Synergetix® Test Sockets
The Probe-Socket Technology Your Device Deserves.
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SocketBuilder.com

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Socket Specifications
Request for Test Socket Quotation
Synergetix Test Socket Solutions
A long life of dependable performance

Probe-socket technology began at Synergetix. With our proven combination of superior probe and socket engineering, you can expect more from Synergetix, like:

Your perfect test socket solution.
- Pitches from 0.40mm
- Solutions for any device, including area array and peripheral devices for any conceivable package footprint
- High performance burn-in to high frequency production and characterization sockets
- Adaptable to most existing DUT boards
- Superior electrical performance with IDI Probes

Your most dependable electrical performance.
- Bandwidths for above 10 GHz
- Consistent, accurate readings to 500,000+ cycles
- Resistance as low as 15mΩ
- Virtually transparent signal paths

Your complete package of standard features.
- Pre-loading to DUT board for infinite DUT board life
- Field replacable contacts
- Heat dissipation features
- Missing ball detection
- Mirrors device footprint on DUT board
- Cleaning and spare probe kit included

Your widest selection of options.
- Sensor grooves
- Component cutouts
- Standard or custom footprints
- Four lid designs or actuators
- Floating nests
- Strip test contactors
- Multiple site test sockets
- Coaxial contactors
The Synergetix Advantage
IDI Probes

Probe technology is clearly the choice for superior electrical performance characteristics over other contact methods, including stamped metal, elastomer, and wire mesh options. IDI, our sister company, is the world's leader in probe technology. Synergetix test sockets are populated using only IDI probes, giving you extended life and increased yields.

Mechanical Performance Features:
• Patented capsule and three-piece probe designs for optimum electrical performance
• Cycle life surpassing 500,000
• Optimizing probe tip geometry with the target
• Tip geometry offering includes these popular options:
  – 4-Point and 3-Point Crown Tips for BGAs and leaded devices
  – Pointed Tips for recessed LGAs when penetration is required
  – Concave Tips for LGAs and QFNs
  – Radius Tips to eliminate or minimize witness marks
• Spring force consistent throughout probe life
• Force per contact between 15 grams and 50 grams
• Device compliance from 0.15mm to 0.76mm
• Minimized cleaning and maintenance

Electrical Performance Features:
• Bandwidths for above 10 GHz
• Virtually transparent signal path for minimal distortion
• Signal paths as short as 1.60mm
• Self-inductance as low as 0.33 nH
• Capacitance as low as .005 pF
• Operating temperature from -55°C to 150°C
• Current rating up to 6 amps
• 50 Ohm characteristic impedance

This mark assures you that our sockets are populated with the industry’s most advanced probes. Synergetix and IDI, as sister companies, combine the world’s leading socket manufacturer and the Innovator in Semiconductor Probe Technology under one roof.

Although IDI probes are the choice of many test socket manufacturers, the newest, highest performing designs are reserved for use exclusively in Synergetix Test Sockets. When referring to the probe insert sheets, titles coded in purple designate probes available only in Synergetix Test Sockets.
When the first Synergetix Test Socket was delivered in 1994, it was the result of a novel approach in socket manufacturing. Never before had socket engineers designed side-by-side with probe engineers. This synergy of probe and socket engineering raised the bar in socket performance standards to a whole new level. When you talk to us, it doesn’t take long to realize that you’re teaming up with the leading probe-socket developers. We ask questions that others don’t. Working engineer-to-engineer, we understand what it takes to design the best socket for your application. And we know how to choose the precise probe so your device aligns properly in the socket for a 100% hit rate every time.

This excellence has earned us the socket business of many of the leaders in the semiconductor industry. In Japan, Synergetix is the leading brand of imported test sockets. We would like the opportunity to earn your socket business.

Our History

It was no accident that Synergetix was one of the first companies to see that probes had an application in test sockets. The story of Synergetix starts with IDI. Established in 1979, IDI is the world’s leader in ATE spring-loaded probe design and manufacturing. As IDI became the spring probe market share leader in the early 1990’s, the company began a strategic initiative to identify new marketplaces where its core competencies could be utilized competitively. Spring-loaded probes, after all, had proven themselves to be ideal electro-mechanical connectors for PCB testing, why not introduce this technology to other applications where high reliability interconnect was demanded? The result of this initiative was the launch of Synergetix in 1994.

You know Synergetix for its leadership in the socket industry. Yet our core competency in multi-cycle interconnection has been welcomed in other areas where reliability is critical. For example, we manufacture custom test interfaces for ATE manufacturers. We have also introduced probe technology to a broader range of markets. If you know an associate who is exploring new interconnect solutions please let them know about Synergetix.

Quality Control Capabilities

Before we help you test, we test ourselves. Building sockets demands exact component tolerances. In order to assure that these tolerances are met, Synergetix assures the highest standards of accuracy throughout our quality control and failure analysis processes. All equipment used for inspection is calibrated and traceable to NIST standards. Our capabilities include:

- ROI OMIS III 12x12 Automated Video Inspection Equipment
- Smart Scope 8x8x6 Automated Video Inspection Equipment
- X-ray examination
- HAST Testing
- Equipment +/- .0002” tolerance measurement
- Network Analyzer
- TDR — DC to 18 GHz
- LCR Meter
- Spice Modeling
Every chip is a unique creation and so is every socket. Your Synergetix sales engineer and design engineer will help you determine what options will be required for your Synergetix Test Socket.

Contact Options

**Optimum Tip Geometry Configuration** is an advantage that bent and stamped metal contacts cannot offer. IDI probes allow the user to select the right tip for the job. For example, a 4-point crown is the perfect tip for contacting a BGA. It does not damage the critical center arc of the ball. For LGA, QFN and other leadless devices, pointed tips are preferred for their precise contact area and deep penetration. Where tolerances are too wide to permit a pointed tip, flat or concave tips are used to compensate. Synergetix can provide the optimal tip geometry for your requirements.

