SG & CG – Socket for Lab and Engineering Applications

High Performance IC Sockets And Test Adaptors
Application Need & Solution

- Low cost for small quantity
- High bandwidth
- Low inductance
- Low contact resistance
- Low cycle count

GHz BGA socket technology provide >40GHz bandwidth in a small, cost effective ZIF socket for prototype and test applications. The GHz BGA socket is a simple mechanical socket based on elastomer contact technology.

The elastomer consists of a fine pitch wire matrix which are embedded at a 63-degree angle in a soft insulating sheet of silicone rubber. The insulation resistance between connections with 500V DC is 1000 MΩ. The elastomer is ideal for high-current (30mA to 50mA per filament) applications where a thin, high-density anisotropic connector is required. The gold-plated brass filaments protrude several microns from the top and bottom surfaces of the silicone sheet to penetrate heavily oxidized solder ball. The operating temperature range for the elastomer is -35° to 125° C.
Elastomer Classification

SG-6000 series
Ps, Pi = 0.1mm
L, W = 1mm to 50mm
t = 0.75mm
BGA, QFN, etc, >=0.75mm pitch

SG-7000 series
Ps, Pi = 0.05mm
L, W = 1mm to 50mm
 t = 0.5mm
BGA, QFN, etc, >=0.3mm pitch

SG-8000 series
Ps, Pi = 0.1mm
L, W = 1mm to 50mm
 t = 0.5mm
BGA, QFN, etc, >=0.75mm pitch

SG-9000 series
Ps, Pi = 0.075mm
L, W = 1mm to 50mm
 t = 0.5mm
BGA, QFN, etc, >=0.4mm pitch
Elastomer Classification

**SG25 - series**
- \( Ps, Pi = 0.05\text{mm} \)
- \( L, W = 1\text{mm to 25mm} \)
- \( t = 0.25\text{mm} \)
- BGA, QFN, etc, \( \geq 0.3\text{mm pitch} \)

**SG15 - series**
- \( Ps, Pi = 0.05\text{mm} \)
- \( L, W = 1\text{mm to 25mm} \)
- \( t = 0.15\text{mm} \)
- BGA, QFN, etc, \( \geq 0.3\text{mm pitch} \)

**Insulation Silicone Rubber**

Inclined Gold plated brass wire

Offset
Socket Lid Options

- **IMPROVED SWIVEL LID**
  - Easier-to-use swivel lid
  - Maintains low-profile design
  - Quick IC installation

- **SNAP LID WITH ADJUSTABLE PRESSURE SCREW SOCKET**
  - No tools required
  - Reliable installation
  - Available for all IC's

- **LEVER LID SOCKET**
  - Fully removable lid
  - Optional heat sink
  - Easy access to IC

- **HEAT SINK LID SOCKET**
  - Easy 2-in-1 installation
  - Up to 100 watts
  - Optional fan available

- **CLAM-SHELL ADJUSTABLE HARD STOP SOCKET**
  - Easy to use snap lid
  - Quick IC installation
  - Low profile designs available

- **OPEN TOP LID SOCKET**
  - Optical applications
  - Easy access to chip
  - Thermal applications
Compression Force

Compress force per ball requirement

- 1.27mm pitch BGA
- 1.0mm pitch BGA
- 0.8mm pitch BGA
- 0.75mm pitch BGA
- 0.65mm pitch BGA
- 0.5mm pitch BGA

IP, Aug 2017
Room Temperature Cycle Data

Same solder ball was used repeatedly. Peak points are due to bad solder ball. After solder ball reflow, Cres drops to initial value.
150C Temperature Test Data

Contact resistance per pin at 150C

IP, Aug 2017
Thermal Cycle Data

SG-BGA625 Thermal Cycling

Contact Resistance Per ball (Ohms)

Temperature (Deg C)

Per ball resistance Ohms
Temperature

Time (hrs:min:sec)

0:00:00 0:20:00 1:00:00 1:20:00 2:10:00 17:35:00 17:50 18:50 19:20 20:00 20:50 45:20:00 45:40:00 46:20:00 46:40:00

0.000 0.020 0.040 0.060 0.080 0.100 0.120 0.140

160 140 120 100 80 60 40 20 0 -20

IP, Aug 2017
Environmental Test Data

- **Hi-temp/Hi-humidity 40 °C – 95%** (Standard: MIL-STD-202 METHOD 103 CONDITION A)
- **Hi-temp 155 °C** (Standard: IEC 68-2-2)
- **Low-temp –55 °C** (Standard: IEC 68-2-1)
## AC Data – 0.4mm Pitch

**SG-7000 series 0.5mm thick elastomer**

**0.40 mm pitch**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inductance</td>
<td>0.118 nH</td>
</tr>
<tr>
<td>Mutual Inductance</td>
<td>0.025 nH</td>
</tr>
<tr>
<td>Capacitance to Ground*</td>
<td>0.229 pF</td>
</tr>
<tr>
<td>Mutual Capacitance</td>
<td>0.025 pF</td>
</tr>
<tr>
<td>S21 (insertion loss) @ -1dB, GSG</td>
<td>19.7 GHz</td>
</tr>
<tr>
<td>S21 (insertion loss) @ -1dB, GSSG</td>
<td>30.5 GHz</td>
</tr>
<tr>
<td>S11 (return loss) @ -20 dB, GSG</td>
<td>5.2 GHz</td>
</tr>
<tr>
<td>S11 (return loss) @ -20 dB, GSSG</td>
<td>13.3 GHz</td>
</tr>
<tr>
<td>Crosstalk at -20dB</td>
<td>40.0 GHz</td>
</tr>
<tr>
<td>Impedance, GSG</td>
<td>39.2 Ω</td>
</tr>
<tr>
<td>Impedance, GSSG</td>
<td>46.0 Ω</td>
</tr>
</tbody>
</table>
AC Data – 0.6mm Pitch

SG15 Series – 0.15mm thick Elastomer

Insertion loss S2,1
DC data

Measured the temperature increase while the current is flowing. Current capacity measured using 60 wires. Sample: thickness 1.0mm
Elastomer Current Data

- 40 Micron Diameter Cu wire fusing limit is 750mA/wire. Recommended safe amount = 50mA/wire
- 23 Micron Diameter BeCu wire fusing limit is 350mA/wire. Recommended safe amount = 30mA/wire
- Maximum amount should not be reached, but higher limits can be achieved as long as the test can handle higher temperature ranges.
- For example: a couple of hundred mA per wire would be fine for a short term test (< 5 sec), but if the test is being held for hours, a heat sink may be necessary to pull off excess heat that may be produced from pushing large amounts of current through each wire.
Value Proposition

- SG elastomer contact enables repeatable electrical/mechanical performance in all lab and engineering applications.
- Custom socket configurations can be produced using SG elastomer contact in 4 weeks.
- SG elastomer sockets accommodate temperature range (-35°C to +125°C).
- SG elastomer sockets are robust and can be used in application demonstration modules for multiple handling process without contact degradation.