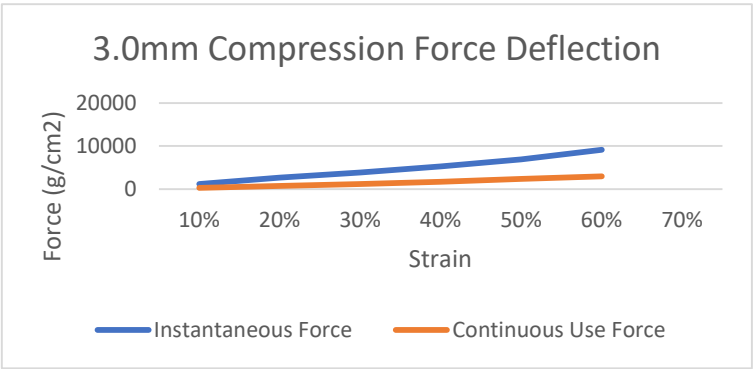












PS-2642

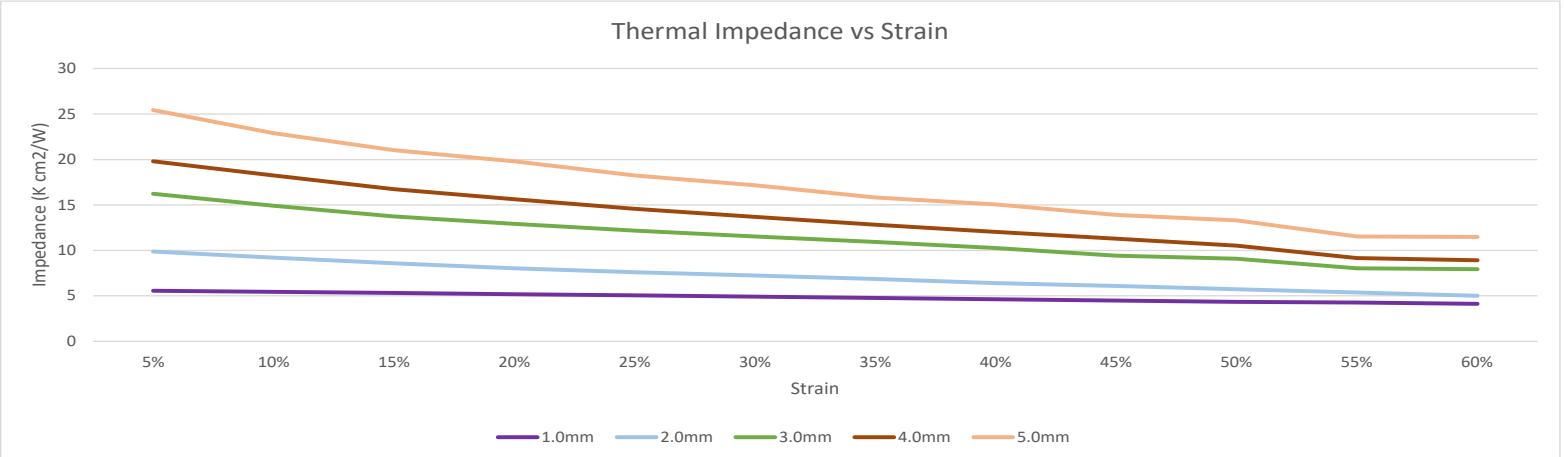
Product Description:

P-THERM® PS-2642 is a silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

Construction / Properties:

	Property	Value			Test Method
General	Color	Blue			Visual
	Thickness Range	0.5 mm - 5.0 mm			ASTM D374
	Reinforcement Carrier Type	Fiberglass			--
	Density (g/cc)	2.43			ASTM D792
	Heat Capacity (J/g K) @ 50 C	1.08			ASTM E1269
	Hardness (Shore 00)	47			ASTM D2240
	Total Mass Loss (@ 125 C/24 hrs)	0.08%			ASTM E595**
	Flammability Rating	V-0			UL 94
	Continuous Use Conditions	-60 - 200 C			QSP-754
Electrical	**Property**	**Value**			**Test Method**
	Dielectric Breakdown Strength (kV/mm)	20.00			ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+11			ASTM D257
Thermal	**Property**	**Value**			**Test Method**
	Thermal Conductivity	2 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm²/W) @ 1mm	5.45	5.18	4.91	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



Features:

- Good Thermal Conductivity
- Excellent Compression Characteristics
- Excellent Wet-Out
- Superb Flexibility
- Excellent Converting Properties
- RoHS and HF Compliant
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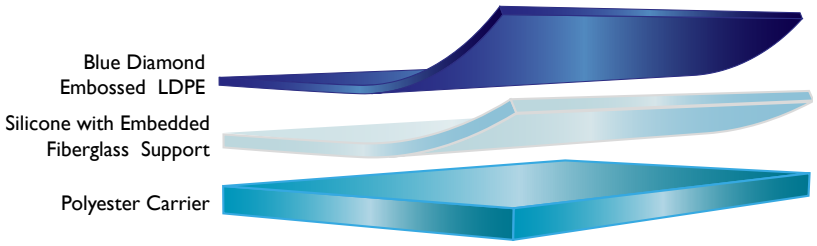
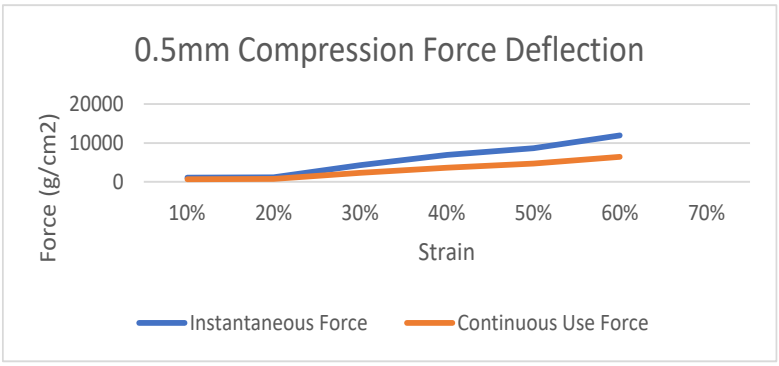
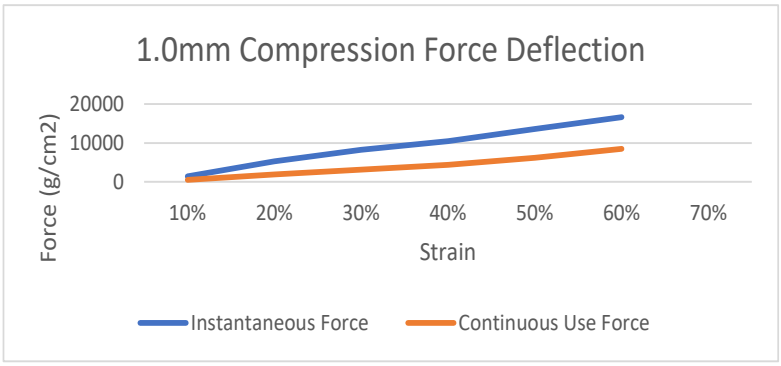
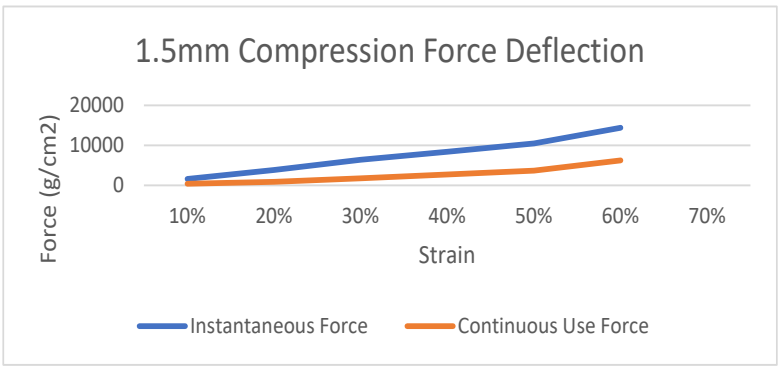


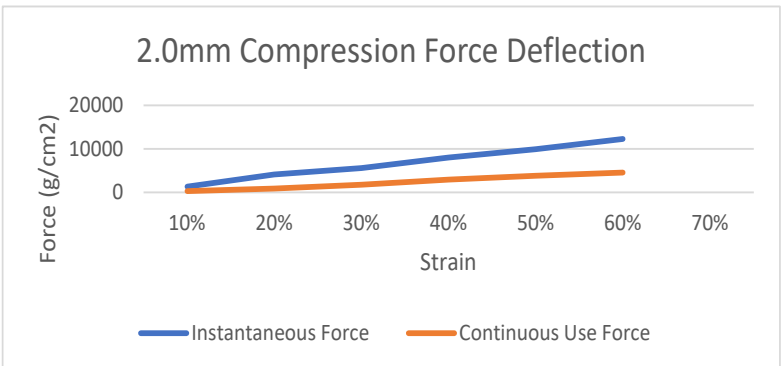
Applications:

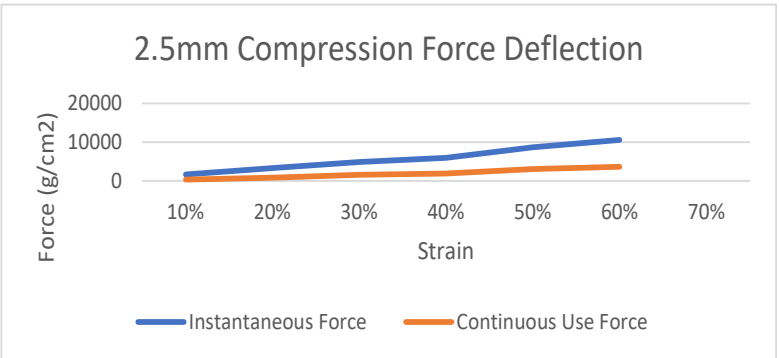
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

