E-tec test sockets are custom made high temperature sockets to test IC packages on a PCB (BGA, LGA, CGA, QFN, GullWing type, etc.). Generally used for prototyping, pre-production and test & burn-in, the E-tec test sockets allow the customer to insert an IC package into the socket, test it in its original condition and remove it again for final soldering to the PCB after all tests have been completed. The sockets are easily adaptable to customer requirements.

Main questions on how to choose a socket

- Which IC package needs to be tested?
  - E-tec offers socket solutions for any chip types
    The mechanical dimensions of the IC package are critical for defining the appropriate socket, thus a dimensional drawing always needs to be submitted.

- Which contact style should be chosen?
  - Generally depends on contact durability, operating temperatures and/or frequency. Three main contact styles are available:
    - E-tec patented Probe pins (standard) up to 3.4 GHz
    - High Speed Probe pins (up to 30 GHz)
    - Elastomer interposers (up to 30 GHz)

- How to connect the socket to the PCB?
  - SMT (standard or raised)
  - Thru-hole
  - Solderless compression (probe pin or elastomer interposer)

- Which socket retainer style is needed?
  - Various factors will influence the choice of the retainer solution chosen, such as:
    - How many times will the socket be opened each day?
    - Cost of socket?
    - Is there any space limitation for the socket?
    - Access required to the die of chip / heat dissipation (open top?)

Options for attaching the socket to the PCB

- **SMT soldering type**
  (Low profile, short signal path)

- **Raised SMT type**
  (lifts socket above close-by components)

- **Thru hole soldering type**
  (Generally for test & burn-in applications)

- **Solderless Compression type**
  (short signal path, avoids soldering process)
Test Sockets & Adapter

Available Retention frames

FastLock

TwistLock

LeverLock

with lever for high pincount

without lever for low pincount

open top (on request)

QuickLock

ClamShell

Economy
Open top

Professional closed top

Professional open top (on request)

SMT Adapter solution for plugging a test socket
- solderball or solid pin surface mount sockets
- easy to solder (especially high pincount)
- easy plugging of test socket after soldering

Step 1: solder mini-grid socket to PCB
Step 2: plug test socket into mini-grid socket

Converter Adapter solution
- generally for high volume requirements
- mini-grid sockets available with solder balls or regular solid pins

Step 1: mini-grid socket soldered to PCB
Step 2: chip soldered to adapter board (converting BGA to PGA)
Step 3: Plug adapter board into mini-grid socket
# Test Sockets & Adapter

## Socket & Retention System Selector Guides

The below Socket & Retention System Selector Guides will help you to make the right choice.

The options indicated refer to standard options. If you should not find what you need or if your specs should vary from the below chart, please contact your closest E-tec office, since we will most likely be able to offer a customized solution also.

### Socket Selector Guide

<table>
<thead>
<tr>
<th>Socket Style</th>
<th>Lowest Pitch</th>
<th>Contact Interface</th>
<th>Chip Types</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Regular Probe pin (up to 3.4 GHz)</td>
<td>BGA/CSP</td>
</tr>
<tr>
<td>Surface Mount</td>
<td>0.50mm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Raised Surface Mount</td>
<td>0.50mm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Thru-hole</td>
<td>0.50mm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Solderless Probe pin</td>
<td>0.40mm</td>
<td>Yes</td>
<td>Only high speed probes</td>
</tr>
<tr>
<td>Solderless Elastomer</td>
<td>0.30mm</td>
<td>n/a</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Retention System Selector Guide

