Socket Technologies

Toll Free: (800) 404-0204 U.S. Only
Tel: (952) 229-8200
Fax: (952) 229-8201
email: info@ironwoodelectronics.com
Introduction

● Company Overview
  – Over 8,000 products
  – High Performance Adapters and Sockets
  – Many Custom Designs
  – Engineering – Electrical and Mechanical
  – ISO9001:2015 Registration

● Socket Technology Overview
  – Embedded gold plated wire elastomer (SG)
  – Stamped & Etched spring pins (SBT)
  – Embedded silver ball elastomer matrix (SM/SMP)
  – Compressible silver button in polyimide (GT/GTP)
  – Surface mount adapters for sockets (SF)
Embedded gold plated wire
40GHz GHz elastomer socket (SG)

- Protruded wire from elastomer
- BGA compressed on Elastomer
- Wire marks on BGA

### Features | Benefits
--- | ---
Short contact | High bandwidth applications
Gold plated Brass wire | Low contact resistance
Small socket footprint | Easy to place inductors, capacitors, resistors, etc for tuning and increasing bandwidth. Ideal for IC prototype and system testing and field upgradeable system designs
High resilient elastomer | Compression cycles in thousands
Optimized contact force | Reliable connection without damage to device or board

### Capabilities
- 0.3mm to 1.27mm pitch
- 1x1mm to 55x55mm device
- BGA, QFN, QFP, SOIC
- 4000 pin count
- Heat sink options
- Easy chip replacement
- Custom support plate options

IP, 3/18/2020
Stamped & Etched spring pin
31.7 GHz socket (SBT)

Features | Benefits
--- | ---
Long contact travel | Compliancy for large package warpage
Gold plated BeCu material | High temperature applications
Small socket footprint | Easy to place inductors, capacitors, resistors, etc for tuning and increasing bandwidth. Ideal for IC prototype and system testing and field upgradeable system designs
High resilient spring | Compression cycles in hundreds of thousands
Optimized pin diameter to length ratio | Impedance matched high speed applications
Stamped contact | High current applications
Automated assembly | Low cost, short lead time

Capabilities
- 0.3mm to 1.27mm pitch
- 1x1mm to 60x60mm device
- BGA, LGA, QFN, QFP, SOIC
- 5000 pin count
- Heat sink options
- Easy chip replacement
- Custom support plate options

LGA high force pin
BGA low force pin
BGA socket w/ Snap Lid

Open top socket
Super short Etched spring pin

Floating plate for precise alignment and swivel lid
Clamshell BGA socket

Development
Proven Capability
Continuous improvement
10 Years

IP, 3/18/2020
Embedded silver ball
45 GHz elastomer socket (SM/SMP)

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortest contact</td>
<td>Highest bandwidth applications</td>
</tr>
<tr>
<td>Silver balls</td>
<td>Low contact resistance</td>
</tr>
<tr>
<td>Small socket footprint</td>
<td>Easy to place inductors, capacitors, resistors, etc for tuning and</td>
</tr>
<tr>
<td></td>
<td>increasing bandwidth. Ideal for IC prototype and system testing and</td>
</tr>
<tr>
<td></td>
<td>field upgradeable system designs</td>
</tr>
<tr>
<td>High resilient elastomer</td>
<td>Compression cycles in hundreds of thousands</td>
</tr>
<tr>
<td>Matrix with core</td>
<td>Optimized force and built-in compression stop mechanism</td>
</tr>
</tbody>
</table>

Capabilities
- 0.25mm to 1.27mm pitch
- 1x1mm to 60x60mm device
- BGA, LGA, QFN
- 3000 pin count
- Heat sink options
- Easy chip replacement
- Custom support plate options

Array of Columns - Elastomer Matrix
Cross section - Silver balls
SMP = Elastomer layer + Protective layer

Replaceable elastomer module

ATE socket with double latch clam shell lid

IP, 3/18/2020
Compressible silver button
94 GHz elastomer socket (GT/GTP)