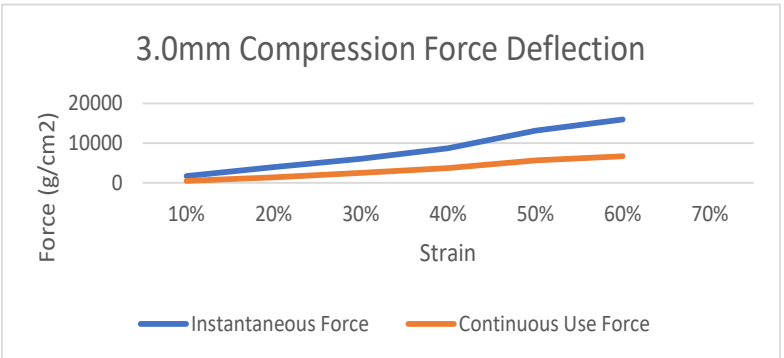












PS-2643

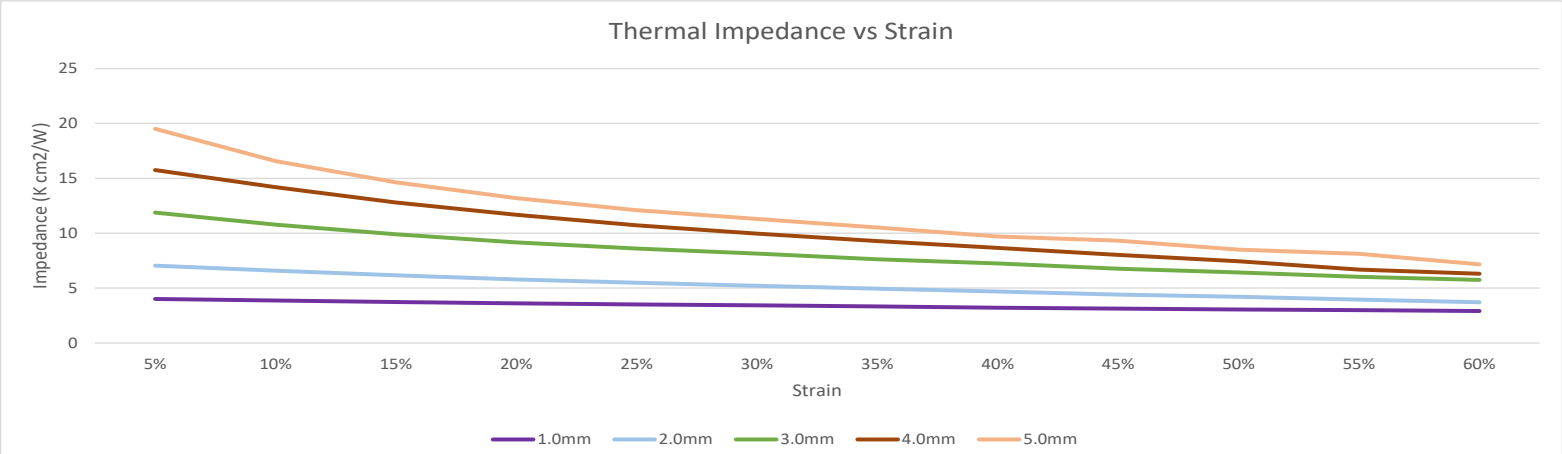
Product Description:

P-THERM® PS-2643 is a silicone based thermally conductive gap filler with an embedded fiberglass support and 125 micron removable polyester carrier.

Construction / Properties:

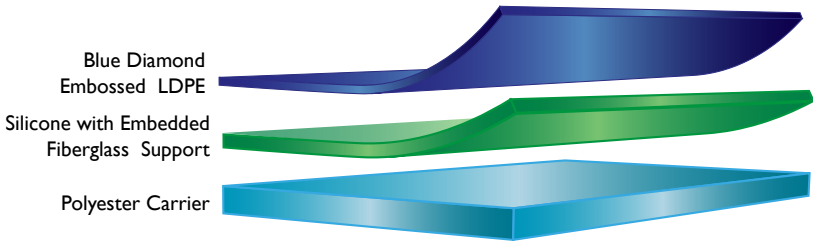
	Property	Value			Test Method
General	Color	Green			Visual
	Thickness Range	0.5 mm - 5.0 mm			ASTM D374
	Reinforcement Carrier Type	Fiberglass			--
	Density (g/cc)	2.73			ASTM D792
	Heat Capacity (J/g K) @ 50 C	0.66			ASTM E1269
	Hardness (Shore 00)	41			ASTM D2240
	Total Mass Loss (@125 C/24 hrs)	0.09%			ASTM E595**
	Flammability Rating	V-0			UL 94
	Continuous Use Conditions	-60 - 200 C			QSP-754
Electrical	**Property**	**Value**			**Test Method**
	Dielectric Breakdown Strength (kV/mm)	13.00			ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+11			ASTM D257
Thermal	**Property**	**Value**			**Test Method**
	Thermal Conductivity	3 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm^2/W) @ 1mm	3.87	3.62	3.43	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.



