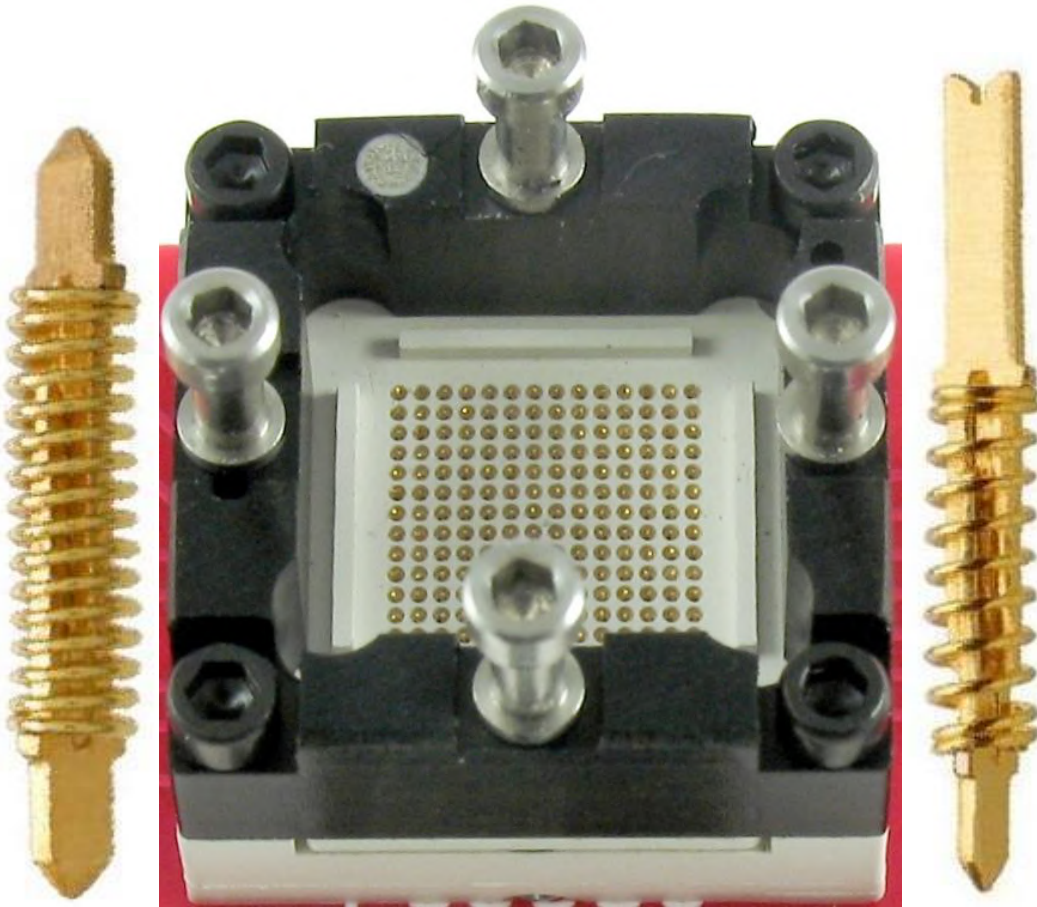


*Stamped Spring Pin Socket for
Burn-in & Test Applications
User Manual*





STAMPED SPRING PIN SOCKET USER MANUAL

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Socket Mechanics

SBT-BGA sockets provide high bandwidth in a small, cost effective ZIF socket for prototype, test and burn-in applications. SBT-BGA socket is a simple, mechanical socket based on stamped spring pin technology. SBT-BGA socket is a solder-less socket that can be mounted on to a PCB using supplied hardware. The PCB should have mounting and alignment holes at proper locations (see page 2 of the drawing for recommended PCB layout information). Typical SBT-BGA socket footprint is only 5mm larger than the maximum IC size. It is compatible with the alternate SG-BGA (elastomer) socket footprint. If there are pre-existing holes in the PCB, a SBT-BGA socket can be custom designed to accommodate those holes (please call Ironwood Tech Support @ 1-800-404-0204).

