GHz QFN Socket User Manual

Ironwood Electronics
HIGH PERFORMANCE SOCKETS & ADAPTERS
Tel: (800) 404-0204
Fax: (952) 229-8201
www.ironwoodelectronics.com

GHz QFN Socket User Manual

Selecting QFN socket:

You need to have the IC package drawing ready to select the correct QFN socket. Go to www.ironwoodelectronics.com. Select "Products" link, then under "Browse" menu, select "GHz BGA & QFN socket" link. In the table, select the part number that corresponds to your IC size X & Y (mm), pitch (mm), and I/O pin count. You will see another frame on the top showing socket price and links to PDF and JPEG files.

The JPEG file shows a picture of the socket. The PDF file will have three pages. The first page shows the socket cross sectional views and material details. The second page shows the recommended PCB layout (Note: QFN pads are not symmetrical to the mounting holes). The third page shows the compatible QFN specification and QFN dimensions. Check the following parameters.

1. IC size X & Y (mm).
2. Pitch (mm)
3. I/O pin count

If any of the above parameters do not match, check the table again and repeat the parameter check. If none of the part numbers match your IC parameters, please call Ironwood Tech Support @1-800-404-0204.

Figure 2: GHz QFN Socket

Socket mechanics:

GHz QFN sockets provide 10 GHz bandwidth in a small cost effective ZIF socket for prototype and test applications. The GHz QFN socket is a simple mechanical socket based on an elastomer connector technology. The GHz QFN socket is a solder-less socket that can be directly mounted onto a PCB using bolts and nuts. PCB should have mounting and alignment holes at proper locations (see pages 2 and 3 of the drawing for recommended PCB layout information). Typical GHz QFN socket is 5mm larger than the maximum IC size. If there are pre-existing holes in the PCB, a GHz socket can be custom designed to accommodate those holes (please call Ironwood Tech Support @1-800-404-0204).

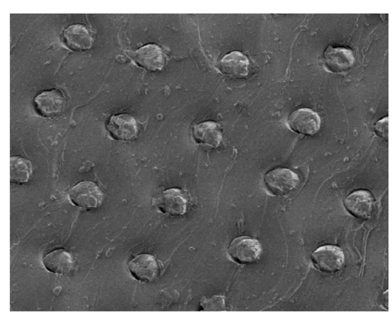

Figure 1: SEM Picture of Elastomer

Figure 1 shows a typical GHz QFN socket. Elastomer is the contactor between the IC package and the PCB. The Z-axis conductive elastomer used in the socket is a low-resistance (<0.01Ω) connector. Figure 2 shows a SEM picture of the elastomer. The elastomer used for high density

Ironwood Electronics
HIGH PERFORMANCE SOCKETS & ADAPTERS
Tel: (800) 404-0204 • (651) 452-8100
Fax: (651) 452-8400
PO Box 21151 • St. Paul, MN 55121 • USA
www.ironwoodelectronics.com

application consists of ultra fine pitch matrix (0.05mm x 0.05mm) of gold plated wires (20 micron diameter), 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. It is ideal for high-current (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. The operating temperature range for the elastomer is -35° to 100° C.

The solder pads from the IC package come in contact with the top end of the elastomer wire. The bottom end of the elastomer wire contacts the PCB pad and thereby makes an electrical path for the signal. Depending upon the solder pad and PCB pad dimensions, multiple wires can make contact between them. Figure 3 shows the cross-sectional side view of the elastomer with an example IC. The socket mechanism can be summarized as a downward force applied on the IC which compresses solder pads onto the elastomer which in turn compresses onto the PCB and thereby making the electrical connection.