Socket Material Options

Housing Material Options will be matched with your application. Although Torlon 5530 is one of the most advanced of the plastics we use in socket construction, we use a variety of materials, which all have the following benefits.

- **Machinability** — Allows for the creation of the most precise features.
- **Minimal Hygroscopic Growth** — With the extremely tight tolerances in our sockets, we work closely with engineering plastics suppliers to avoid any change in dimension due to moisture.
- **Material Stability** — Socket integrity is protected through thermal and mechanical cycling.

Heat Control Options

**Thermal Stream Access Holes**, standard on all Synergetix Test Socket lids, allow constant airflow for temperature control.

**Heat Dissipating Fans**, an option if your application requires forced airflow from the lid itself.

**Heat Sinks** to keep your device cooler. A metal component with good heat absorption properties, the heat sink draws the heat from the devices into itself.
Lid Options

- **Clamshell** lids are used for manual test applications. Our innovative controlled travel design permits easy actuation and adjusts to accommodate a wide range of device thicknesses.

- **Clip-On** lids perform flawlessly during setup for the handler.

- The **VCC or Vertical Compression Lid**, is a clamshell lid without the secondary actuation. Some customers prefer the convenience of pushing the device into the pocket in a single actuation. The VCC’s unique design assures effortless linear compression of the device.

- **CamLock** is a new, economical option that allows easy compression of the device during tester setup. A simple, universal design keeps costs and lid inventory under control.

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Probe Technology Versus Conventional Interconnect Options

As the chart below shows, probe technology clearly outperforms all competing contact options. It has superior electrical performance characteristics over stamped metal, elastomer, and wire mesh options. IDI probes are unsurpassed, providing you the same spring force on the first cycle as the 500,000th cycle. In comparison, bent metal, fuzz buttons and elastomers all take a set and as the cycles continue, their contact force is reduced which will cause more resistance and jeopardize electrical performance.

<table>
<thead>
<tr>
<th>Synergetix Spring Probe Test Sockets</th>
<th>Conductive Electronic Test Sockets</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Conventional Interconnect Options</td>
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<td>RF Properties</td>
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</tr>
</tbody>
</table>
| Synergetix's innovative Capsule Probe designs are the shortest, lowest inductance, highest bandwidth spring probes in the world.

**Missing Ball Detection** will assure that you do not get a false positive if a ball is missing on your device. We make sure that there is a clearance between the chip and probe tips, controlled by a hard stop location.

**IDI’s Three-Piece Probe Design** has been our standard for several years, and is still unmatched in the industry. The contact tip is cut directly into the probe barrel. This allows Synergetix to offer large tip diameters, low contact resistance, long life and excellent RF properties.
Handler and DUT Board Options

Standard or Custom Sizes, Footprints and Pockets cover every requirement. Synergetix offers five standard socket series with standard or customized footprints, or we can do any size socket and any footprint. Synergetix has extensive experience with every major handler type. We provide unmatched expertise in matching socket configuration to handler and change kit requirements. Since Synergetix only makes custom sockets, we can handle any device, no matter how unusual.

...and still more options.

- Synax MLF socket with component cutouts
- DeltaFlex MLF socket
- Very small profile socket
- Single and multi-site Delta Castle MX contactors
- Series 27 MSOP socket
- High pin count BGA socket
- MCT7632 dual site TSOP contactor
- Multitest 9320 MLF socket
- Custom MLM socket with integral clamshell lid
- Multitest 9510 socket
- Modular Delta Castle MX contactor insert
Specialty Socket Options

**Floating Nests**
Spring-Loaded
Floating Nests permit alignment by the device lead rather than the substrate edge. Since lead position is often much better controlled than substrate dimensions can be, floating nests can provide greatly improved alignment, better yield performance, and increased contact life.

**Multiple Test Site**
Test setups often benefit from having Multiple Test Sites in one socket body. This offers greater socket economy and increased throughput.

**Coaxial Test Socket**
Certain devices demand absolute control of impedance. Synergetix uses probes made by IDI, who has many patents on Coaxial probe technology. Shielded probes can be integrated into a test socket to allow true controlled impedance signal transfer.

**Strip Test Contactors**
Synergetix is the world’s premier manufacturer of Strip Test Contactors. We have worked closely with strip test handler manufacturers and have made several advances in contactor design which improve the overall performance of presingulation test.

**Back Side Cutouts** are specified to accommodate DUT board components, such as decoupling capacitors. This allows the socket to have a conventional footprint and still permit decoupling as close as 0.5 mm to the device edge.
SocketBuilder.com

Your tool for design automation is a click away.

Ever imagine designing your own socket on the web? Ever imagine that you could have a drawing in about three minutes? Well, stop imagining and log on to SocketBuilder.com. Launched in April, 2003, with area array designs, SocketBuilder.com has already been upgraded to give you QFN designs and budgetary quotes! SocketBuilder.com has transformed the way test sockets are purchased, just as it has already transformed our company. You see, SocketBuilder was being used internally as a tool for our engineers. Now, we’re making it a web interface tool for our customers. From now on, you will control your own destiny when it comes to getting drawings and quotes.

Here’s how SocketBuilder works:

• When you come into the site, you’ll spec out your application, chip, electrical performance criteria, handler type, etc.
• Based on this input, SocketBuilder.com will generate an engineering drawing for the required socket.
• SocketBuilder.com will send you an e-mail with a hyperlink to your drawing. This is a detailed manufacturing drawing, not just a generic drawing with limited dimensions.
• SocketBuilder.com also provides a budgetary quote based on the drawing and various options.
• SocketBuilder.com will even recommend the appropriate spring contact probes.
Use our flash animated demo to see how easy it is to use SocketBuilder.com.