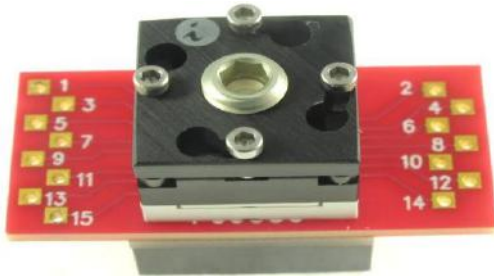


Figure 1: Stamped Spring Pin Socket with Swivel Lid

Figure 1 shows a typical stamped spring pin socket. A heat sink screw on the top provides the compression force as well as thermal relief and can be customized to dissipate more power. SBT socket uses SBT contact technology for high endurance and wide temperature applications. SBT Contact is a stamped contact with outside spring as well as inside leaf spring that provides a robust solution for Burn-in & Test applications. The stamped pin used in the socket is a low-resistance ($<0.015\Omega$) connector. Figure 2 shows a picture of the 1mm center – stamped spring pin. SBT contact technology has 3 part system which includes top plunger, bottom plunger and a spring. The Beryllium Copper plungers are stamped

and assembled to a stainless steel spring in an automated system to enable fast turnaround time, low cost and zero defects. The spring probe has high current rating (4.0A continuous for 0.5mm pin and 8A for 1mm pin). The operating temperature range is -55° to 180° C.

The solder balls from the IC package come in contact with the crown end of the pin. The bottom end of stamped pin contacts the circuit board pad, completing an electrical path for the signal. The socket mechanism can be summarized as a downward force applied on the IC which compresses solder balls on the spring probe which in turn compresses on the circuit board and thereby making electrical connection.



Figure 2: Picture of 1mm center - Spring Pin

Selecting a BGA Stamped pin socket

Please refer to the IC package drawing to select the corresponding BGA stamped pin socket. Visit the Ironwood website: www.ironwoodelectronics.com. Select the “Products” link. Next, under the “Browse” menu, select the “GHz BGA & MLF Socket (SG, SS, SBT)” link. In the table, select the part number from the first column which corresponds to your pin count, IC body size, array size, and pitch. The top webpage frame will show a link to the drawing, a picture of the socket (JPEG format), and provide low-volume price information. The drawing is a four page PDF file. The first page shows the socket exploded view and the material details. The second page provides the recommended PCB layout (Note: **BGA pads are not symmetrical with respect to the mounting holes**). The third page shows the compatible BGA specification. The fourth page shows more socket views and backing/insulation plate dimensions. Check the BGA pattern and the following four parameters.

1. IC co-planarity value should be less than or equal to that shown in the table.
2. Maximum total height of IC should be less than or equal to that shown in the table.



3. Maximum solder ball diameter of IC should be less than or equal to that shown in the table.
4. Maximum and minimum solder ball height should fall within the range shown in the table.

If any of the above parameters do not match, please call Ironwood Tech Support @1-800-404-0204 to help select a socket (which may currently be in development).

PCB Requirements

Please refer to page 2 of the socket drawing for all PCB recommendations.

For IC body sizes of 30mm or below, the socket requires 4 mounting holes.

For IC body sizes of 31mm or above, the socket requires 8 mounting holes.

Two alignment holes are used in all sockets. **The BGA pattern is not symmetrical with respect to the mounting holes.** The BGA pattern is same as the one used for the elastomer socket. It is shifted due to the fact that the wire filaments in the elastomer are at an angle (the shift is half the elastomer thickness in the positive x-direction). The same footprint used by elastomer socket is recommended for stamped pin socket for interchangeability. Again, please refer to page 2 of the drawing for recommended footprint.

Thickness

1.5mm minimum. This will change per customer application, environment and usage.

Finish

SnPb plating or Immersion Au or Immersion Ag. Other plating may be used but testing may be required. Typical Solder mask clearance over pad surface is acceptable.

Cleanliness

Isopropyl Alcohol or equivalent should be used to clean the board surface prior to attaching socket.

IC and PCB Reflow Requirement

If the same IC is used for number of cycles, crown tip on stamped pin damages the Sn63Pb37 solder balls on IC and conical tip damages HASL(hot air solder level) pads on PCB. From our test results, we recommend reflowing IC solder balls every 10 cycles and HASL PCB every 30 cycles. Gold plated PCBs will not need any reflows.

Socket Assembly

Refer to figure 4 for graphical illustrations.

1. Install the socket base assembly onto the target PCB with the hardware (socket base screws) provided. Because of asymmetrical tooling holes, the socket can be assembled with only one orientation.
2. Place BGA package (solder ball side down) into the socket. NOTE: BGA orientation on target PCB is critical. If an IC frame (optional) is supplied, place it over the BGA package. This IC frame may be necessary for packages in which the encapsulate around the die does not extend to the edge of the IC's substrate.
3. Place compression plate on top of the BGA package.
4. Install the socket top assembly on to the socket base assembly and swivel to lock into the position.



5. Turn the compression screw clockwise, until it makes contact with the compression plate and/or the BGA package.
6. Turn the compression screw further so that BGA balls are compressed on the spring pins to make contact. When turning becomes hard, full compression is achieved. Internal stops will prevent over compression when turned by hand.