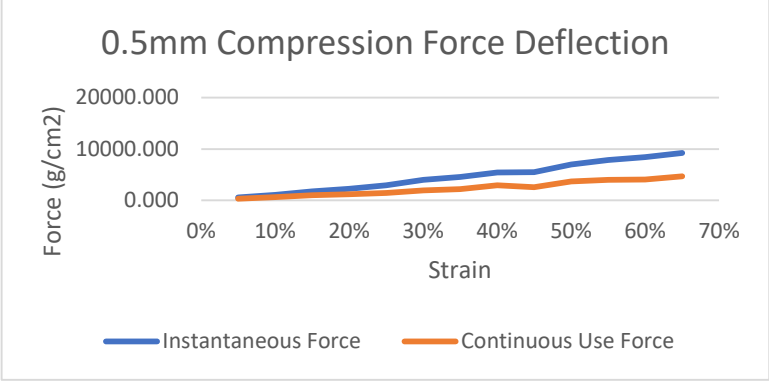
Features:

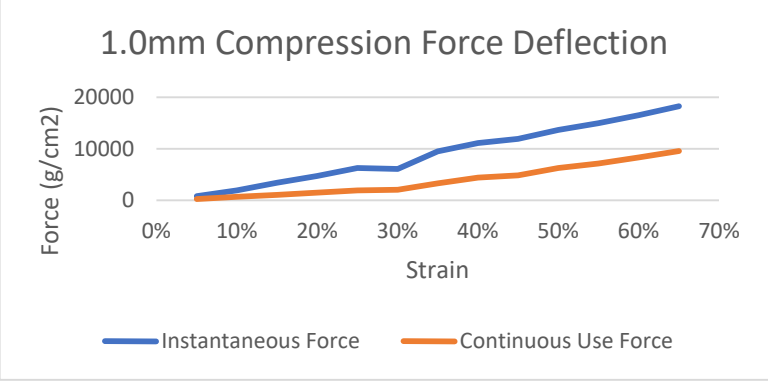
- Excellent Thermal Conductivity
- Excellent Compression Characteristics
- Good Wet-Out
- Superb Flexibility
- Excellent Converting Properties
- RoHS and HF Compliant

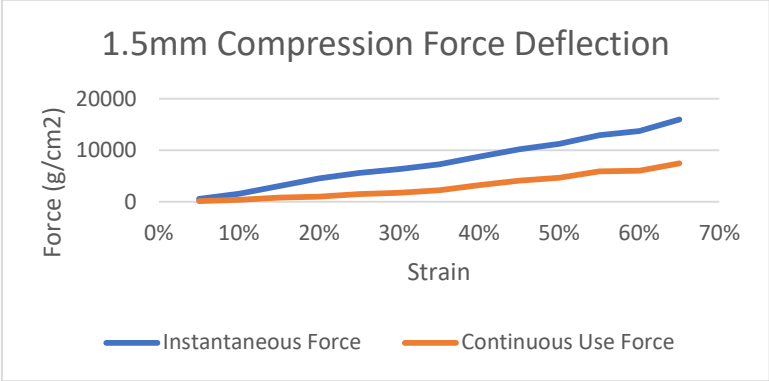


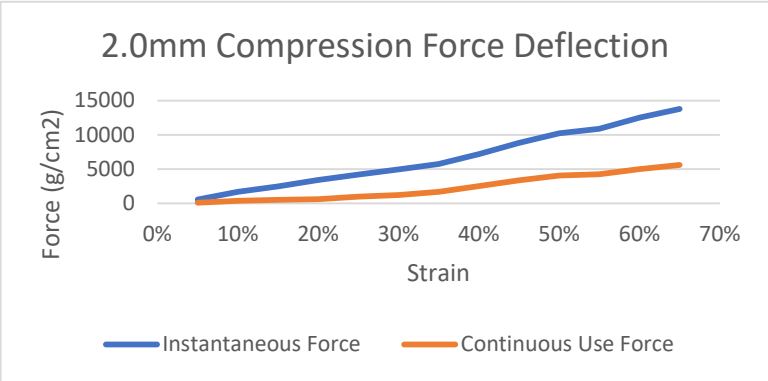
Applications:

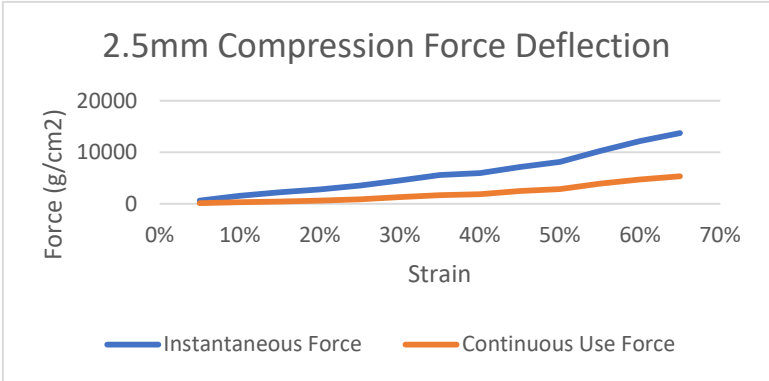
- LED Lighting
- Battery Components
- Infotainment Modules
- Smartphones
- Tablets
- Computers
- Digital Personal Assistants
- Automotive Lighting