These are two sample screens of the SocketBuilder.com automated design application. In the screen above, the user defines the device footprint. In the lower screen, the user can customize the socket footprint.
Dear Synergetix Test Socket Customer,

Synergetix has become an innovator of probe-socket technology, the industry standard for ultimate performance. But we haven’t done this alone. The innovations and impressive solutions you see in this brochure are the result of thorough collaboration between our engineers and our customers.

But innovation has one drawback: it’s so easy for your literature to become outdated! Hence, the reason for this pocket. We want to make sure the information on the enclosed probe spec sheets represents the most current state of our capabilities. When you refer to this folder in the future, please contact your sales engineers for potential updates, or visit our web site at www.synergetix.com.

Another thing I’ve learned about innovation at Synergetix: it doesn’t stop with our test socket design and manufacturing. Our award-winning web team has revolutionized the way we deliver our service. I am referring to SocketBuilder.com, the unique web tool that has put socket design automation in the hands of our customers.

Imagine designing your own socket on the web. Now imagine that you could have a drawing in about three minutes. That’s the reality of SocketBuilder.com! With this web innovation, what used to take us weeks is now achieved by you in around three minutes.

I invite you to use SocketBuilder.com on your next test socket order. It will simplify your job and gain you precious time. After you use it, let me know what you think by e-mailing me at ceo@idinet.com.

Sincerely,

Ed Schifman
CEO, Synergetix
### 101001 Semiconductor Probe

**Probe Specifications**

- Minimum Device Pitch: 0.50 (.020)
- Signal Path Length: 2.37 (.093)
- Force per Contact: 27.14 grams (0.96 oz.) @ 0.30 (.012) travel
- Device Compliance: 0.15 (.006)
- DUT Board Compliance: 0.15 (.006)
- Maximum Compliance: 0.38 (.015)
- Operating Temperature: -55°C to 150°C
- Insertions: >500,000

### Materials

- Barrel: Nickel/silver, gold plated
- Spring: Stainless steel, gold plated
- Plungers: Full-hard beryllium copper, gold plated

### Cross Section – Free State

Dimensions in millimeters (inches)

#### Probes

- **L1, L2**: pin self-inductance
- **M21**: mutual-inductance between adjacent pins
- **R1, R2**: shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a**: mutual-capacitance between adjacent pins (PCB side)
- **C21b**: mutual-capacitance between adjacent pins (BGA side)

### Electrical Specifications

- Impedance: 50 Ω characteristic
- Bandwidth: 6.4 GHz @ -1 dB
- Self Inductance: 0.50 nH @ 0.50 (.020) pitch
- Mutual Inductance: 0.01 nH @ 0.50 (.020) pitch diagonal
- Capacitance: 0.040 pF
- Contact Resistance: <60 mΩ
- Current Carrying Capacity: 5 amps continuous (Individual probe in free air @ ambient temperature)

### Equivalent Circuit Diagram

![Equivalent Circuit Diagram](image)

### Part Number

- 101001-000 for 90° Concave Tip
- 101001-001 for 90° Spear Point Tip
- 101001-002 for 4-Point Crown Tip
- 101001-012 for 3-Point Crown Tip
- 101001-016 for 120° Spear Point Tip

Specifications subject to change without notice. All measurements were taken at 0.50mm pitch.
Minimum Device Pitch – 0,50 (.020) 101041

**Probes by**

### Electrical Specifications

**Impedance:** 50 Ω characteristic
**Bandwidth:** 6.4 GHz @ -1 dB
**Self Inductance:** 0.58 nH @ 0.50 (.020) pitch
**Mutual Inductance:**
- 0.00 nH @ 0.50 (.020) pitch diagonal
- 0.09 nH @ 0.50 (.020) pitch adjacent
**Capacitance:** 0.04 pF
**Contact Resistance:** <60 mΩ
**Current Carrying Capacity:** 5 amp continuous

(Individual probe in free air @ ambient temperature)

### Equivalent Circuit Diagram

![Equivalent Circuit Diagram](image)

**Element Definitions**

- **L1, L2:** pin self-inductance
- **M21:** mutual-inductance between adjacent pins
- **R1, R2:** shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a:** mutual-capacitance between adjacent pins (PCB side)
- **C21b:** mutual-capacitance between adjacent pins (BGA side)

### Element Values

The socket model is valid from DC to 3.05 GHz. The measured and modeled transmission response agrees within 0.3 dB. A model was extracted for four types of pins: adjacent field pins, field pin oriented diagonally, edge pins and corner pins.

<table>
<thead>
<tr>
<th>Probes</th>
<th>L1 &amp; L2 (nH)</th>
<th>M21 (nH)</th>
<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>field adjacent</td>
<td>0.58</td>
<td>0.09</td>
<td>500</td>
<td>0.040</td>
<td>0.040</td>
</tr>
<tr>
<td>field diagonal</td>
<td>0.57</td>
<td>0.00</td>
<td>700</td>
<td>0.007</td>
<td>0.007</td>
</tr>
<tr>
<td>corner adjacent</td>
<td>0.75</td>
<td>0.13</td>
<td>500</td>
<td>0.050</td>
<td>0.050</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice.

All measurements were taken at 0.75mm pitch.