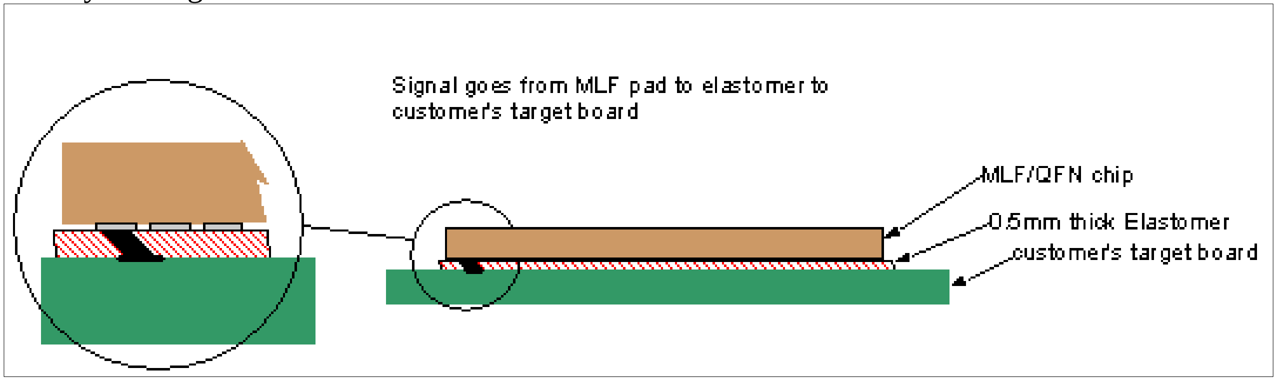

Figure 3: Elastomer cross-sectional side view

PCB Requirements:
Please refer to page 2 of the socket drawing for all PCB recommendations.
GHz socket needs four mounting holes.
Two alignment holes are used in all sockets. One is 2.54mm (in most cases) below the upper right mounting hole, and the other is 5.08mm (in most cases) above the lower left mounting hole. QFN pattern is not symmetrical to those mounting holes and it is shifted half the elastomer thickness (0.25mm in most cases) in the positive x-direction.
Thickness: 1.6mm minimum. This will change as per customer's application, environment and usage.
Finish: SnPb plating or Immersion Au or Immersion Ag. Other plating may be used, but testing may be required. Ideally pad surface is flush or higher than the solder mask, although solder mask of 0.002” above pad surface is acceptable.
Cleanliness: Isopropyl Alcohol or similar should be used to clean the board surface prior to attaching socket.

Tel: (800) 404-0204 • (651) 452-8100
Fax: (651) 452-8400
PO Box 21151 • St. Paul, MN 55121 • USA
www.ironwoodelectronics.com

Socket Assembly:
Refer to figure 4 for graphical illustrations.

1. Install the socket base assembly on the target PCB with the hardware (socket base screws and nuts) provided (because of asymmetrical tooling holes, socket can be assembled only one way).

2. Place QFN package (solder pad side down) into the socket. NOTE: QFN orientation on target PCB is critical.

3. Place the compression plate on top of the QFN package.

4. Install the socket top assembly onto the socket base assembly and swivel to lock into the position. Tight all the four socket lid screws.

5. Turn the compression screw clockwise to the specified torque called out on the SG-QFN drawing, page 1. Be careful not to over-tighten compression screw, the QFN package does not need much force to make appropriate contact with the elastomer. Over-tightening will damage the elastomer.

