

# LOCTITE® SI 5404

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## PRODUCT DESCRIPTION

LOCTITE® SI 5404 provides the following product characteristics:

<b>Technology</b>	Silicone
Chemical Type	Silicone
Appearance (uncured)	White to gray paste
Components	One component – requires no mixing
<b>Cure</b>	Heat cure
<b>Application</b>	Bonding
Specific benefits	Combines good electrical isolation and high thermal conductivity
Flexibility	Enhances load bearing & shock absorbing characteristics of the bond area.

LOCTITE® SI 5404 is designed to bond metallic heat sinks, ceramic chips and circuit board substrates. LOCTITE® SI 5404 applications include the bonding of various heat generating devices (power devices) to their respective heat sinks. The adhesive is designed to provide a strong bond between the device and its heat sink as well as low resistance to the flow of heat from the electronic device to the heat sink. A typical application would be the bonding of any power semiconductor, module, graphics processor or other heat generating device to a heat sink or metal enclosure in an electronics circuit.

## Typical properties of uncured material

Specific Gravity @ 25°C	2.3 to 2.45
VOC, ASTM D 3960, g/l	32.1
Flash point - see SDS	
Extrusion Rate, g/min:	
Pressure 0.35 MPa, temperature 25°C:	180 to 400
Semco cartridge	
Viscosity by Rheometer, at 25°C	50-74*
2cm Plate – 500µm gap @ 15s-1 shear rate, Pa.s	

\*range is at DOM (Date Of Manufacturing), viscosity could increase up to 60% over shelf life

## Typical curing performance

We recommend minimizing the time during which the fixtured parts are exposed to a temperature above 30°C. This will help maintain a consistent dispersion of the conductive filler within the adhesive matrix.

Suggested minimum heat cure conditions for either IR or convection oven: 10 minutes at 150°C or 15 minutes at 130°C. All times given above are exclusive of heat up rate. It is essential that the bond lines attain these temperatures for the stated times. Cure rate is very dependent on the oven type used, the size and geometry of the parts being bonded as well as their composition.

## Typical properties of cured material

Cured for 1 hours @ 150 °C:

### Physical properties:

Coefficient of Thermal Conductivity, ISO 8302, W/(m·K)	≥0.95
Shore Hardness, ISO 868, Durometer A	53 to 65
Elongation, ISO 37, %	≥65
Tensile Strength, ISO 37	N/mm <sup>2</sup> (psi)

Cured for 1 hours @ 130 °C:

### Physical properties:

Coefficient of thermal expansion, ISO 11359-2, K <sup>-1</sup> :	1.04x10 <sup>-4</sup>
Glass transition temperature, °C	-40
Young's modulus	N/mm <sup>2</sup> (psi)

## Electrical Properties:

Dielectric Constant / Dissipation Factor, IEC 60250:

100 kHz	6.3 / 0.1292
1 kHz	5.8 / 0.0364
1-MHz	5.4 / 0.0148

Volume resistivity, IEC 60093, Ω·cm

2.9x10<sup>14</sup>

Surface resistivity, IEC 60093, Ω

4.3x10<sup>14</sup>

Dielectric breakdown strength, IEC 60243-1, kV/mm

19.2

After 1 week @ 85°C / 85% RH

### Electrical Properties:

Dielectric Constant / Dissipation Factor, IEC 60250:

100 kHz	5.75 / 0.0591
1 kHz	5.6 / 0.0193
1-MHz	5.4 / 0.0139

Volume resistivity, IEC 60093, Ω·cm

3.2x10<sup>14</sup>

Surface resistivity, IEC 60093, Ω

6.2x10<sup>13</sup>

Dielectric strength

17.1



Cured @50°C

**Electrical properties:**

Volume resistivity, IEC 60093, Ω·cm	6.4×10 <sup>11</sup>
Dielectric breakdown strength, IEC 60243-1, kV/mm	19.2

Cured @100°C

**Electrical properties:**

Volume resistivity, IEC 60093, Ω·cm	1.10×10 <sup>11</sup>
Dielectric breakdown strength, IEC 60243-1, kV/mm	20

**Typical performance of cured material****Adhesive properties**

Cured for 30 minutes @ 130 °C

Lap Shear Strength, ISO 4587:

Aluminum to aluminum	N/mm <sup>2</sup> (psi)	1.2 (175)
Steel to steel	N/mm <sup>2</sup> (psi)	1.6 (232)
Aluminum to epoxy glass	N/mm <sup>2</sup> (psi)	1.1 (160)

**Adhesive properties**

Cured for 1 hours @ 130 °C:

Lap Shear Strength, ISO 4587:

Aluminum to aluminum	N/mm <sup>2</sup> (psi)	≥2.1 (≥305)
Steel to steel	N/mm <sup>2</sup> (psi)	2.2 (320)
Aluminum to epoxy glass	N/mm <sup>2</sup> (psi)	1 (145)

**GENERAL INFORMATION**

**This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.**

**For safe handling information on this product, consult the Material Safety Data Sheet.**

**Direction for use****Application**

This composition contains .13mm diameter glass spheres to produce an adhesive bond line of about .13 to .15mm. The amount of adhesive applied to the part or heat sink should be limited to the amount necessary to fill the bond. The dispensing or application of the adhesive should be done in such a manner as to eliminate air entrapment within the bond line.

**Heat curing**

Our laboratory test experience indicates that a period of time is required for the bond line temperature to approach the set temperature of the curing oven. The factors which affect this time-lag and hence, the bond line temperature include, but are not limited to: the type of oven (infrared, convection, conveyorized, type of conveyor belt, batch, type of oven racks), the size, shape and color of the bonded components (thermal mass and heat absorption or reflection), and the surrounding or other-side components on the board. Therefore, it is important to note that the cure profiles should be used as a guide and that the potential thermal effects of the board, components, and oven be accounted for when setting your curing conditions.

**Storage**

Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.

**Optimal storage: 2°C to 8°C. Storage below 2°C or greater than 8°C can adversely affect product properties.**

Some separation between filler and resin can happen over shelf life, which is a common occurrence in such kind of highly filled systems. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Henkel representative.

**Product Specification**

The technical data contained herein are intended as reference only and are not considered specifications for the product.

Product specifications are located on the Certificate of Analysis or please contact Henkel representative.

**Approval and Certificate**

Please contact a Henkel representative for related approval or certificate of this product.

**Data Ranges**

The data contained herein may be reported as a typical value. Values are based on actual test data and are verified on a periodic basis.

Temperature/Humidity Ranges: 23°C / 50% RH = 23±2°C / 50±5% RH

**Conversions**

(°C x 1.8) + 32 = °F

kV/mm x 25.4 = V/mil

mm / 25.4 = inches

µm / 25.4 = mil

N x 0.225 = lb

N/mm x 5.71 = lb/in

N/mm<sup>2</sup> x 145 = psi

MPa x 145 = psi

N·m x 8.851 = lb·in

N·m x 0.738 = lb·ft

N·mm x 0.142 = oz·in

mPa·s = cP



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