### Part Number

- **101041-000** for 90° Concave Tip
- **101041-001** for 90° Spear Tip
- **101041-002** for 4-Point Crown Tip
- **101041-006** for 120° Spear Point
Minimum Device Pitch – 0,50 (.020) 101210

101210 Semiconductor Probe

**Electrical Specifications**
- Impedance: 50 Ω characteristic
- Bandwidth: 4.5 GHz @ -1 dB
- Self Inductance: 0.93 nH @ 0,50 (.020) pitch
- Mutual Inductance:
  - 0.06 nH @ 0.50 (.020) pitch diagonal
  - 0.19 nH @ 0.50 (.020) pitch adjacent
- Capacitance: 0.08 pF
- Contact Resistance: <50 mΩ
- Current Carrying Capacity: 3 amps continuous
  (Individual probe in free air @ ambient temperature)

**Part Number**
101210-000

**Probe Specifications**
- Minimum Device Pitch: 0,50 (.020)
- Signal Path Length: 5,20 (.205)
- Force per Contact: 31.19 grams (1.1 oz.)
  @ 0.66 (.026) travel
- Device Compliance: 0.51 (.020)
- DUT Board Compliance: 0.15 (.006)
- Maximum Compliance: 1.00 (.039)
- Operating Temperature: -55°C to 85°C
- Insertions: >500,000

**Materials**
- Barrel: Nickel/silver, gold plated
- Spring: Music wire, gold plated
- Plungers: Full-hard beryllium copper, gold plated

**Cross Section – Free State**

Dimensions in millimeters (inches)
Minimum Device Pitch – 0,65 (.026) 101085

PROBE SPECIFICATIONS

Minimum Device Pitch: 0,65 (.026)
Signal Path Length: 1,60 (.063)
Force per Contact: 22.03 grams (0.8 oz.)
@ 0,36 (.014) travel
Device Compliance: 0,18 (.007)
DUT Board Compliance: 0,18 (.007)
Maximum Compliance: 0,46 (.018)
Operating Temperature: -55°C to 150°C
Insertions: >500,000

Materials
Barrel: Nickel/silver, gold plated
Spring: Stainless steel, gold plated
Plunger: Nickel/silver, gold plated

Cross Section – Free State

Dimensions in millimeters (inches)

ELECTRICAL SPECIFICATIONS

Impedance: 50 Ω characteristic
Bandwidth: 7.8 GHz @ -1 dB
Self Inductance: 0.33 nH @ 0,65 (.026) pitch
Mutual Inductance:
- 0.003 nH @ 0,65 (.026) pitch diagonal
- 0.050 nH @ 0,65 (.026) pitch adjacent
Capacitance: 0.04 pF
Contact Resistance: <50 mΩ
Current Carrying Capacity: 3 amps continuous
(Individual probe in free air @ ambient temperature)

Equivalent Circuit Diagram

Element Definitions
L1, L2: pin self-inductance
M21: mutual-inductance between adjacent pins
R1, R2: shunt-resistance of inductors L1 and L2, used to model high-frequency loss
due to skin effect and dielectric loss
C21a: mutual-capacitance between adjacent pins (PCB side)
C21b: mutual-capacitance between adjacent pins (BGA side)

Element Values
The socket model is valid from DC to 3.05 GHz. The measured and modeled transmission
response agrees within 0.2 dB. A model was extracted for four types of pins: adjacent field
pins, field pin oriented diagonally, edge pins and corner pins.

<table>
<thead>
<tr>
<th>Probes</th>
<th>L1 &amp; L2 (nH)</th>
<th>M21 (nH)</th>
<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>field</td>
<td>0.33</td>
<td>0.050</td>
<td>50</td>
<td>0.040</td>
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<tr>
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<td>0.050</td>
<td>50</td>
<td>0.040</td>
<td>0.040</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice.
All measurements were taken at 0.75mm pitch.

PART NUMBER

101085-000
**Probes by 60° Spear Spherical Radius 4-Point Crown**

**100938 SEMICONDUCTOR PROBE**

**Minimum Device Pitch**
- 0.65 (0.026)

**Minimum Device Pitch**
- 0.65 (0.026)

**Signal Path Length**
- 4.75 (0.187)

**Force per Contact**
- 31.22 grams (1.1 oz.) @ 0.97 (0.038) travel

**Device Compliance**
- 0.48 (0.019)

**DUT Board Compliance**
- 0.48 (0.019)

**Maximum Compliance**
- 1.30 (0.051)

**Operating Temperature**
- -55°C to 150°C

**Insertions**
- >500,000

**Materials**
- **Barrel:** Nickel/silver, gold plated
- **Spring:** Stainless steel, gold plated
- **Plungers:** Full-hard beryllium copper, gold plated

**Cross Section – Free State**

**Dimensions in millimeters (inches)**
- 5.72 (0.225)
- 0.53 (0.021)
- 1.00 (0.0395)
- 0.25 (0.010)

**ELECTRICAL SPECIFICATIONS**

- **Impedance:** 50 Ω characteristic
- **Bandwidth:** 2.4 GHz @ -1 dB
- **Self Inductance:** 0.9 nH @ 0.75 (0.029) pitch
- **Mutual Inductance:**
  - 0.09 nH @ 0.75 (0.029) pitch diagonal
  - 0.23 nH @ 0.75 (0.029) pitch adjacent
- **Capacitance:** 0.10 pF
- **Contact Resistance:** <70 mΩ
- **Current Carrying Capacity:** 3 amps continuous (Individual probe in free air @ ambient temperature)

**Equivalent Circuit Diagram**

**Element Definitions**
- **L1, L2:** pin self-inductance
- **M21:** mutual-inductance between adjacent pins
- **R1, R2:** shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a:** mutual-capacitance between adjacent pins (PCB side)
- **C21b:** mutual-capacitance between adjacent pins (BGA side)

**Element Values**

The socket model is valid from DC to 3.05 GHz. The measured and modeled transmission response agrees within 0.3 dB. A model was extracted for four types of pins: adjacent field pins, field pin oriented diagonally, edge pins and corner pins.