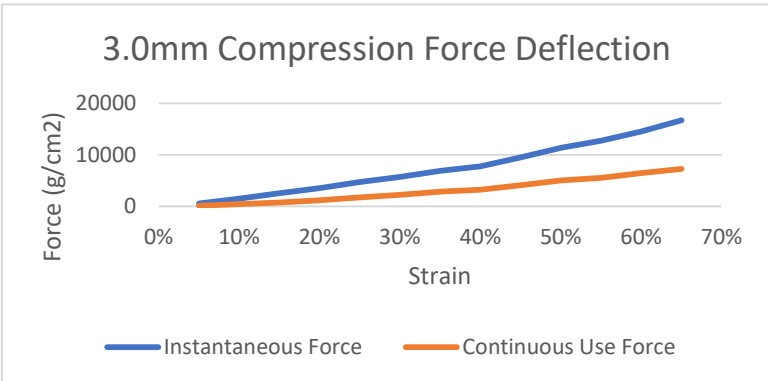












PS-1595

Product Description:

P-THERM® PS-1595 is a non-silicone, thermally conductive tacky phase change material with a siliconized paper release liner.

Construction / Properties:

	Property	Value	Test Method
General	Color	Yellow	Visual
	Thickness Range	0.25 mm	ASTM D374
	Carrier Type	--	--
	Density (g/cc)	2.39	ASTM D792
	Heat Capacity (J/g K) @ 50 C	1.09	ASTM E1269
	Hardness (Shore 00)	--	ASTM D2240
	Total Mass Loss (@125 C/24 hrs)	1.00%	ASTM E595**
	Phase Change Temperature	55 C	UL 94
	Continuous Use Conditions	-25 - 125 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	15.03	ASTM D149
	Volume Resistivity (ohm-cm)	--	ASTM D257

	Property	Value			Test Method
Thermal	Thermal Conductivity	4 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm^2/W) @ 0.25mm	3.48	2.07	1.72	

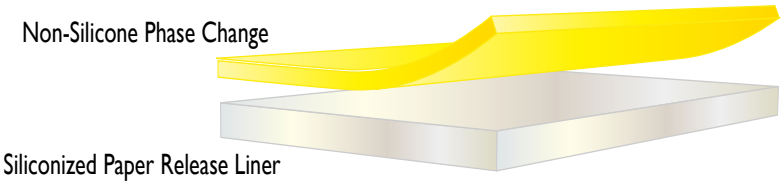
* Thermal conductivity tested at 20% strain.

** Tested at atmospheric pressure

*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.

Features:

- High Temperature Resistance
- Low Stress on Components
- Shock Absorbing
- Low VOC
- RoHS and HF Compliant



Applications:

- Gaming Systems
- Battery Components
- Solar Panels
- Infotainment and Navigation Systems
- Smartphones
- Tablets
- Computers

PS-1522

Product Description:

P-THERM® PS-1522 is a double coated, thermally conductive polyurethane coating on a polyester carrier designed to offer good dielectric and thermal conductivity without the worry of flow from wax-based products or mess associated with thermal grease. The polyurethane coating is formulated to feel dry to the touch while offering natural tack to mitigate movement during assembly. PS-1522 is supplied with a polyester carrier.

Construction / Properties:

	Property	Value	Test Method
General	Color	White	Visual
	Thickness Range	0.15 mm	ASTM D374
	Carrier Type	Polyester	--
	Density (g/cc)	1.61	ASTM D792
	Heat Capacity (J/g K) @ 50 C	1.05	ASTM E1269
	Hardness (Shore 00)	--	ASTM D2240
	Total Mass Loss (@125 C/24 hrs)	0.18%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	0 - 165 C	QSP-754

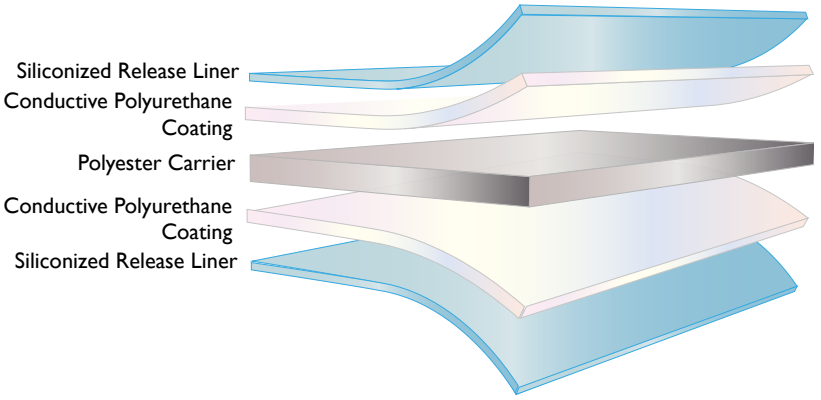
	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	110.00	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+16	ASTM D257

	Property	Value			Test Method
Thermal	Thermal Conductivity	0.4 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm^2/W) @ 0.15mm	125.54	120.40	114.89	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.