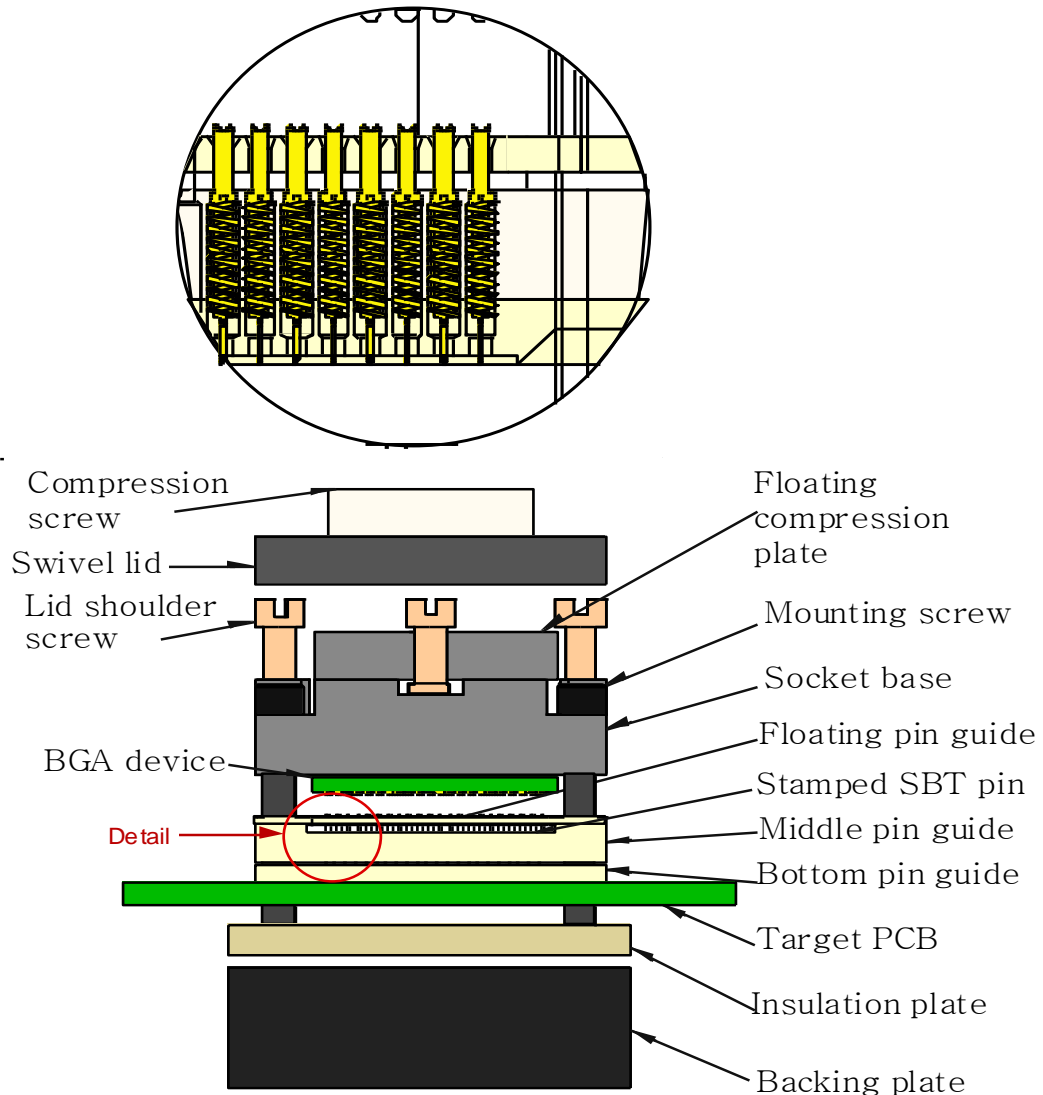


Figure 4: Graphical Illustration of Socket Assembly



Backing and insulation Plate

For all IC body sizes, stamped pin sockets require a rigid metal backing plate to prevent deflection of the target circuit board due to a high normal force required to compress the stamped pins. If the backside of the target PCB contains capacitors and resistors, a custom insulation plate with cavities cut for those components can be designed. This insulation plate sandwiches between the backing plate and target PCB as shown in figure 4. Figure 5 shows an example of a custom insulation plate.

