CHOMERICS

- *Phase-change thermal interface materials*
- *Thermally conductive adhesive tapes*
- *Thermally conductive insulator pads*
- *Thermally conductive gap fillers*
- *Thermally conductive silicone compounds*
- *Flexible heat spreaders • Thermal management for BGAs*

LEADER IN THERMAL MANAGEMENT: DESIGN, INNOVATION AND MATERIALS

Parker Seals

TECHNICAL BULLETIN 45

CHO-THERM® 1671 Thermally Conductive Elastomer Insulators

FEATURES

- Low thermal impedance
- High dielectric strength
- Proven reliability in demanding military and aerospace applications

MATERIAL DESCRIPTION & PRODUCT FORM OPTIONS

CHO-THERM 1671 insulators are silicone elastomers, precisely filled with a controlled dispersion of boron nitride particles to provide superior thermal and electrical performance characteristics. Reinforced with fiberglass cloth, they offer maximum resistance to tear, cut-through, and punctures due to burrs and other mating surface irregularities.

CHO-THERM 1671 material is available in sheet form and die-cut configurations. It is also available with an optional pressure-sensitive adhesive coating to facilitate assembly and production.

CRITICAL PERFORMANCE CHARACTERISTICS

There are generally two objectives that must be satisfied in the interface between power semiconductor devices and their heat sinks:

1. To enhance the flow of heat from the device to the metal heat sink.
2. To electrically isolate the device from the metal heat sink.

CHO-THERM 1671 insulators perform both functions simultaneously, effectively replacing the commonly used combination of ceramic insulators and silicone grease usually required to achieve these objectives in high performance and applications.

THERMAL INTERFACE IMPEDANCE

The thermal impedance of an interface depends greatly on a number of different parameters, including the flatness and smoothness of the mating surfaces forming the interface and the contact pressure between them, as well as the thickness of the interface material, its thermal conductivity and conformability.

CONTACT PRESSURE & MOUNTING TORQUE

The optimum contact pressure range for CHO-THERM materials is 300-500 psi (2.07×10^6 – $3.45 \times 10^6 N/m^2$). Beyond this range,performance gains are negligible.

continued

	TYPICAL PROPERTIES	1671	TEST METHOD
CONSTRUCTION	Binder	Silicone	—
	Filler	Boron Nitride	—
	Carrier	Fiberglass	—
	Color	White	Visual
	Thickness, inch (mm)	0.015 (0.38)*	ASTM D374
THERMAL	Thermal Impedance, °C-in²/W (°C-cm²/W)	0.23 (1.48)	ASTM D5470
	Thermal Conductivity, W/m-K	2.6	ASTM D5470
	Operating Temperature Range, (°C)	–60 to +200	—
ELEC.	Voltage Breakdown, Vac	4000	ASTM D149
	Volume Resistivity, ohm-cm	1×10^{14}	ASTM D257
	Tensile Strength, psi (MPa)	1000 (6.89)	ASTM D412
	Tear Strength, lb/in (kN/m)	100 (17.5)	ASTM D624
MECHANICAL	Elongation, %	2	ASTM D412
	Hardness (Shore A)	90	ASTM D2240
	Specific Gravity	1.55	ASTM D792
	UL Recognized	File No. E57104	QMFZ2
	Outgassing: % TML % CVCM	0.76 0.07	ASTM E595

TML= Total Mass Loss
CVCM= Collected Volatile Condensible Materials
*CHO-THERM 1671 material is available in custom thicknesses. (Contact Chomerics for part numbers)

Note: Pressure-sensitive adhesive may increase thermal impedance by as much as 0.05°C-in²/W (0.32°C-cm²/W). Contact Chomerics for further information.

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To convert mounting torque into contact pressure, use the following equation:

$$P = \frac{(T)\ (N)}{(0.2)\ (D)\ (A)}$$

P = Contact Pressure (psi or N/m^2)
T = Torque (in-lbs or N-m)
N = Number of Fasteners
(0.2) = Average Friction Factor
D = Diameter (in. or m)
A = Contact Area (in^2 or m^2)

IMPROVEMENT IN THERMAL IMPEDANCE WITH TIME

The thermal impedance characteristics of CHO-THERM materials can be expected to improve during use due to stress relaxation of the elastomer and consequent additional filling of the microscopic voids in the interface surfaces. Improvement can be as much as 10-15% after the first few weeks of use.

VOLTAGE BREAKDOWN CHARACTERISTICS

When using thermal interface pads to electrically isolate a component from a metal heat sink or chassis, the critical material property for the pad is its dielectric strength. Dielectric strength is a measure of how well a material can prevent the voltage on the component case from arcing through the material and allowing an electrical short circuit between the component and the metal mounting surface. This property is commonly presented as the voltage breakdown shown in the Typical Properties Table and is determined by electrical testing of multiple flat sheet samples in accordance with the test procedures detailed in ASTM D149. The higher the value of voltage breakdown, the better the material is at withstanding applied voltages.

The dielectric strength of a material can also be affected by many external factors including: insulator thickness, area of the contact surfaces, temperature, humidity, mechanical stress applied to the insulator, the presence of partial discharge, etc. Contact Chomerics Applications Engineering for details of test methods and assistance with the electrical requirements of your specific application.

CHEMICAL & SOLVENT RESISTANCE

Exposure to petrochemicals or chlorinated solvents, such as trichlorethylene, freon, toluene, trichlorethane and other cleaning agents, chemicals and solvents used in vapor degreasing, defluxing and cleaning operations is not harmful to CHO-THERM 1671 material although exposed edges do tend to swell. The amount of swelling is a function of exposure time and type of solvent. After drying out, the exposed edges will return to their former size and condition with no effect on thermal or electrical properties.

ORDERING INFORMATION

Using the diagram below, construct the appropriate part number: WW-XX-YYYY-1671. Part numbers for non-standard configurations will be assigned by Chomerics.

For non-symmetrical, die-cut parts, a drawing indicating on which side the adhesive is to be applied must be submitted to Chomerics.

WW — XX — YYYY — 1671

WW:

60 = Standard die-cut part
69 = Custom die-cut part
61 = Sheet stock
62 = Sheet stock PSA one side

XX:

Die-cut Parts	Sheet Stock
11 = Without PSA 12 = PSA, one side	15 = .015 in (.381mm)

YYYY:

Die-cut Parts	Sheet Stock
Contact Chomerics for standard configurations and part numbers.	0808 = 8 in. (20.3 cm)