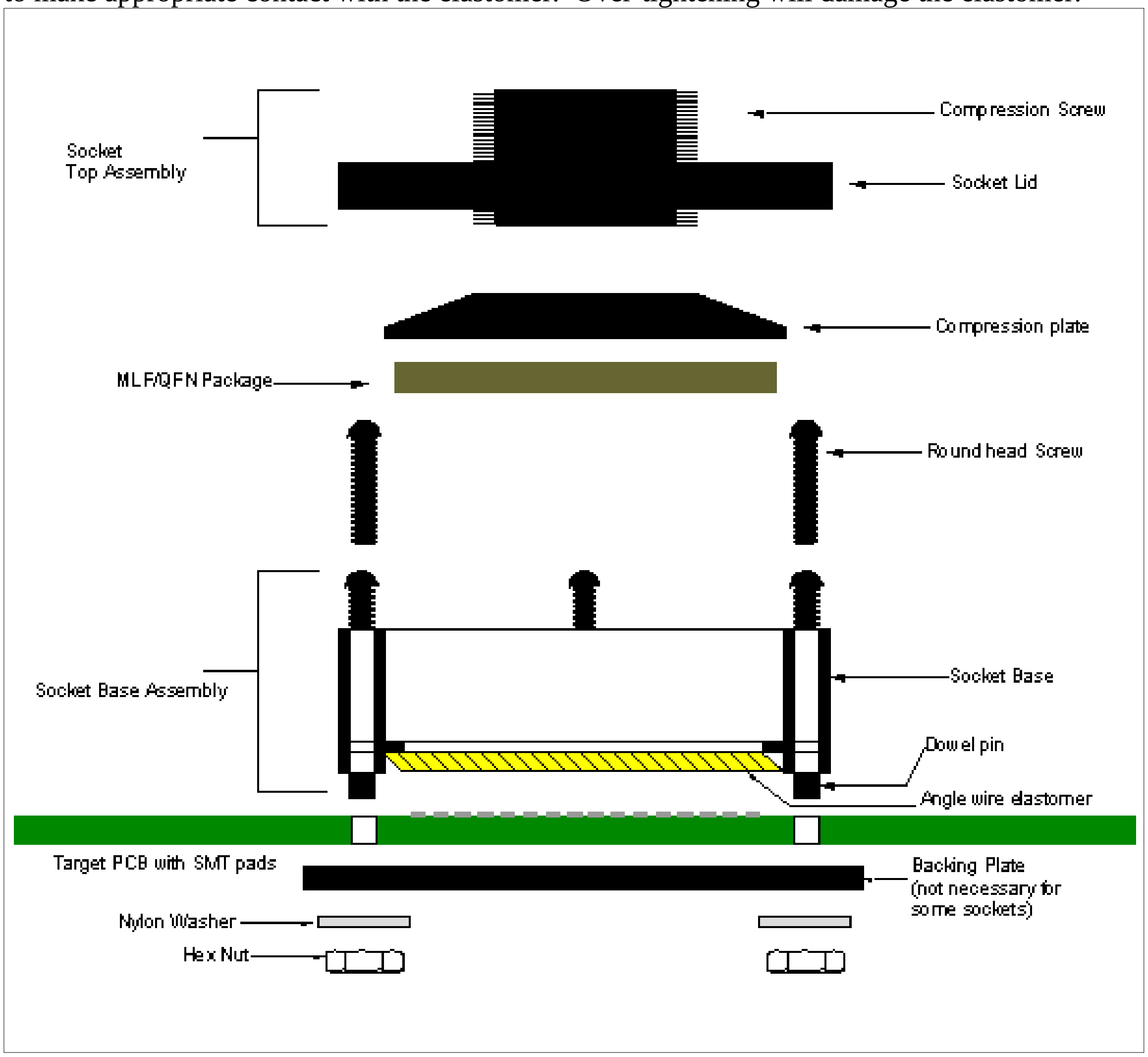

Figure 4: Graphical Illustration of Socket Assembly

Tel: (800) 404-0204 • (651) 452-8100
Fax: (651) 452-8400
PO Box 21151 • St. Paul, MN 55121 • USA
www.ironwoodelectronics.com

Torque tool:
A torque tool should be used to apply the proper torque to the compression screw. There are adjustable and factory preset torque tools currently available that may be purchased separately.

- TL-TORQUEDRIVER-04 (adjustable, 20-100 inch oz range)
- TL-TORQUEDRIVER-05 (factory preset, 8 inch oz)
- TL-TORQUEDRIVER-06 (factory preset, 16 inch oz)

They will come with a 5mm hex insert (compatible with compression screw). For other inserts, please call Ironwood Tech Support @1-800-404-0204.

Vacuum pen:
A vacuum pen is recommended for insertion/extraction of ICs having a body size of 8x8mm or larger. Figure 5 shows a typical vacuum pen. This part, TL-VACUUMPEN-01, may be purchased separately.

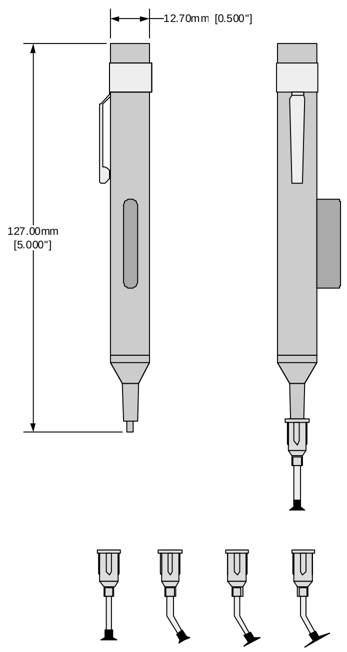

Figure 5: Vacuum Pen with Attachments

Tweezers:
A small tweezers is recommended for insertion/extraction of ICs having a body size of 7x7mm or smaller. Figure 6 shows a typical small tweezers with a GHz QFN socket.