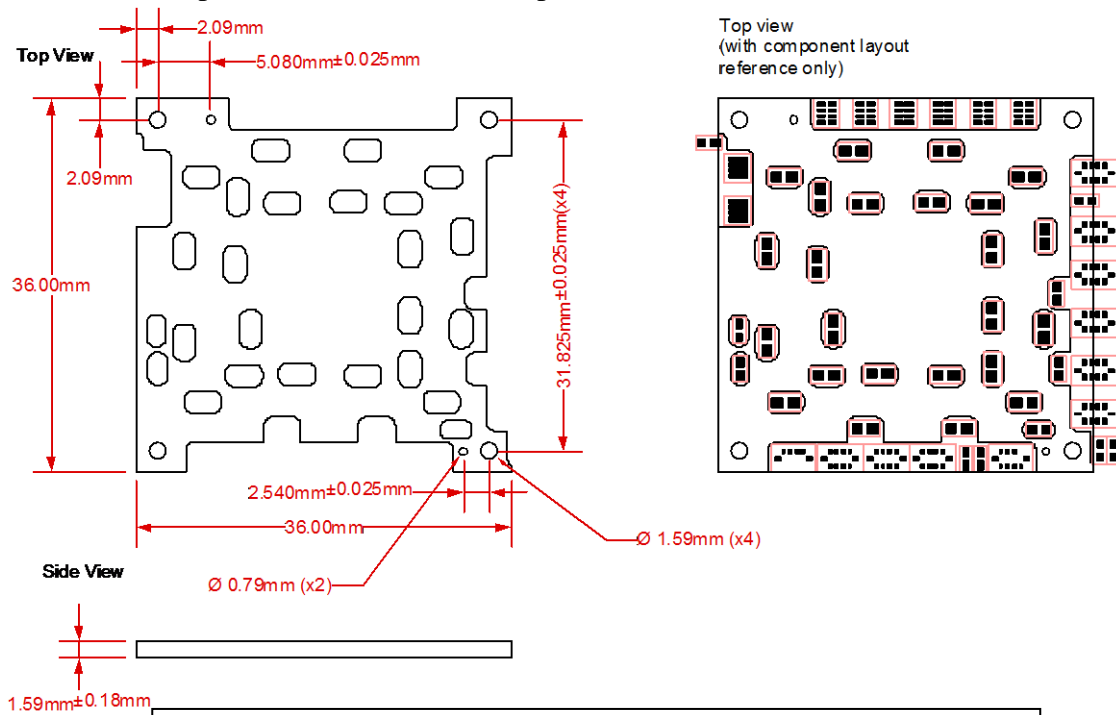


Figure 5: Insulation Plate example drawing

IC Insertion/extraction

A vacuum pen is recommended for insertion/extraction of ICs. Figure 6 shows a typical vacuum pen. TL-vacuumpen-01 can be purchased separately. Hand insertion of ICs and extraction using a small tweezers is also acceptable.

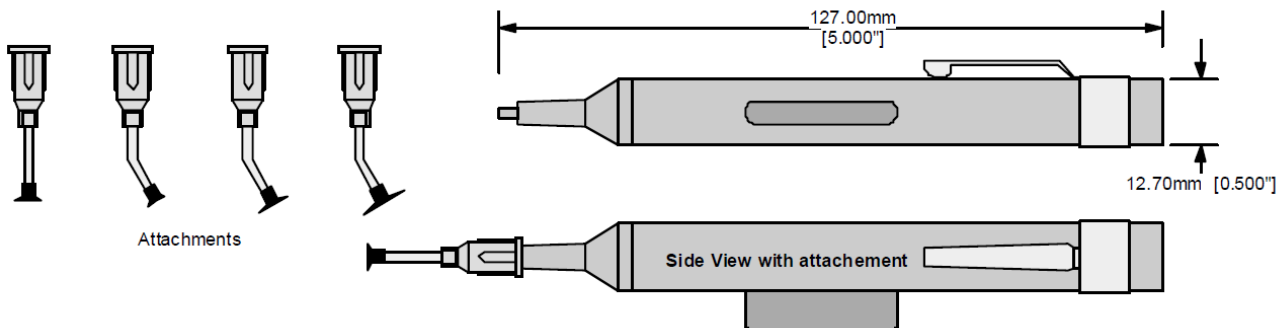
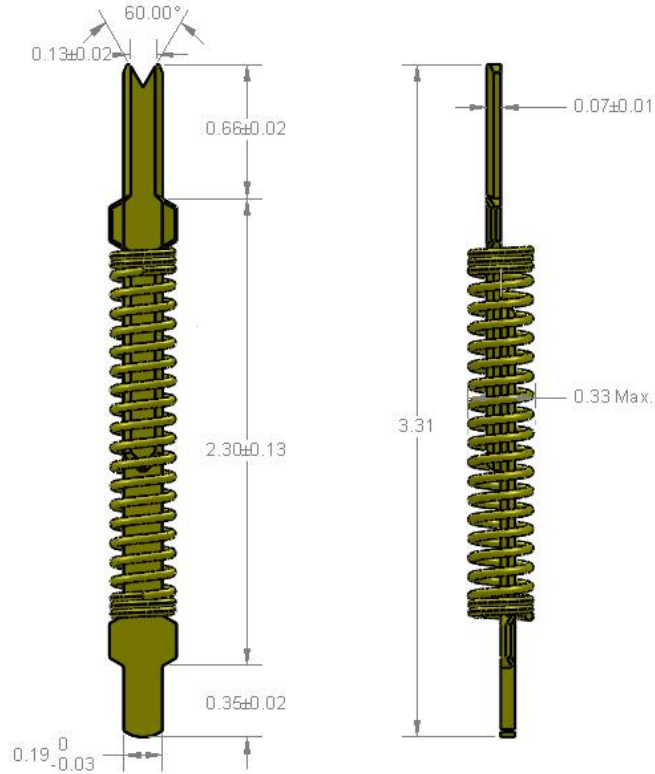