<table>
<thead>
<tr>
<th>Retention Frame Style</th>
<th>Socket Cost</th>
<th>Open Cap</th>
<th>Open/Closed Cap</th>
<th>Open/Close Cycles</th>
<th>Socket Size</th>
<th>Socket Height Above Board</th>
<th>Tools Required for Open/Close</th>
<th>Socket Tools Available with Integrated Heatsink</th>
<th>Recessed Chip Height Min/Max Acceptable</th>
<th>Accepted Chip Heights from Min to Max Acceptable</th>
<th>Acceptable Chip Size</th>
<th>Accepted Min/Max Chip Size</th>
<th>Available for Elastomer Sockets</th>
<th>Available for Gullwing Chip Sockets</th>
<th>Available for Gullwing Chips with &quot;tie bar&quot; attached to legs</th>
<th>Available for Gullwing Chip Sockets with &quot;tie bar&quot; attached to legs</th>
</tr>
</thead>
<tbody>
<tr>
<td>TwistLock / ScrewLock</td>
<td>Low</td>
<td>Yes</td>
<td>1000</td>
<td>Smallest</td>
<td>Lowest Setting</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No Limit</td>
<td>No Limit</td>
<td>No Limit</td>
<td>No Limit</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>FastLock</td>
<td>Low</td>
<td>Yes</td>
<td>10000</td>
<td>Small Medium</td>
<td>No</td>
<td>Yes</td>
<td>Yes, with locating pegs</td>
<td>No Limit</td>
<td>2.5mm</td>
<td>2.5mm</td>
<td>min 7x7mm max 50x50mm</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Economy ClamShell</td>
<td>Low</td>
<td>Yes</td>
<td>10000</td>
<td>Small Medium</td>
<td>No</td>
<td>Yes</td>
<td>Yes, with locating pegs</td>
<td>No Limit</td>
<td>2.5mm</td>
<td>2.5mm</td>
<td>min 7x7mm max 50x50mm</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>LeverLock</td>
<td>Medium</td>
<td>Yes</td>
<td>1000</td>
<td>Small Low</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No Limit</td>
<td>0.4mm</td>
<td>0.4mm</td>
<td>min 15x15mm max 40x40mm</td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>QuickLock</td>
<td>Medium to High</td>
<td>on request</td>
<td>10000</td>
<td>Medium High</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>min 0.5mm</td>
<td>3.0mm</td>
<td>3.0mm</td>
<td>min 4x4mm max 36x36mm</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td></td>
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<tr>
<td>Professional ClamShell</td>
<td>High</td>
<td>on request</td>
<td>10000</td>
<td>Largest High</td>
<td>No</td>
<td>No</td>
<td>Yes, with locating pegs</td>
<td>min 0.5mm</td>
<td>3x5mm</td>
<td>3.5mm</td>
<td>min 7x7mm max 40x40mm</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Adapter solution (mini grid socket &amp; pluggable Test socket)</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>small adapter base</td>
<td>high</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Depends on retention system</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
General Socket Recommendations

TwistLock Test Socket
1. Use the E-tec torque tool TOL-7CN-TORQUE with appropriate torque setting for TwistLock sockets. Generally 7cNm up to 800 pins and 7cNm to 10cNm for higher pin counts.
2. Close the screws of the retainer with light tightening first and then fully tighten the screws one after each other. For sockets with 4 or 8 screws tighten the screws “cross wise” to apply equal forces.

SMT Test Socket
1. Use solder paste without silver or less than 0.5% silver content.
2. Solder profile & socket mounting recommendations are available for download from our homepage www.e-tec.com
3. Whenever possible use locating pegs which are tin plated for soldering to the PCB. This avoids the solder joints from being stressed during handling of the socket. Socket life cycle can be heavily reduced if used without locating pegs.
4. For high pin count sockets, it’s preferable to solder a light weight mini-grid adapter to the PCB first and then plug the test socket into that adapter.
5. Choose the raised SMT socket for lifting the socket above close-by components. Special clearances in the socket body can also be offered on request.

Solderless Test Socket
1. Use gold plated PCB pads (hard gold if possible).
2. PCB pads must be flush or higher than the solder mask for reliable interconnection with the socket.
3. Clearance for close-by components or components underneath the PCB can be offered on request.

Test Socket with Mini-Grid SMT Adapter
When inserting the test socket into the mini-grid adapter, make sure that the pin alignment plate has been positioned at the tip of the test socket pins. During insertion, this plate will then be pressed backwards and remain seated in-between the socket and the mini-grid adapter. This pin alignment board ensures correct alignment of the test socket pins onto the pins of the mini-grid adapter and thus reduces the risk of damaging the test socket pins during insertion. If the adapter socket has been removed from the mini-grid socket, then this pin alignment board needs to be pushed back to the tip of the test socket pins prior to reinserting the test socket into the mini-grid adapter.

E-tec Patented Probe Pin Designs

| BGA ball grid array contact design (patented) standard size solderballs | BGA ball grid array contact design (patented) small size solderballs | LGA land grid array contact design (patented) | CGA Column grid contact design (patented) |