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<tr>
<th>Probes</th>
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<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
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<td>0.9</td>
<td>0.23</td>
<td>250</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>adjacent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>field</td>
<td>0.9</td>
<td>0.09</td>
<td>250</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>diagonal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>edge</td>
<td>1.0</td>
<td>0.30</td>
<td>250</td>
<td>0.14</td>
<td>0.14</td>
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<tr>
<td>adjacent</td>
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<td></td>
<td></td>
<td></td>
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<td>corner</td>
<td>1.3</td>
<td>0.30</td>
<td>250</td>
<td>0.14</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice. All measurements were taken at 0.75mm pitch.

**How to Order**

- 100938-001: for 4-point crown tip both ends
- 100938-014: for 4-point crown tip and radius tip
- 100938-015: for 4-point crown tip and spear tip
- 100938-016: for radius tip both ends
- 100938-018: for spear tip both ends

Probes by
101052 SEMICONDUCTOR PROBE

Minimum Device Pitch: 0.75 (.029)
Signal Path Length:
- 101052-001: 3.00 (.118)
- 101052-002: 2.54 (.100)
- 101052-003: 3.00 (.118)
Force per Contact:
- 101052-001: 35.45 grams (1.25 oz.) @ 0.38 (.015) travel
- 101052-002: 22.74 grams (0.8 oz.) @ 0.38 (.015) travel
- 101052-003: 35.45 grams (1.25 oz.) @ 0.38 (.015) travel
Device Compliance: 0.23 (.009)
DUT Board Compliance: 0.15 (.006)
Maximum Compliance: 0.56 (.022)
Operating Temperature: -55°C to 150°C
Insertions: >500,000

Materials
Barrel: Beryllium copper, gold plated
Spring: Stainless steel, gold plated
Plunger: Full-hard beryllium copper, gold plated

Cross Section – Free State

Dimensions in millimeters (inches)

PROBE SPECIFICATIONS

ELECTRICAL SPECIFICATIONS
Impedance: 50 Ω characteristic
Bandwidth: 10.0 GHz @ -1 dB
Self Inductance: 0.56 nH @ 0.75 (.029) pitch
Mutual Inductance:
- 0.01 nH @ 0.75 (.029) pitch diagonal
- 0.09 nH @ 0.75 (.029) pitch adjacent
Capacitance: 0.05 pF
Contact Resistance: <25 mΩ
Current Carrying Capacity: 6 amps continuous (Individual probe in free air @ ambient temperature)

Equivalent Circuit Diagram

Element Definitions
- L1, L2: pin self-inductance
- M21: mutual-inductance between adjacent pins
- R1, R2: shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- C21a: mutual-capacitance between adjacent pins (PCB side)
- C21b: mutual-capacitance between adjacent pins (BGA side)

Element Values
The socket model is valid from DC to 3.0 GHz. The measured and modeled transmission response agrees within 0.3 dB. A model was extracted for four types of pins: adjacent field pins, field pin oriented diagonally, edge pins and corner pins.

<table>
<thead>
<tr>
<th>Probes</th>
<th>L1 &amp; L2 (nH)</th>
<th>M21 (nH)</th>
<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field adjacent</td>
<td>0.56</td>
<td>0.09</td>
<td>300</td>
<td>0.055</td>
<td>0.070</td>
</tr>
<tr>
<td>Field diagonal</td>
<td>0.54</td>
<td>0.01</td>
<td>300</td>
<td>0.009</td>
<td>0.008</td>
</tr>
<tr>
<td>Corner adjacent</td>
<td>0.85</td>
<td>0.071</td>
<td>300</td>
<td>0.070</td>
<td>0.070</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice. All measurements were taken at 0.75mm pitch.

PART NUMBER
101052-001 for 0.51 (.020) diameter tip with an overall length of 3.38 (.133)
101052-002 for 0.51 (.020) diameter tip with an overall length of 2.92 (.115)
101052-003 for 0.44 (.0175) diameter tip with an overall length of 3.38 (.133)
**Probes by**

**DEVICE SIDE PLUNGER**

**101053 SEMICONDUCTOR PROBE**

**Minimum Device Pitch – 0,75 (.029) 101053**

**PROBE SPECIFICATIONS**

- Minimum Device Pitch: 0,75 (.029)
- Signal Path Length:
  - 101053-001: 3,00 (.118)
  - 101053-002: 2,54 (.100)
- Force per Contact:
  - 101053-001: 35.45 grams (1.25 oz.) @ 0,38 (.015) travel
  - 101053-002: 22.74 grams (0.8 oz.) @ 0,38 (.015) travel
- Device Compliance: 0,23 (.009)
- DUT Board Compliance: 0,15 (.006)
- Maximum Compliance: 0,56 (.022)
- Operating Temperature: -55°C to 150°C
- Insertions: >500,000

**Materials**

- Barrel: Beryllium copper, gold plated
- Spring: Stainless steel, gold plated
- Plunger: Full-hard beryllium copper, gold plated

**Cross Section – Free State**

**DIMENSIONS IN MILLIMETERS [INCHES]**

- 2,92 (.115) or 3,38 (.133)
- 0,58 (.023)
- 0,25 (.010)
- 0,69 (.027)
- 1,52 (.060)

**ELECTRICAL SPECIFICATIONS**

- Impedance: 50 Ω characteristic
- Bandwidth: 10.0 GHz @ -1 dB
- Self Inductance: 0.63 nH @ 0,75 (.029) pitch
- Mutual Inductance:
  - 0.005 nH @ 0,75 (.029) pitch diagonal
  - 0.09 nH @ 0,75 (.029) pitch adjacent
- Capacitance: 0.055 pF
- Contact Resistance: <25 mΩ
- Current Carrying Capacity: 6 amps continuous (Individual probe in free air @ ambient temperature)

**Equivalent Circuit Diagram**

**Element Definitions**

- L1, L2: pin self-inductance
- M21: mutual-inductance between adjacent pins
- R1, R2: shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- C21a: mutual-capacitance between adjacent pins (PCB side)
- C21b: mutual-capacitance between adjacent pins (BGA side)

**Element Values**

The socket model is valid from DC to 3.0 GHz. The measured and modeled transmission response agrees within 0.3 dB. A model was extracted for four types of pins: adjacent field pins, field pin oriented diagonally, edge pins and corner pins.