Features:

- Non-Silicone
- High Temperature Resistance
- Low Stress on Components
- Shock Absorbing
- Low VOC
- RoHS and HF Compliant



Applications:

- Televisions
- Automotive Electronics
- Consumer Electronics
- Power Semiconductor Devices

PS-1523

Product Description:

P-THERM® PS-1523 is a double coated, thermally conductive polyurethane coating on a polyimide carrier designed to offer good dielectric and thermal conductivity without the worry of flow from wax-based products or mess associated with thermal grease. The polyurethane coating is formulated to feel dry to the touch while offering natural tack to mitigate movement during assembly. PS-1523 is supplied with a polyimide carrier.

Construction / Properties:

	Property	Value	Test Method
General	Color	Tan	Visual
	Thickness Range	0.15 mm	ASTM D374
	Carrier Type	Polyimide	--
	Density (g/cc)	1.36	ASTM D792
	Heat Capacity (J/g K) @ 50 C	1.14	ASTM E1269
	Hardness (Shore 00)	--	ASTM D2240
	Total Mass Loss (@125 C/24 hrs)	0.42%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	0 - 165 C	QSP-754

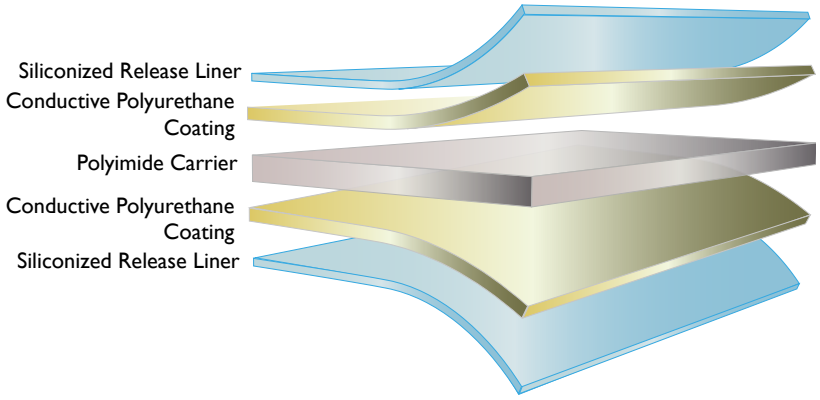
	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	69.00	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+16	ASTM D257

	Property	Value			Test Method
Thermal	Thermal Conductivity	0.75 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm^2/W) @ 0.05mm	145.14	138.5	127.91	

* Thermal conductivity tested at 20% strain.
** Tested at atmospheric pressure
*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.

Features:

- Non-Silicone
- High Temperature Resistance
- Low Stress on Components
- Shock Absorbing
- Low VOC
- RoHS and HF Compliant



Applications:

- Televisions
- Automotive Electronics
- Consumer Electronics
- Power Semiconductor Devices

PS-1524

Product Description:

P-THERM® PS-1524 is a double coated, thermally conductive polyurethane coating on a fiberglass carrier designed to offer good dielectric and thermal conductivity without the worry of flow from wax-based products or mess associated with thermal grease. The polyurethane coating is formulated to feel dry to the touch while offering natural tack to mitigate movement during assembly. PS-1524 is supplied with a fiberglass carrier.

Construction / Properties:

	Property	Value	Test Method
General	Color	White	Visual
	Thickness Range	0.25 mm	ASTM D374
	Carrier Type	Fiberglass	--
	Density (g/cc)	1.14	ASTM D792
	Heat Capacity (J/g K) @ 50 C	1.00	ASTM E1269
	Hardness (Shore 00)	--	ASTM D2240
	Total Mass Loss (@125 C/24 hrs)	0.27%	ASTM E595**
	Flammability Rating	V-0	UL 94
	Continuous Use Conditions	0 - 165 C	QSP-754

	Property	Value	Test Method
Electrical	Dielectric Breakdown Strength (kV/mm)	47.00	ASTM D149
	Volume Resistivity (ohm-cm)	1.00E+17	ASTM D257

	Property	Value			Test Method
Thermal	Thermal Conductivity	0.7 W/m K			ASTM D5470*
	Thermal Performance vs. Strain				
	Deflection (% Strain)	10	20	30	ASTM D5470***
	Thermal Impedance (K cm^2/W) @ 0.05mm	28.58	20.02	10.53	

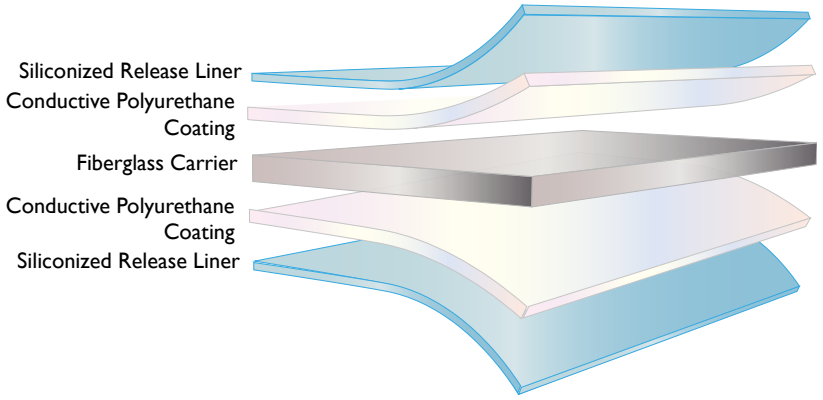
* Thermal conductivity tested at 20% strain.