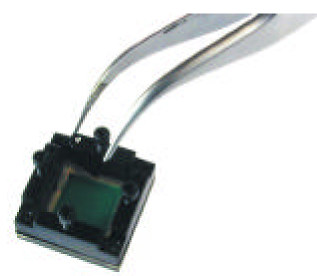

Figure 6: Tweezers with SG-QFN socket

Elastomer cleaning procedure:
Elastomer cleaning requirements vary with the customer application and are dependent on variables such as contact force, QFN package and environment it is used. A light cleaning is recommended every 25-50 cycles. A thorough cleaning is recommended every 100 cycles. These recommendations are suggestions only, and should be increased or decreased based on observation.

Required Tools: Scotch™ Magic™ Transparent tape. (For more thorough cleaning technique use alcohol, De-Ionized (DI) water, a stiff nylon brush, and clean dry shop air.)

Elastomer can be quickly cleaned of dust and debris with a piece of transparent tape approximately 2 inches long. (Scotch brand has been shown to be effective, but others may work as well.) The

Tel: (800) 404-0204 • (651) 452-8100
Fax: (651) 452-8400
PO Box 21151 • St. Paul, MN 55121 • USA
www.ironwoodelectronics.com

tape is rolled loosely around a fingertip, with the adhesive side out, and overlapped to adhere to itself. Remove socket from the board. With the tape positioned around the fingertip, roll the tape over the surface of the elastomer. The tape will not adhere to the elastomer, even if some force is applied, however, the tape will adhere to the elastomer guide. After cleaning the first side, remove the elastomer guide and clean the opposite side with a fresh piece of tape. The exposed side of the elastomer can be cleaned without removing it from the socket base assembly.

Elastomer, elastomer guide and IC guide are assembled using silicone adhesive and are press fit to the dowel pins on the socket base. Elastomer orientation in the elastomer guide is critical. Socket will not function properly if the elastomer orientation is wrong (See figure 7 for proper orientation).

Caution: the elastomer will absorb liquids and may become deformed if it absorbs too much. Do not apply liquids directly to the elastomer or submerse the elastomer in liquid.

For a more thorough cleaning, use the stiff nylon brush and a solution of half DI water and half isopropyl alcohol. Wet the brush, scrub the surfaces of the elastomer, and blow both sides dry with clean dry shop air. After allowing it to fully dry, clean the surfaces with the rolled tape method to remove any dust or lint accidentally deposited in the drying process. Only perform the thorough cleaning with the elastomer removed from the elastomer guide.

Elastomer specifications:

Operating Temperature

Continuous usage: -35C to +100C
Compression set: 150C for 22hrs
Thickness change: -4.5%

Vibration

Standard: MIL-STD202, METHOD 204, CONDITION A
No change in resistance and thickness

Humidity

Standard: MIL-STD202, METHOD 106
Resistance change: 26 mΩ
Thickness change: -1%

Thermal shock

Standard: MIL-STD202, METHOD 107, CONDITION A
Resistance change: -19 mΩ
Thickness change: -1%

Temperature cycling

Standard: MIL-STD202, METHOD 103, CONDITION A
Resistance change: 15 mΩ
Thickness change: -6%

Mechanical Specifications:

Conductive elastomer life: 1700 cycles.

Electrical Specifications	0.5mm Thick
Contact resistance:	50mΩ[1]
Insulation resistance:	1000MΩ[2]

Ironwood Electronics
HIGH PERFORMANCE SOCKETS & ADAPTERS

Tel: (800) 404-0204 • (651) 452-8100
Fax: (651) 452-8400
PO Box 21151 • St. Paul, MN 55121 • USA
www.ironwoodelectronics.com

Self Inductance:	0.15nH[3]
Bandwidth:	10.0GHz
Insertion loss:	1dB@10GHz
Mutual Capacitance (at PCB):	0.010pF[5]
Mutual Capacitance (at device):	0.015pF[5]
Current carrying capacity:	50mA/wire[6]

Notes:1 Maximum contact resistance with 0.2mm compression (contact resistance will decrease with increased compression). Measurements were taken using 0.4mm square electrodes. The 0.75mm value is interpolated from a test of 0.5mm, 1mm, and 2.0mm elastomers.