**Specifications subject to change without notice.**

All measurements were taken at 1,0mm pitch.

**PART NUMBER**

101053-001 for 3,38 (.133) length
101053-002 for 2,92 (.115) length
**Minimum Device Pitch – 0.75 (.029) 101111**

**101111 Semiconductor Probe**

- **Minimum Device Pitch:** 0.75 (.029)
- **Signal Path Length:** 2.49 (.098)
- **Force per Contact:** 25.51 grams (0.90 oz.) @ 0.55 (.022) travel
- **Device Compliance:** 0.41 (.016)
- **DUT Board Compliance:** 0.15 (.006)
- **Maximum Compliance:** 0.63 (.025)
- **Operating Temperature:** -55°C to 150°C
- **Insertions:** >500,000

**Materials**
- **Barrel:** Phosphor bronze, gold plated
- **Spring:** Stainless steel, gold plated
- **Plunger:** Phosphor bronze, gold plated

**Cross Section – Free State**

**Electrical Specifications**

- **Impedance:** 50 Ω characteristic
- **Bandwidth:** 10.0 GHz @ -1 dB
- **Self Inductance:** 0.58 nH @ 0.75 (.029) pitch
- **Mutual Inductance:**
  - 0.01 nH @ 0.75 (.029) pitch diagonal
  - 0.08 nH @ 0.75 (.029) pitch adjacent
- **Capacitance:** 0.033 pF
- **Contact Resistance:** <50 mΩ
- **Current Carrying Capacity:** 6 amps continuous

(Individual probe in free air @ ambient temperature)

**Equivalent Circuit Diagram**

**Element Definitions**

- **L1, L2:** pin self-inductance
- **M21:** mutual-inductance between adjacent pins
- **R1, R2:** shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a:** mutual-capacitance between adjacent pins (PCB side)
- **C21b:** mutual-capacitance between adjacent pins (BGA side)

**Element Values**

The socket model is valid from DC to 3.05 GHz. The measured and modeled transmission response agrees within 0.1 dB. A model was extracted for four types of pins: adjacent field pins, field pin oriented diagonally, edge pins and corner pins.

<table>
<thead>
<tr>
<th>Probes</th>
<th>L1 &amp; L2 (nH)</th>
<th>M21 (nH)</th>
<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>field adjacent</td>
<td>0.58</td>
<td>0.08</td>
<td>400</td>
<td>0.033</td>
<td>0.033</td>
</tr>
<tr>
<td>field diagonal</td>
<td>0.55</td>
<td>0.01</td>
<td>600</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td>corner adjacent</td>
<td>0.59</td>
<td>0.08</td>
<td>400</td>
<td>0.045</td>
<td>0.045</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice. All measurements were taken at 1.0mm pitch.

**Part Number**

101111-001

---

**Back to TOC**
**Minimum Device Pitch** – 0,75 (.029) 101084

**101084 Semiconductor Probe**

**Device Side Plunger**

**Probes by**

**PROBE SPECIFICATIONS**

- **Minimum Device Pitch:** 0,75 (.029)
- **Signal Path Length:** 5,21 (.205)
- **Force per Contact:** 35,79 grams (1.26 oz.) @ 0,74 (.029) travel
- **Device Compliance:** 0,41 (.016)
- **DUT Board Compliance:** 0,33 (.013)
- **Maximum Compliance:** 1,00 (.039)
- **Operating Temperature:** -55°C to 150°C
- **Insertions:** >500,000

**Materials**

- **Barrel:** Beryllium copper, gold plated
- **Spring:** Stainless steel, gold plated
- **Plunger:** Full-hard beryllium copper, gold plated

**Cross Section – Free State**

- Dimensions in millimeters [inches]

**ELECTRICAL SPECIFICATIONS**

- **Impedance:** 50 Ω characteristic
- **Bandwidth:** 6.3 GHz @ -1 dB
- **Self Inductance:** 1.27 nH @ 1,00 (.039) pitch
- **Mutual Inductance:**
  - 0.004 nH @ 1,00 (.039) pitch diagonal
  - 0.018 nH @ 1,00 (.039) pitch adjacent
- **Capacitance:** 0.06 pF
- **Contact Resistance:** <50 mΩ
- **Current Carrying Capacity:** 5 amps continuous

(Individual probe in free air @ ambient temperature)

**Equivalent Circuit Diagram**

**Element Definitions**

- **L1, L2:** pin self-inductance
- **M21:** mutual-inductance between adjacent pins
- **R1, R2:** shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a:** mutual-capacitance between adjacent pins (PCB side)
- **C21b:** mutual-capacitance between adjacent pins (BGA side)

**Element Values**

The socket model is valid from DC to 2.05 GHz. The measured and modeled transmission response agrees within 0.3 dB. A model was extracted for four types of pins: adjacent field pins, field pin oriented diagonally, edge pins and corner pins.

<table>
<thead>
<tr>
<th>Element</th>
<th>L1 (nH)</th>
<th>M21 (nH)</th>
<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>field adjacent</td>
<td>1.27</td>
<td>0.18</td>
<td>3000</td>
<td>0.060</td>
<td>0.085</td>
</tr>
<tr>
<td>field diagonal</td>
<td>1.23</td>
<td>0.004</td>
<td>3000</td>
<td>0.015</td>
<td>0.016</td>
</tr>
<tr>
<td>corner adjacent</td>
<td>1.60</td>
<td>0.001</td>
<td>3000</td>
<td>0.070</td>
<td>0.115</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice. All measurements were taken at 1,0mm pitch.