Array of Silver Buttons - Elastomer Matrix

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shortest contact</td>
<td>Highest bandwidth applications</td>
</tr>
<tr>
<td>Silver particles</td>
<td>Low contact resistance</td>
</tr>
<tr>
<td>Small socket footprint</td>
<td>2.5 mm per side larger than actual IC packages</td>
</tr>
<tr>
<td>Individual buttons</td>
<td>No mechanical coupling</td>
</tr>
<tr>
<td>Laser cut substrate</td>
<td>Precise contact location</td>
</tr>
</tbody>
</table>

Capabilities
- 0.2mm to 1.27mm pitch
- 1x1mm to 50x50mm device
- BGA, LGA, QFN
- 5000 pin count
- Heat sink options
- Easy chip replacement
- Custom support plate options

Lever actuated socket

Socket with heat sink

BGA Rest & Test condition

QFN, LGA Rest & Test condition

IP, 3/18/2020
# Contact Technology Summary

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Embedded Wire Elastomer (SG)</th>
<th>Stamped spring pins (SBT)</th>
<th>Embedded Silver Ball Elastomer Matrix (SM/SMP)</th>
<th>Silver Button Elastomer (GT/GTP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth, GHz</td>
<td>27 to 56.8</td>
<td>4.15 to 31.7</td>
<td>44.8</td>
<td>94</td>
</tr>
<tr>
<td>Endurance, Cycles*</td>
<td>2K</td>
<td>500K</td>
<td>5K/500K</td>
<td>1K/200K</td>
</tr>
<tr>
<td>Resistance, mΩ</td>
<td>20</td>
<td>15</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Self Inductance, nH</td>
<td>0.11 to 0.28</td>
<td>0.88 to 0.98</td>
<td>0.1</td>
<td>0.04</td>
</tr>
<tr>
<td>Max Current, Amp</td>
<td>2</td>
<td>8</td>
<td>7.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Temp Range, °C</td>
<td>-35 to +125</td>
<td>-55 to +180</td>
<td>-55 to +155</td>
<td>-55 to +160</td>
</tr>
<tr>
<td>Pitch, mm</td>
<td>0.3 to 1.27</td>
<td>0.3 to 1.27</td>
<td>0.25 to 1.27</td>
<td>0.2 to 1.27</td>
</tr>
<tr>
<td>Package Types</td>
<td>BGA, QFN, QFP, SOIC</td>
<td>BGA, LGA, QFN, QFP, SOIC</td>
<td>BGA, LGA, QFN</td>
<td>BGA, LGA, QFN</td>
</tr>
<tr>
<td>Lab test</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Production test</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Field upgrade</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Temperature test</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Kelvin test</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Burn-in test</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Cycle life shown at room temperature. Reduced cycle life is expected when used at extreme temperatures, thermal cycling, improper force, cleaning and handling.