[2] The test used 0.5mm wide Au plated electrodes with a 0.5mm gap between them. 500VDC was used with a 1mm thick elastomer compressed 0.35mm.

[3] Measurements were taken with a flat gold plated electrode. The 0.75mm value is interpolated from a test of several elastomer thicknesses ranging from 0.1mm to 2.0mm.

[4] This is a conservative estimate based on 1mm thick elastomer test results with test probes spaced at 0.5mm.

[5] Measurements were taken with test probes at 0.5mm pitch. The 0.75mm value is interpolated from a test of several elastomer thicknesses ranging from 0.1mm to 2.0mm.

[6] The wires are on a 0.05x0.05mm grid. Multiple wires make contact per solder ball based on its size and depth of penetration.

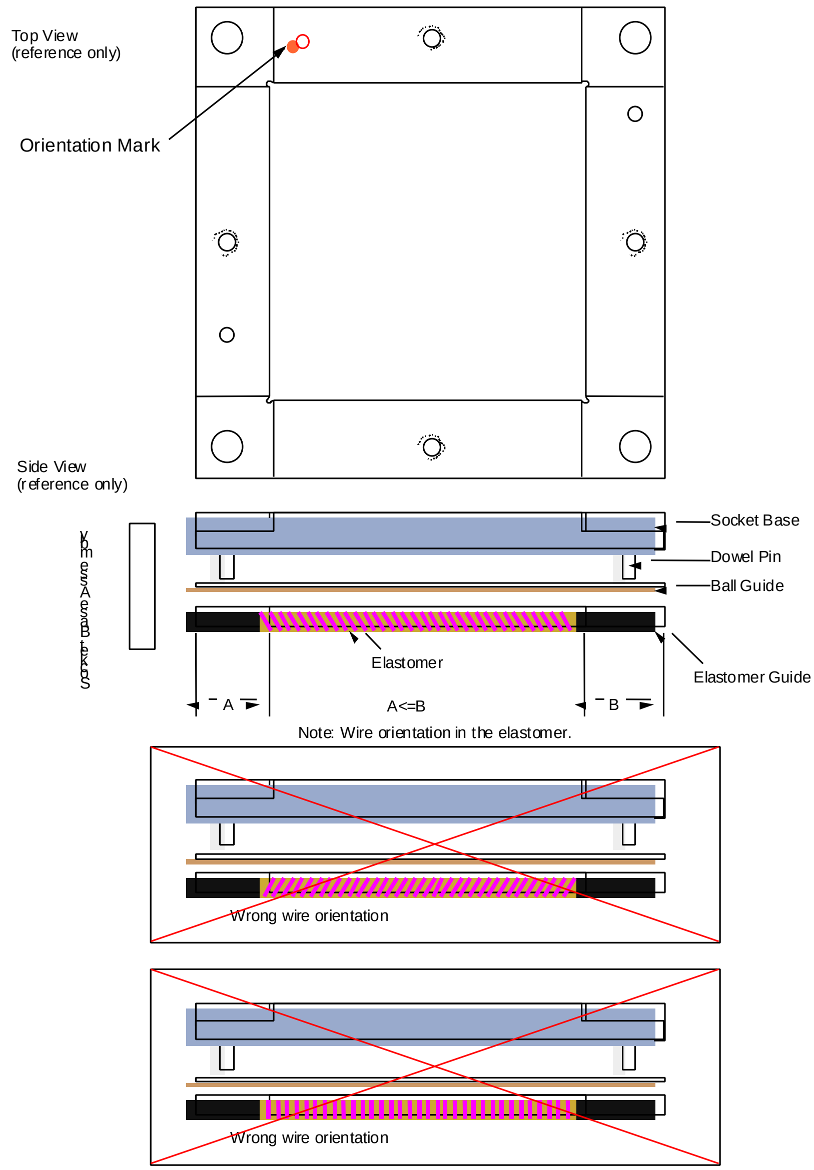

Figure 7: Elastomer Orientation

Rev. D, RP, 7/23/14