**PART NUMBER**

101084-000
### Electrical Specifications

- **Impedance:** 50 Ω characteristic
- **Bandwidth:** 2.9 GHz @ -1 dB
- **Self Inductance:** 1.30 nH @ 1,00 (.039) pitch
- **Mutual Inductance:**
  - 0.10 nH @ 1,00 (.039) pitch diagonal
  - 0.25 nH @ 1,00 (.039) pitch adjacent
- **Capacitance:** 0.10 pF
- **Contact Resistance:** <50 mΩ
- **Current Carrying Capacity:** 5 amps continuous
  (Individual probe in free air @ ambient temperature)

### Element Definitions

- **L1, L2:** pin self-inductance
- **M21:** mutual-inductance between adjacent pins
- **R1, R2:** shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a:** mutual-capacitance between adjacent pins (PCB side)
- **C21b:** mutual-capacitance between adjacent pins (BGA side)

### Minimum Device Pitch – 1,00 (.039) 100881

### Probe Specifications

- **Minimum Device Pitch:** 1,00 (.039)
- **Signal Path Length:** 5.46 (.215)
- **Force per Contact:** 28.33 grams (1.0 oz.) @ 0.51 (.020) travel
- **Device Compliance:** 0.36 (.014)
- **DUT Board Compliance:** 0.15 (.006)
- **Maximum Compliance:** 0.76 (.030)
- **Operating Temperature:** -55°C to 150°C
- **Insertions:** >500,000

### Materials

- **Barrel:** Beryllium copper, gold plated
- **Spring:** Stainless steel, gold plated
- **Plunger:** Full-hard beryllium copper, gold plated

### Cross Section – Free State

- **Dimensions in millimeters (inches):**
  - 5.97 (.235)
  - 4.57 (.180)
  - 0.76 (.030)
  - 0.25 (.010)
  - 0.89 (.035)
  - 0.41 (.016)
  - 2.92 (.115)
100929 Semiconductor Probe

**Probes by**

100929

### Electrical Specifications

- **Impedance:** 50 Ω characteristic
- **Bandwidth:** 2.0 GHz @ -1 dB
- **Self Inductance:** 1.30 nH @ 1,00 (.039) pitch
- **Mutual Inductance:**
  - 0.10 nH @ 1,00 (.039) pitch diagonal
  - 0.25 nH @ 1,00 (.039) pitch adjacent
- **Capacitance:** 0.10 pF
- **Contact Resistance:** <50 mΩ
- **Current Carrying Capacity:** 5 amps continuous (Individual probe in free air @ ambient temperature)

**Equivalent Circuit Diagram**

**Element Definitions**

- **L1, L2:** pin self-inductance
- **M21:** mutual-inductance between adjacent pins
- **R1, R2:** shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
- **C21a:** mutual-capacitance between adjacent pins (PCB side)
- **C21b:** mutual-capacitance between adjacent pins (BGA side)

### Probe Specifications

- **Minimum Device Pitch:** 1,00 (.039) or greater
- **Signal Path Length:** 6.35 (.250)
- **Force per Contact:** 31.64 grams (1.1 oz.) @ 1,02 (.040) travel
- **Device Compliance:** 0.25 (.010)
- **DUT Board Compliance:** 0.10 (.025)
- **Maximum Compliance:** 1.27 (.050)
- **Operating Temperature:** -55°C to 150°C
- **Insertions:** >500,000

### Materials

- **Barrel:** Beryllium copper, gold plated
- **Spring:** Stainless steel, gold plated
- **Plunger:** Full-hard beryllium copper, gold plated

### Cross Section – Free State

- **Dimensions in millimeters (inches):**
  - 7.37 (.290)

### Specifications subject to change without notice.

All measurements were taken at 1.0mm pitch.
Minimum Device Pitch – 1.27 (.050) 101150

**PROBE SPECIFICATIONS**

Minimum Device Pitch: 1.27 (.050)
Signal Path Length: 3.00 (.118)

Force per Contact:
- **101150-000**: 31.19 grams (1.1 oz.)
  @ 0.51 (.020) travel
- **101150-001**: 19.84 grams (0.7 oz.)
  @ 0.51 (.020) travel

Device Compliance: 0.36 (.014)
DUT Board Compliance: 0.15 (.006)
Maximum Compliance: 0.61 (.024)

Operating Temperature:
- **101150-000**: -55°C to 150°C
- **101150-001**: -55°C to 120°C

Insertions: >500,000

**Materials**

Barrel: Phosphor bronze, gold plated
Spring: 101150-000: Stainless steel, passivated
                  101150-001: Beryllium copper, precious metal plated
Plungers: Phosphor bronze, gold plated

**Cross Section – Free State**

Dimensions in millimeters (inches)

**ELECTRICAL SPECIFICATIONS**

Impedance: 50 Ω characteristic
Bandwidth: 10.0 GHz @ -1.0 dB
Self Inductance: 0.68 nH @ 1.27 (.050) pitch
Mutual Inductance:
- 0.01 nH @ 1.27 (.050) pitch diagonal
- 0.09 nH @ 1.27 (.050) pitch adjacent
Capacitance: 0.037 pF
Contact Resistance: <25 mΩ
Current Carrying Capacity: 5 amps continuous
(Individual probe in free air @ ambient temperature)

**Element Definitions**

L1, L2: pin self-inductance
M21: mutual-inductance between adjacent pins
R1, R2: shunt-resistance of inductors L1 and L2, used to model high-frequency loss due to skin effect and dielectric loss
C21a: mutual-capacitance between adjacent pins (PCB side)
C21b: mutual-capacitance between adjacent pins (BGA side)

**Element Values**

The BGA socket model is valid from DC to 3.05 GHz. The measured and modeled transmission response agrees within 0.3 dB. A model was extracted for four types of pins: adjacent field pins, field pins oriented diagonally and corner pins.

