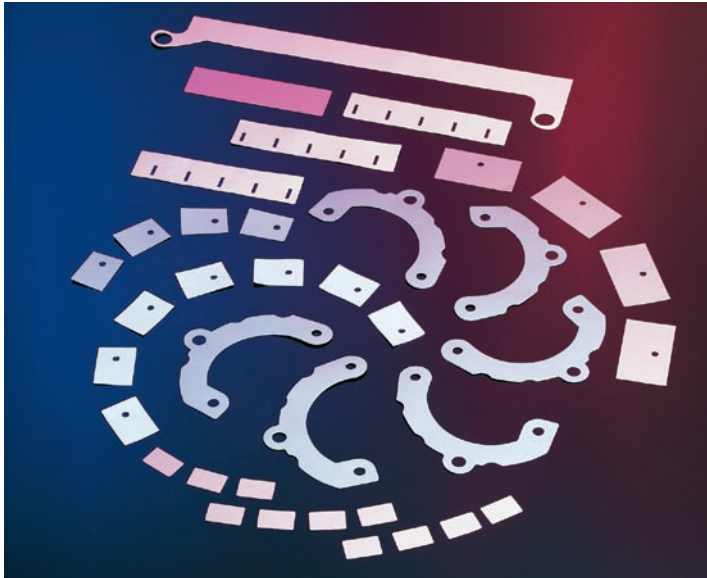


# Choosing the right Sil-Pad Starts with the Mechanical and Electrical Properties



## MECHANICAL PROPERTIES

Woven fiberglass and films are used in Sil-Pads to provide mechanical reinforcement. The most important mechanical property in Sil-Pad applications is resistance to cut-through to avoid electrical shorting from the device to the heat sink.

- SPK4®, SPK6® and SPK10® are very good at resisting cut-through from sharp burrs left on heat sinks after machining operations such as drilling and tapping
- Fiberglass is good at resisting the type of cut-through encountered when device mounting flanges are pulled into oversized mounting holes. This occurs when fasteners are torqued. (SP400®, SP1000®, SP2000®)

Cut-through resistance is very dependent on the application and depends on several factors:

- A very sharp burr may cause cut-through with less than 100 pounds while a blunt burr may require several hundred pounds to cause cut-through
- When two flat parallel surfaces are brought together on a Sil-Pad, over 1000 pounds of force can be applied without damaging the insulator
- The Poly-Pad insulators are the most mechanically durable Sil-Pads overall. The polyester resin used has a higher modulus than silicone rubber. (Poly-Pad 400®, Poly-Pad 1000®, Poly-Pad K4® and Poly-Pad K10®)

## MOUNTING TECHNIQUES AND MOUNTING PRESSURE

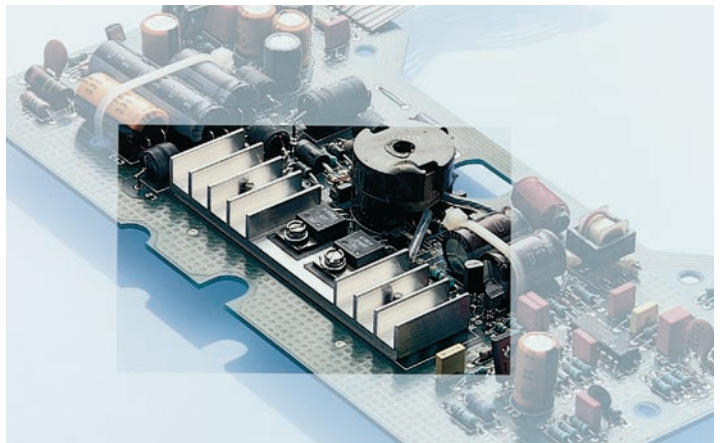
Typical mounting techniques include:

- A Spring clip, which exerts a centralized clamping force on the body of the transistor. The greater the mounting force of the spring, the lower the thermal resistance of the insulator
- A screw in the mounting tab. With a screw mounted TO-220, the force on the transistor is determined by the torque applied to the fastener

In extremely low pressure applications, an insulator with pressure sensitive adhesive on each side may give the lowest thermal resistance since the adhesive wets out the interface easier than the dry rubber. This decreases the interfacial thermal resistance.

Devices with larger surface areas need more pressure to get the insulator to conform to the interface than smaller devices. In most screw mount applications, the torque required to tighten the fastener is sufficient to generate the pressure needed for optimum thermal resistance. There are exceptions where the specified torque on the fastener does not yield the optimum thermal resistance for the insulator being used and either a different insulator or a different mounting scheme should be used.

Interfacial thermal resistance decreases as time under pressure increases. In applications where high clamping forces cannot be used, time can be substituted for pressure to achieve lower thermal resistance. *The only way to know precisely what the thermal resistance of an insulator will be in an application is to measure it in that application.*



# Choosing the right Sil-Pad Starts with the Mechanical and Electrical Properties

## ELECTRICAL PROPERTIES

If your application does not require electrical insulation Q-Pad II® or Q-Pad 3® are ideal grease replacement materials. These materials do not isolate but have excellent thermal properties.

The most important electrical property in a typical assembly where a Sil-Pad insulator is used is dielectric strength. In many cases the dielectric strength of a Sil-Pad will be the determining factor in the design of the apparatus in which it is to be used.

Here are some general guidelines regarding electrical properties to consider when selecting a Sil-Pad material;

- Q-Pad II and Q-Pad 3 are used when electrical isolation is not required
- Dielectric breakdown voltage is the total voltage that a dielectric material can withstand. When insulating electrical components from each other and ground, it is desirable to use an insulator with a high breakdown voltage

- Breakdown voltage decreases as the area of the electrodes increases. This area effect is more pronounced as the thickness of the insulator decreases
- Breakdown voltage decreases as temperature increases
- Breakdown voltage decreases as humidity increases (SP1750® and SP1950® are less sensitive to moisture)
- Breakdown voltage decreases in the presence of partial discharge
- Breakdown voltage decreases as the size of the voltage source (kVA rating) increases
- Breakdown voltage can be decreased by excessive mechanical stress on the insulator

Dielectric strength, dielectric constant and volume resistivity should all be taken into consideration when selecting a Sil-Pad material. If your application requires special electrical performance please contact the factory for more detailed testing information.

## TYPICAL ELECTRICAL PROPERTIES OF SIL-PADS®

Material	Breakdown Voltage (kV)	Dielectric Strength (Volts/mil) ( kV/mm)		Dielectric Constant	Volume Resistivity (Ohm-Metre)
SP400®-.007	5	700	18	5.5	10 <sup>11</sup>
SP400®-.009	7	800	20	5.5	10 <sup>11</sup>
SP1000®	7	700	18	4.5	10 <sup>11</sup>
SP2000®	12	800	20	4.0	10 <sup>11</sup>
SPK-4®	7	1200	30	5.0	10 <sup>12</sup>
SPK-6®	7	1200	30	4.0	10 <sup>12</sup>
SPK-10®	7	1200	30	3.7	10 <sup>12</sup>
Test Method	ASTM D 149*	ASTM D 149*		ASTM D 150	ASTM D 257
	*Method A, Type 3 Electrodes				