Figure 6: Vacuum Pen with Attachments



0.4mm Center – BGA Stamped Contact Specification (Scale 40:1)



MECHANICAL PROPERTIES:

- . Pitch: 0.40mm (min)
- . Working Travel: 0.63mm
- . Contact Force@ working travel: 34 gf
- . Full Length: 3.31mm
- . Compressed Length: 2.67mm
- . Operating Temperature: -55°C to +155°C
- . Mechanical Life: 10,000+ cycles

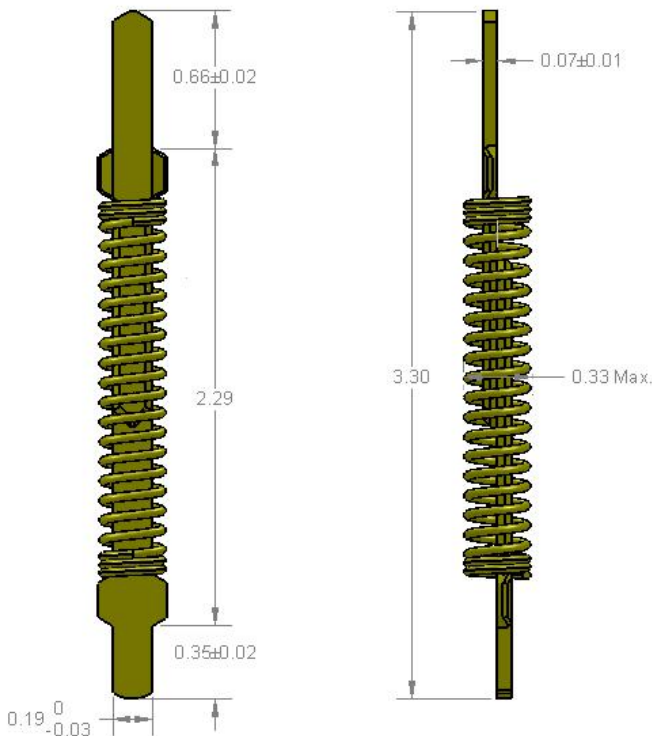
ELECTRICAL PROPERTIES:

- . Average Contact Resistance: <70mohms
- . Current Rating: 2.2 amp
(Ambient, No Cycling, Non Inductive Load)
- . Self Inductance: 0.9 nH
- . Capacitance: 0.03 pF
- . Bandwidth @ -1dB: 7 to 9.1 GHz

MATERIALS:

- . Stamped Contact: Cu110 Alloy, Au Plate
- . Spring SS, Au Plate

0.4mm Center – LGA Stamped Contact Specification (Scale 40:1)



MECHANICAL PROPERTIES:

- . Pitch: 0.40mm (min)
- . Working Travel: 0.6mm
- . Contact Force@ working travel: 34 gf
- . Full Length: 3.31mm
- . Compressed Length: 2.67mm
- . Operating Temperature: -55°C to +155°C
- . Mechanical Life: 10,000+ cycles

ELECTRICAL PROPERTIES:

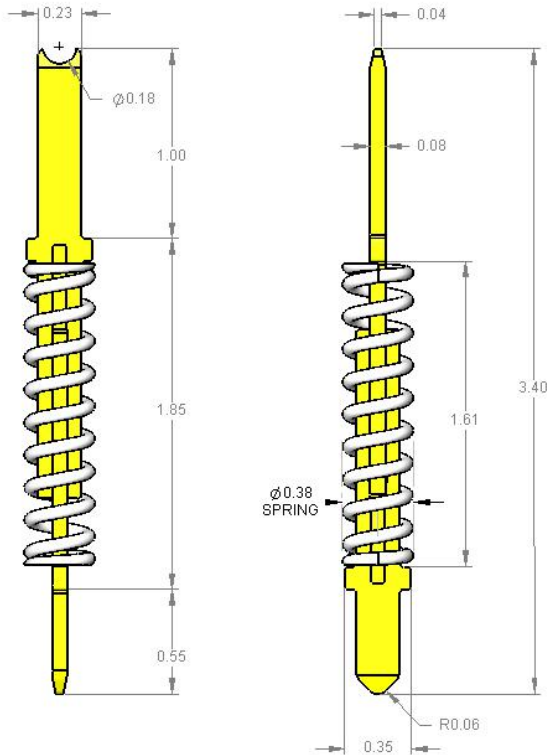
- . Average Contact Resistance: <70mohms
- . Current Rating: 2.2 amp
(Ambient, No Cycling, Non Inductive Load)
- . Self Inductance: 0.9 nH
- . Capacitance: 0.03 pF
- . Bandwidth @ -1dB: 7 to 9.1 GHz

MATERIALS:

- . Stamped Contact: Cu110 Alloy, Au Plate
- . Spring SS, Au Plate



0.5mm, 0.65mm & 0.8mm Center – BGA Stamped Contact Specification (Scale 40:1)



MECHANICAL PROPERTIES:

- . Pitch: 0.50mm (min)-0.8mm(max.)
- . Working Travel: 0.43mm
- . Contact Force@ working travel: 30.9 gf
- . Full Length: 3.4mm
- . Compressed Length: 2.92mm
- . Operating Temperature: -55°C to +180°C
- . Mechanical Life: 125,000+ cycles

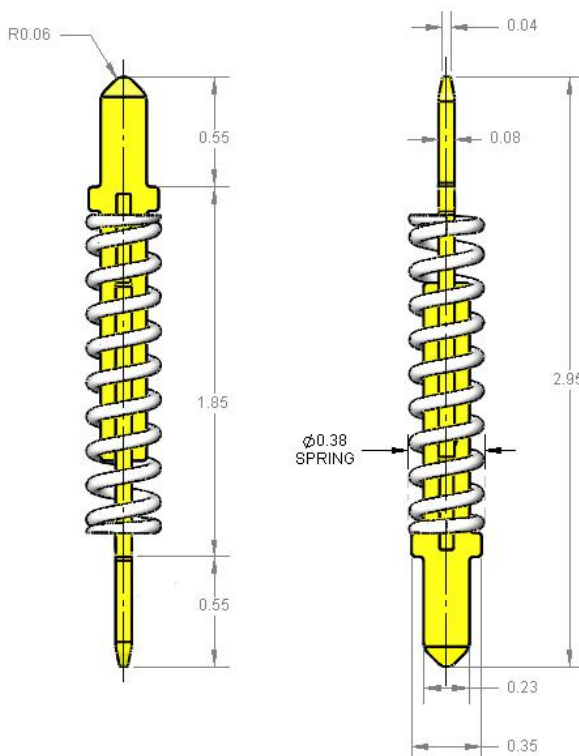
ELECTRICAL PROPERTIES:

- . Contact Resistance: <35mohms
- . Current Rating (80C rise): 4 amp
- . Self Inductance: 0.88 nH
- . Capacitance: 0.097 pF
- . Bandwidth @ -1dB: 5.2 to 15.7 GHz

MATERIALS:

- . Stamped Contact: BeCu, Au Plate
- . Spring SS, Au Plate

0.5mm, 0.65mm & 0.8mm Center – LGA/QFN Stamped Contact Specification (Scale 40:1)



MECHANICAL PROPERTIES:

- . Pitch: 0.50mm (min)-0.8mm(max.)
- . Working Travel: 0.43mm
- . Contact Force@ working travel: 30.9 gf
- . Full Length: 2.95mm
- . Compressed Length: 2.52mm
- . Operating Temperature: -55°C to +180°C
- . Mechanical Life: 125,000+ cycles

ELECTRICAL PROPERTIES:

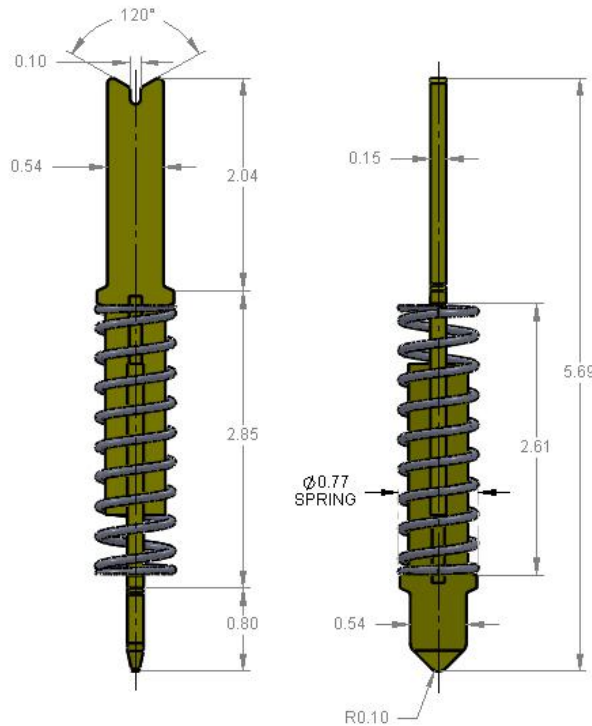
- . Contact Resistance: <35mohms
- . Current Rating (40C rise): 4 amp
- . Self Inductance: 0.88 nH
- . Capacitance: 0.097 pF
- . Bandwidth @ -1dB: 5.2 to 15.7 GHz

MATERIALS:

- . Stamped Contact: BeCu, Au Plate
- . Spring SS, Au Plate



1mm & 1.27mm Center – BGA Stamped Contact Specification (Scale 25:1)



MECHANICAL PROPERTIES:

- . Pitch: 1mm (min)-1.27mm(max.)
- . Working Travel: 0.6mm
- . Contact Force@ working travel: 19 gf
- . Full Length: 5.69mm
- . Compressed Length: 4.99mm
- . Operating Temperature: -55°C to +180°C
- . Mechanical Life: 125,000+ cycles

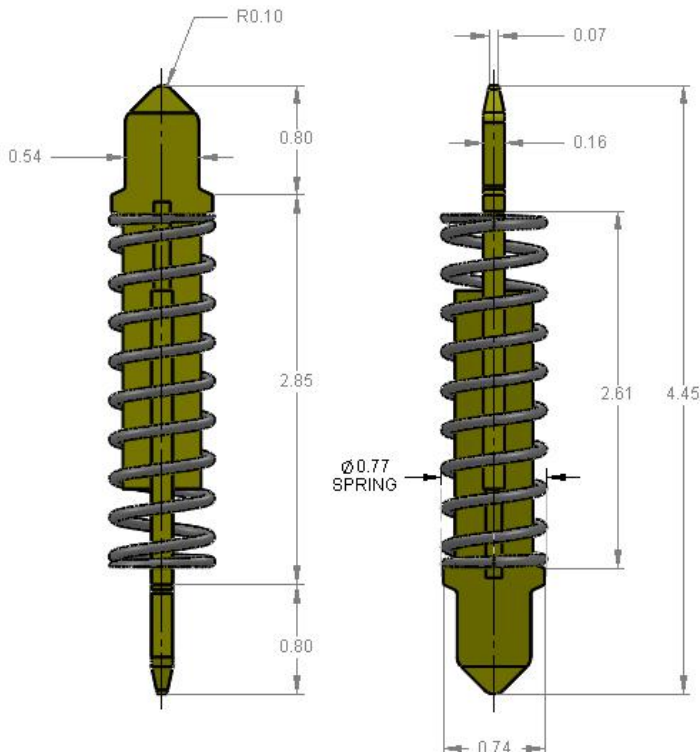
ELECTRICAL PROPERTIES:

- . Contact Resistance: <16mohms
- . Current Rating (80C rise): 4 amp
- . Self Inductance: 0.93 nH
- . Capacitance: 0.097 pF
- . Bandwidth @ -1dB: 14.1 to 21.9 GHz

MATERIALS:

- . Stamped Contact: BeCu, Au Plate
- . Spring SS, Au Plate

1mm & 1.27mm Center – LGA/QFN Stamped Contact Specification(Scale 25:1)



MECHANICAL PROPERTIES:

- . Pitch: 1mm (min)-1.27mm(max.)
- . Working Travel: 0.6mm
- . Contact Force@ working travel: 19 gf
- . Full Length: 4.45mm
- . Compressed Length: 3.85mm
- . Operating Temperature: -55°C to +180°C
- . Mechanical Life: 125,000+ cycles

ELECTRICAL PROPERTIES:

- . Contact Resistance: <16mohms
- . Current Rating (30C rise): 4 amp
- . Self Inductance: 0.93 nH
- . Capacitance: 0.097 pF
- . Bandwidth @ -1dB: 14.1 to 21.9 GHz

MATERIALS:

- . Stamped Contact: BeCu, Au Plate
- . Spring SS, Au Plate



Socket Maintenance

Setting up a Preventative Maintenance Program is important in maintaining both Socket and Test Probe life expectancy as well as good electrical continuity which will help minimize false rejects and low test yields. Generally, light cleaning is recommended for a preventative maintenance program of the test socket assembly. The most effective way to determine a schedule is by tracking test yields. The maintenance schedule should be based on when yields begin to fall below the performance of a new test socket. Some customers perform light cleanings on a per day basis or at 10,000 or 20,000 cycle intervals. The schedule depends on amount of debris or contamination that the socket and test probes are subject to.

The following items should be included in a typical maintenance program.

- Regular visual inspection to identify abnormal wear and contaminants on the socket or test probes.
- Examine the composition of any debris present and determine its source. Try to minimize the source of debris if possible.
- Verify that the socket is properly mounted to the load board and that it's flush to the top surface of the load board.
- Do not use any lubricants for test probe cleaning.

Dry Cleaning Procedure

Required equipment needed:

- Soft to medium bristle nylon brush
- Set of screwdrivers
- Set of Hex / Allen wrenches
- Small electronics industrial vacuum
- Non-powdered latex or rubber gloves or finger cots

Cleaning Procedure

- Remove the socket from the load board and brush any debris from the solder pads of the load board while vacuuming.
- If the socket is equipped with a manual lid remove or open it to gain access to the test probe tips.
- Hold the test socket in the vertical position, brush and vacuum at the same time to avoid any contaminants going inside the socket or working their way into the test probe assembly.
- Rotate the socket 90 degrees and repeat the previous step.
- Brush and vacuum the socket including the floating guide if equipped.
- Re-assemble the socket onto the load board when cleaning is complete.
- If your test socket is to be put in storage it is recommended that the light cleaning procedure be performed before storage so that any harmful contaminants left on the test probes do not harden and become difficult to remove. For example solder buildup will oxidize over time and will permanently damage probe tips.
- Always store the socket assembly in a dust free fully enclosed package.

What to avoid when cleaning?

- Use of compressed air >30psi is strongly discouraged. Compressed Air will drive contaminants into the internal working parts of the socket.
- Do not apply solder or heat to the test probes.



- Repeated mechanical cleaning of the probe tips will shorten the time period between required maintenance and more importantly it will start to remove surface plating which can result in continuity issues as well as contact failures and increased resistance.
- Heavy cleaning should be avoided if possible and if needed should only be performed once in the lifetime of the test probes. Heavy cleaning can be done by using the same tools and methods as with light cleaning with the exception of a soft brass brush being used with a very small amount of alcohol. Remember that an excess of alcohol and heavy brushing can lead to damage as well as unfavorable test results.

Wet Cleaning Procedure

Required equipment needed:

- Soft to medium bristle nylon brush
- Set of screwdrivers
- Set of Hex / Allen wrenches
- Small electronics industrial vacuum
- Non-powdered latex or rubber gloves or finger cots
- Ultrasonic bath
- IPA 99.5%
- Baking oven

Cleaning Procedure

- Remove the socket from the load board and brush any debris from the solder pads of the load board while vacuuming.
- Remove 4 screws from the bottom of socket base. Slowly remove middle and bottom guide together along with stamped contacts. Floating guide and floating springs will come apart. Save them for re-assembly.
- Separate both middle and bottom guides and dump stamped contacts into a beaker that has 99.5% IPA (enough to cover the pins).
- Place the beaker in ultrasonic cleaner and run at 22 °C at frequencies approximately 40kHz.
- Cleaning time: 45 to 60 minutes.
- After the ultrasonic bath, remove the socket from the bath, and dry with 30 psi maximum compressed air.
- Bake socket for 30 minutes at 65C.

Reassemble procedure:

- Flip the middle guide to side with bigger hole diameter and load SBT pins upside down with device interface tip end going in first.
- Align and place bottom guide on the top of the middle guide and flip the guide assembly.
- Place the Compression springs in the pockets located on the middle pogo guide top side.
- Align and place the top floating guide on top of the floating springs.
- Align and press SBT guide assembly (3 guides) onto dowel pins protruding from socket base.
- Mount 4 screws to attach SBT guide assembly to socket base.

Heat Sink Specifications

For high power dissipation, a specific heat sink lid can be designed using QFIN software. Please call Ironwood Tech Support @ 1-800-404-0204.