<table>
<thead>
<tr>
<th>Probes</th>
<th>L1 &amp; L2 (nH)</th>
<th>M21 (nH)</th>
<th>R1 &amp; R2 (Ohms)</th>
<th>C21a (pF)</th>
<th>C21b (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>field</td>
<td>0.68</td>
<td>0.09</td>
<td>300</td>
<td>0.037</td>
<td>0.037</td>
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<tr>
<td>adjacent</td>
<td>0.64</td>
<td>0.01</td>
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<td>0.007</td>
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<tr>
<td>field</td>
<td>0.82</td>
<td>0.11</td>
<td>300</td>
<td>0.047</td>
<td>0.047</td>
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<tr>
<td>diagonal</td>
<td>0.11</td>
<td>0.047</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications subject to change without notice.
All measurements were taken at 1.0mm pitch.

**PART NUMBER**

101150-000 for 31.19 grams (1.1 oz.) spring force
101150-001 for 19.84 grams (0.7 oz.) spring force
Socket Specifications

Dimensions in millimeters (inches)

<table>
<thead>
<tr>
<th></th>
<th>Series 27</th>
<th>Series 45</th>
<th>Series 35D</th>
<th>Series 45D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>62,30 (2.45)</td>
<td>88,08 (3.47)</td>
<td>92,84 (3.66)</td>
<td>92,84 (3.66)</td>
</tr>
<tr>
<td>B</td>
<td>45,28 (1.78)</td>
<td>63,27 (2.49)</td>
<td>73,03 (2.88)</td>
<td>73,03 (2.88)</td>
</tr>
<tr>
<td>C</td>
<td>38,00 (1.50)</td>
<td>49,53 (1.95)</td>
<td>50,80 (2.00)</td>
<td>50,80 (2.00)</td>
</tr>
<tr>
<td>D</td>
<td>29,87 (1.18)</td>
<td>42,00 (1.65)</td>
<td>62,90 (2.48)</td>
<td>67,08 (2.64)</td>
</tr>
<tr>
<td>E</td>
<td>23,60 (0.93)</td>
<td>42,00 (1.65)</td>
<td>26,00 (1.02)</td>
<td>40,00 (1.57)</td>
</tr>
<tr>
<td>F</td>
<td>30,02 (1.18)</td>
<td>49,53 (1.95)</td>
<td>21,00 (0.83)</td>
<td>21,00 (0.83)</td>
</tr>
<tr>
<td>G</td>
<td>41,18 (1.62)</td>
<td>59,18 (2.33)</td>
<td>44,19 (1.74)</td>
<td>57,19 (2.25)</td>
</tr>
<tr>
<td>H</td>
<td>44,98 (1.77)</td>
<td>63,00 (2.48)</td>
<td>48,26 (1.90)</td>
<td>61,01 (2.40)</td>
</tr>
<tr>
<td>J</td>
<td>5,09 (0.20)</td>
<td>5,74 (0.25)</td>
<td>4,97 (0.20)</td>
<td>4,97 (0.20)</td>
</tr>
</tbody>
</table>

Probes by

Dimensions in millimeters (inches)
Request for Test Socket Quotation

Lid Requirements

Style
- Clamshell
- Controlled Travel – Star Handle
- Bolt-on
- Slide-on
- Free Travel – 3 Lobe Handle
- Bolt-on
- Slide-on
- Clip-on
- Integral
- VCC
- Clip-on One Piece Bolt-Down

Features
- Is heat dissipation required? Yes ☐ No ☐
  - If yes, how much?
    - < 20 Watts ☐ 20-35 Watts ☐ > 35 Watts ☐

Application
- Used with handler ☐ Hand test ☐
  - If a handler is used, what type? ____________
- Is this a new application? Yes ☐ Existing ☐
  - Other requirements: _________________________

Socket Preferences

Number of sites:
- Single ☐ Multiple ☐
  - If multiple, how many? ___________________

Are component relief cutouts required? Yes ☐ No ☐
- If yes, please specify: ___________________

Are specific board fasteners required? Yes ☐ No ☐
- If yes, please specify: ___________________

Are specific alignment dowels required? Yes ☐ No ☐
- If yes, please specify: ___________________

Is custom engraving required? Yes ☐ No ☐
- If yes, please specify: ___________________

Temperature Requirements

Max. temp: _______ °C  Duration: _______
Min. temp: _______ °C  Duration: _______

Electrical Requirements

Max. operating frequency (in GHz): _______
Max. current (in amps): _______
- Constant ☐ Intermittent ☐
  - If intermittent, the cycle time on/off: _______

Other electrical parameters: _________________________

Device Requirements

Device Family:
- BGA ☐ PGA ☐ Leaded ☐ Leadless ☐ Other ☐

Please submit complete device drawings (including dimensions and tolerances)

If device drawings not available, please fill out the below:

Array pitch: ___________________
Number of balls, lands, leads, etc.: _______
Size of contacts (balls, lands, leads, etc.): _______
Number of probes for Ground Pad (if applicable):
  - Minimum ☐ Nominal ☐ Maximum (heat dissipation) ☐

Quantity

Requested ship date:

Socket
  - Prototype: _______
  - Production: _______

Lid
  - Prototype: _______
  - Production: _______

Additional comments:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Please fax your Request for Quotation to (913) 342-6623. Thank you.