** Tested at atmospheric pressure

*** Values tested include interfacial thermal resistance: Application performance is directly related to surface roughness, flatness and pressure applied.

Features:

- Non-Silicone
- High Temperature Resistance
- Low Stress on Components
- Shock Absorbing
- Low VOC
- RoHS and HF Compliant



Applications:

- Televisions
- Automotive Electronics
- Consumer Electronics
- Power Semiconductor Devices

FAQ

Q: What is thermal conductivity?
A: Thermal conductivity is the measure of a material's ability to conduct heat. Thermal conductivity is a bulk property of the material so does not take into account thickness, geometry or other application-specific characteristics.

Q: What thermal conductivity test method is used to achieve the values reported on the data sheets of P-THERM® gap filler products?
A: Thermal conductivity is measured using the guarded heat plate method outlined in ASTM D4570. 1"x1" samples are compressed at 20% to determine the thermal impedance. Three thicknesses are tested and the inverse of the slope of the measured impedances is used to determine the bulk thermal conductivity of the product.

Q: What is the difference between thermal conductivity and thermal impedance?
A: Thermal impedance is the sum of the thermal resistance of the material as well as the contact resistance at each interface at a given compression. Thermal impedance takes into account all forms of resistance of heat flow including thickness of the TIM, surface irregularities or smoothness and area of the component. Thermal conductivity is a bulk property of the material and good for general comparisons, but thermal impedance is better to use for simulating heat transfer efficiency of the system.

Q: How does the thermal conductivity test measurement for P-THERM® Phase Change Material differ from that of gap filler?
A: P-THERM® Phase Change Material is also tested using the guarded heat plate method outlined in ASTM D5470. The difference is that phase change materials are treated as viscous liquids, defined as a Type 1 material. Conductivity testing is performed at 60 C and tested across a range of pressure rather than thickness which is used for gap fillers.

Q: Why do compression force deflection curves for P-THERM® gap fillers show two values?
A: The force exerted on a component upon initial compression is the instantaneous force. After the initial force, the gap filler will have an opportunity to equilibrate over 1 minute as the continuous use force which is based upon the elastic properties of the gap filler to demonstrate the force the assembly will see during long

Q: Is durometer of the P-THERM® gap filler determined by thickness of the gap filler?
A: Durometer of the P-THERM® gap fillers is measured as a bulk property from a 10mm thickness cured puck of material which does not contain any type of reinforcement. The reinforcement scrim may have an impact based upon the thickness of the sample being tested.

Q: What test method is used to determine loss on drying of the P-THERM® gap fillers?
A: To determine the volatile content of the gap filler, the sample is heated to 125 C and held for 24 hours. The sample is weighed on a microbalance to determine weight loss over the period of heat exposure at atmospheric pressure to simulate actual use conditions. Small molecular weight silicones and additives commonly volatilize and leach from the silicone gap filler products.

Q: In what format are P-THERM® thermal management products supplied?
A: P-THERM® thermal management products are all available in roll formats. Some thicknesses may be better suited for sheets, so they can be supplied in sheet form even though they are manufactured on a roll-to-roll basis.

Q: Is there any required surface preparation required when using a P-THERM® thermal management product?
A: Although no surface preparation is required, applying any thermal management material to a clean, dry surface is preferred. Contamination on the surface from dust or debris may act as a source of resistance and impede the effectiveness of the thermal management material.

Q: What is the continuous use range for P-THERM® silicone gap fillers?
A: Silicone gap fillers are able to be used across a wide range of temperatures, -60 C – 200 C. The gap fillers are not expected to change in rigidity, thermal performance or shock resistance across this temperature range. Short exposure to 250 C for five minutes and 300 C for 1 minute should not negatively impact the functionality of the P-THERM® silicone gap fillers.

Q: What characteristics should be considered when choosing a P-THERM® gap filler?
A: The two functional characteristics of a gap filler used to determine how effective it will work in your application is thermal conductivity which is the bulk property associated with the rate of heat transfer across a gap of given length and the resistance that this gap filler has at each of planar interface. This resistance may be a result of incomplete wetting of the surface by the gap filler as well as air gaps or voids in between the gap filler and the heat sink or heat source. These resistance sources may be a result of surface roughness or stepped faces in the application. In addition to thermal conductivity, durometer and conformability of the gap filler mitigates interfacial resistance.