IP, 3/18/2020
## Pin Datasheet

<table>
<thead>
<tr>
<th>Pin Family</th>
<th>SBT</th>
<th>SBT</th>
<th>SBT</th>
<th>SBT</th>
<th>SBT</th>
<th>SBT</th>
<th>SBT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>P-P204A</td>
<td>P-P185A</td>
<td>P-P184A</td>
<td>P-P196A</td>
<td>P-P150A</td>
<td>P-P151A</td>
<td>P-P152A</td>
</tr>
<tr>
<td>Minimum Pitch (mm)</td>
<td>0.35</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pin Type</td>
<td>BGA</td>
<td>BGA</td>
<td>LGA</td>
<td>BGA</td>
<td>LGA</td>
<td>BGA</td>
<td>LGA</td>
</tr>
<tr>
<td>Length (mm)</td>
<td>3.46</td>
<td>3.81</td>
<td>2.9</td>
<td>3.86</td>
<td>2.95</td>
<td>5.69</td>
<td>4.45</td>
</tr>
<tr>
<td>DUT Side Tip Shape</td>
<td>Crown</td>
<td>V Shape</td>
<td>Radius Cone</td>
<td>V Shape</td>
<td>Radius Cone</td>
<td>Notched V</td>
<td>Radius Cone</td>
</tr>
<tr>
<td>DUT Side Tip Dimension (mm)</td>
<td>0.17</td>
<td>0.14</td>
<td>0.12</td>
<td>0.2</td>
<td>0.06</td>
<td>0.54</td>
<td>0.1</td>
</tr>
<tr>
<td>PCB Side Tip Shape</td>
<td>Radius Cone</td>
<td>Radius Cone</td>
<td>Radius Cone</td>
<td>Radius Cone</td>
<td>Radius Cone</td>
<td>Radius Cone</td>
<td>Radius Cone</td>
</tr>
<tr>
<td>PCB Side Tip Dimension (mm)</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>DUT Side Travel (mm)</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>PCB Side Travel (mm)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Force (g)</td>
<td>8.7</td>
<td>17</td>
<td>14.5</td>
<td>30</td>
<td>30</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Cres (mOhms)</td>
<td>&lt; 70</td>
<td>&lt; 50</td>
<td>&lt; 50</td>
<td>&lt; 30</td>
<td>&lt; 30</td>
<td>&lt; 15</td>
<td>&lt; 15</td>
</tr>
<tr>
<td>CCC @ ambient (Amps)</td>
<td>1</td>
<td>1.8</td>
<td>1.8</td>
<td>4.0</td>
<td>6.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Bandwidth (GHz @ -1dB)**</td>
<td>23.5 - 26.1</td>
<td>20.5 - 31.7</td>
<td>20.5 - 31.7</td>
<td>5.2 - 15.7</td>
<td>5.2 - 15.7</td>
<td>14.1 - 21.9</td>
<td>14.1 - 21.9</td>
</tr>
<tr>
<td>Self inductance (nH)</td>
<td>0.92</td>
<td>0.98</td>
<td>0.98</td>
<td>0.88</td>
<td>0.88</td>
<td>0.93</td>
<td>0.93</td>
</tr>
<tr>
<td>Temperature (deg C)</td>
<td>-55 to +180C</td>
<td>-55 to +180C</td>
<td>-55 to +180C</td>
<td>-55 to +180C</td>
<td>-55 to +180C</td>
<td>-55 to +180C</td>
<td>-55 to +180C</td>
</tr>
<tr>
<td>Insertion Cycles</td>
<td>50K</td>
<td>50K</td>
<td>50K</td>
<td>500K</td>
<td>500K</td>
<td>500K</td>
<td>500K</td>
</tr>
</tbody>
</table>

* 0.4mm/0.5mm pitch SBT pins are used in 0.65mm and 0.8mm pitch applications
** Bandwidth range is based on pin location (corner, edge, field). See report for test conditions and setup.

IP, 3/18/2020
Socket Lid Options

Swivel Lid Socket

Screw Top Socket w/Center Open

Snap Lid Socket w/Center Open

Double Latch Socket w/Center Open

Double Latch Socket w/Handle

Snap Lid with adjustable pressure screw Socket
Socket Lid Options

Clamshell Socket w/Center Open

Clamshell Adjustable Hard Stop Socket

Clamshell Socket w/Heat Sink

Lever Lid Socket

Lever Lid Socket w/Center Open

Lever Lid Socket w/Fan and Heat Sink

IP, 3/18/2020
Surface Mount Adapters for sockets (SF)

Features
- Pluggable interface
- FR4 & Gold plated contacts
- Small adapter footprint
- Conductive filled via
- Optimized plated thru hole with filled via
- Edge castellation (QFN)
- Standard Solder (BGA)

Benefits
- Easy insertion and extraction for device swap
- High temperature applications
- Easy to place inductors, capacitors, resistors, etc for tuning and increasing bandwidth. Ideal for IC prototype and system testing and field upgradeable system designs
- Excellent thermal dissipation and high current applications
- Low inductance and high speed applications
- Easy manual assembly
- Easy assembly (industry standard reflow profile)

Capabilities
- 0.5mm to 1.27mm pitch
- 2x3mm to 50x50mm device
- BGA, LGA, QFN, QFP, SOIC
- 2000 pin count
- Lead free options
- Easy pluggable module
- Custom height extension

Spring pin socket + Thru hole adapter + Surface mount adapter
Thru hole adapter + Surface mount adapter
0.5mm pitch
Pluggable adapter pair

Pluggable adapter pair with soldered device
Thru hole adapter

IP, 3/18/2020
Custom Capability

- Custom socket designs in 2 days
- Match customer’s PCB footprint
- Custom socket manufacturing in 10 days
- Multiple contactor technologies
- Heat sink simulation and design
- Contactor signal integrity simulation
- In-house automated optical inspection
- In-house machining
- Quick-turn production