Q: Are gap fillers repositionable?
A: Gap fillers with natural tack or containing a velvet finish is repositionable. There will be little impact on the functionality of the pad after repositioning as long as care is taken not to damage the pad during the repositioning process.

Q: What is the thickness tolerance of the silicone gap fillers?
A: The thickness tolerance for product 0.5mm and greater is ±10%. The thickness tolerance for gap fillers less than 0.5mm is ±20%.

Q: The surface of the gap filler feels tacky, is this normal?
A: The surface of the gap filler will have a small amount of tack, referred to as a "natural tack" as a result of the soft silicone wetting out smooth or semi-smooth surfaces. This tack is useful because it allows the material to stay in place during assembly. This surface tack is high enough to keep the material in place, but low enough to be easily removed and repositioned or allow for reworking an assembly if subsequent repairs or replacement is required.

Q: What is the Polymer Science proprietary "velvet finish?"
A: Polymer Science may offer its gap fillers coated with a thin, thermally conductive coating which decreases the natural tack on the surface of the coated gap filler. Some products are coated with the velvet finish as the standard, but can be offered without this coating if a natural tack is needed on both sides of the gap filler.

Q: Can a pressure sensitive adhesive be added to the P-THERM® Gap Filler?
A: The typical configuration of the material does not include a pressure sensitive adhesive, but can be added if mechanical anchorage is not present in the design or securement of the pad to the device is required. The gap pad can be supplied with an adhesive, or an adhesive that will adhere to silicone can be utilized to provide an adhesive layer to the construction.

Q: What is the shelf life of P-THERM® silicone gap fillers?
A: The shelf life of the gap fillers are 1 year from date of manufacture for materials shipped without an adhesive. After 1 year, the material should be reassessed for fitness of use in the particular application with regard to the natural tack of the product. The addition of an adhesive may reduce the shelf life.

Q: Are P-THERM® thermal management products electrically isolating?
A: Silicone gap fillers are electrically isolating. In addition to the silicone and ceramic additives being electrical insulators, a layer of fiberglass provides additional isolation. Polymer Science electronic control interface products are specifically designed to offer higher levels of isolation than other P-THERM® product types.

Q: What is P-THERM® Phase-Change Material (PCM)?
A: Phase change materials are thin non-silicone materials that have been loaded with thermally conductive additives which do not flow, but soften to a tacky interface which will conform into microscopic inconsistencies found at an interfacial boundary. P-THERM® PCMs will soften at 55 C and will cycle to and from this softened state over the life of the device after assembly. Applications where a Phase Change Material should be considered is when operating temperatures are greater than 55 C, but do not exceed the maximum use temperature of 93 C.

Q: Can P-THERM® Phase Change Materials be used without a mechanical fastener?
A: P-THERM® Phase change materials do not possess any pressure sensitive adhesive characteristics so will require the use of a mechanical fastener.

Q: What type of fastener should be used when using a P-THERM® PCM?

A: Phase change materials work best when a consistent amount of pressure is applied to the interface. 10 psi is the recommended application pressure. A spring mount or clip which can apply consistent pressure is preferred over a screw mount which is better suited for gap filler products.

Q: Can P-THERM® Phase Change Materials be reworked?

A: Phase change materials are able to be repositioned prior to heating. Once heat is applied to the system and the temperature exceeds 55 C, the material will soften and bond to the heat sink. This bond may require removal where it can be peeled away from the surface and should be replaced with a new piece of P-THERM® Phase Change Material.

Q: When should P-THERM® heat spreaders be used?

A: Heat spreaders are specifically designed to transfer heat in the x-y plane or spread the heat from a generation point across a larger surface area. They are used when thin profile, high heat applications such as high temperature LED or high heat generating components of smaller handheld devices need dispersed for protection of the component or the user of a device.

Q: What type of P-THERM® heat spreaders are available?

A: P-Therm® heat spreaders are available in aluminum and copper foil formats. Aluminum offers higher conformability, whereas copper offers a higher thermal conductivity in the x-y plane. Because foils offer the benefit of electrical conductivity, versions are available laminated to a dielectric film to help protect against shorting between charged components.

Q: Do P-THERM® heat spreaders have an adhesive?

A: Due to the non-adhesive characteristic of the foils used for P-THERM® heat spreaders, all foil based heat spreaders have been coated with a thermally conductive pressure sensitive acrylic adhesive. Polymer Science recommends that the adhesive be applied with 2 kg force per square inch for 2 seconds to ensure proper anchorage after the surface has been cleaned to remove surface dust and debris.

Q: Which P-THERM® gap filler is right for my application?

A: Gap fillers are available in a variety of bulk thermal conductivities, hardness and compression profiles. Polymer Science recommends a minimum of 20% compression for gap filler products. To determine the best gap filler product for the application, the gap to be filled, the amount of heat or rate of heat that needs to be transferred and the amount of compression force deflection which can be withstood by the components in the application should be understood. Compression force deflection profiles as well as thermal impedance vs compression data is available for all P-THERM® gap filler products by request.

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