

## Applications



### BGA/LGA Socketing System

- smallest BGA socket available
- suitable for multi-gigabit applications



### Board to Board Interconnect

- z-height tailored to application

also...

**Flex to PCB interconnect**  
**CCGA socketing**

## Features

### Highs

- **High Density:** 0.8mm pitch and above
- **High Speed:** 1 dB cut-off measured at 9.3 GHz
- **High I/O:** Can be supplied with over 2000 I/O
- **High Reliability:** Proven dual-beam gold-plated high strength copper alloy contacts
- **High Speed Assembly:** Pick and place compatible

### Lows

- **Low Profile:** Socket height less than 2mm
- **Low Cost:** Less than \$0.02 per mated pair in high volume production
- **Low Tooling Cost:** Tooling cost for custom footprints less than \$1000
- **Low Insertion Force:** One ounce per contact

### Flexibility

- **Any Application:** Includes both pin and socket arrays to accommodate multiple applications: Production IC socket, module interconnect, board-to-board connector, flex to PCB connector
- **Quick Delivery:** Prototype quantities shipped in 2 weeks
- **Any Footprint:** Not limited to standard arrays or geometries. Design freedom for mixed pitch, selectively populated, and non-grid arrays
- **CTE Compliant:** Can be designed to accommodate thermal mismatch

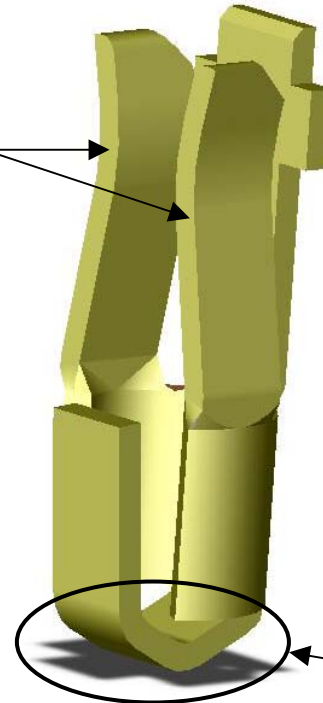
The HiLo system consists of two contacts: A pin (male) and socket (female)



### Pin (Male)

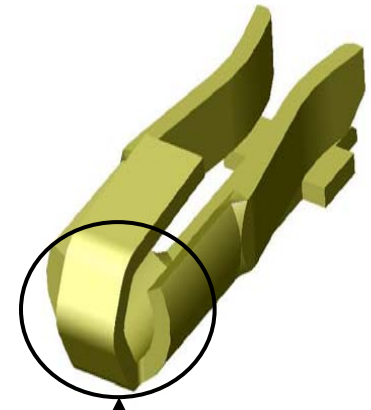
- Base material: Phos Bronze (typical)
- Plating: Gold over Nickel (typical)
- Diameter 0.3mm (0.012") for 1mm pitch +
- Diameter 0.2mm (.008") for < 1mm pitch

Dual beams make contact to pin



### Socket (Female)

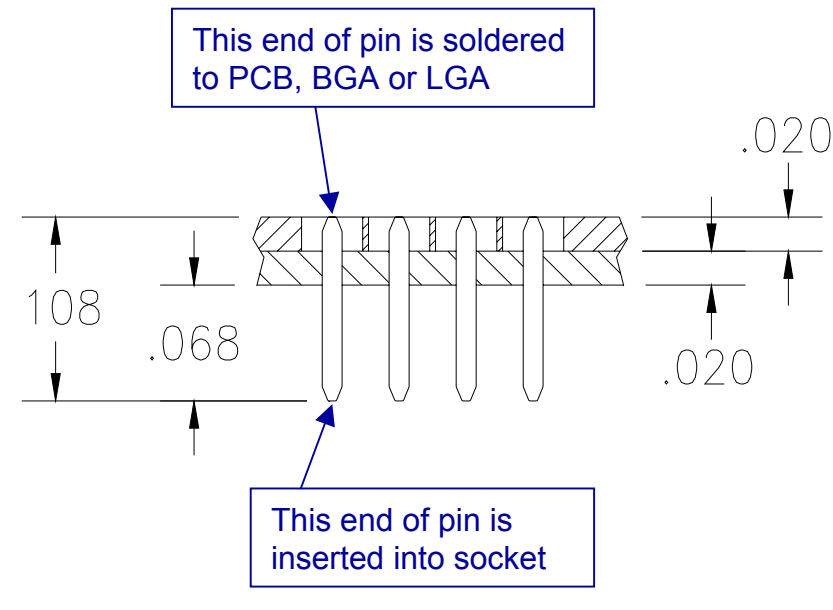
- Base material: Beryllium Copper
- Plating: Gold over Nickel (typical)
- Different contacts tooled for different pitch



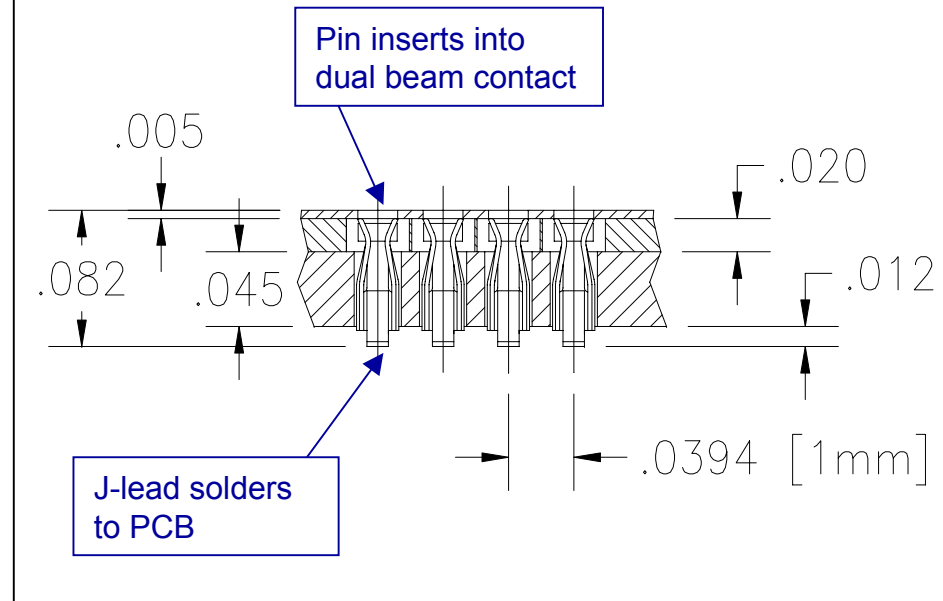
J-Lead on bottom of contact is surface mount soldered to BGA pattern on PCB

## Typical Configurations:

### Pin Field



### Socket



- Pins are inserted into two layers of laminate and planarized.
- Bottom layer is drilled at same diameter as pin to provide interference fit
- Top layer is drilled at larger diameter to provide clearance for solder joint

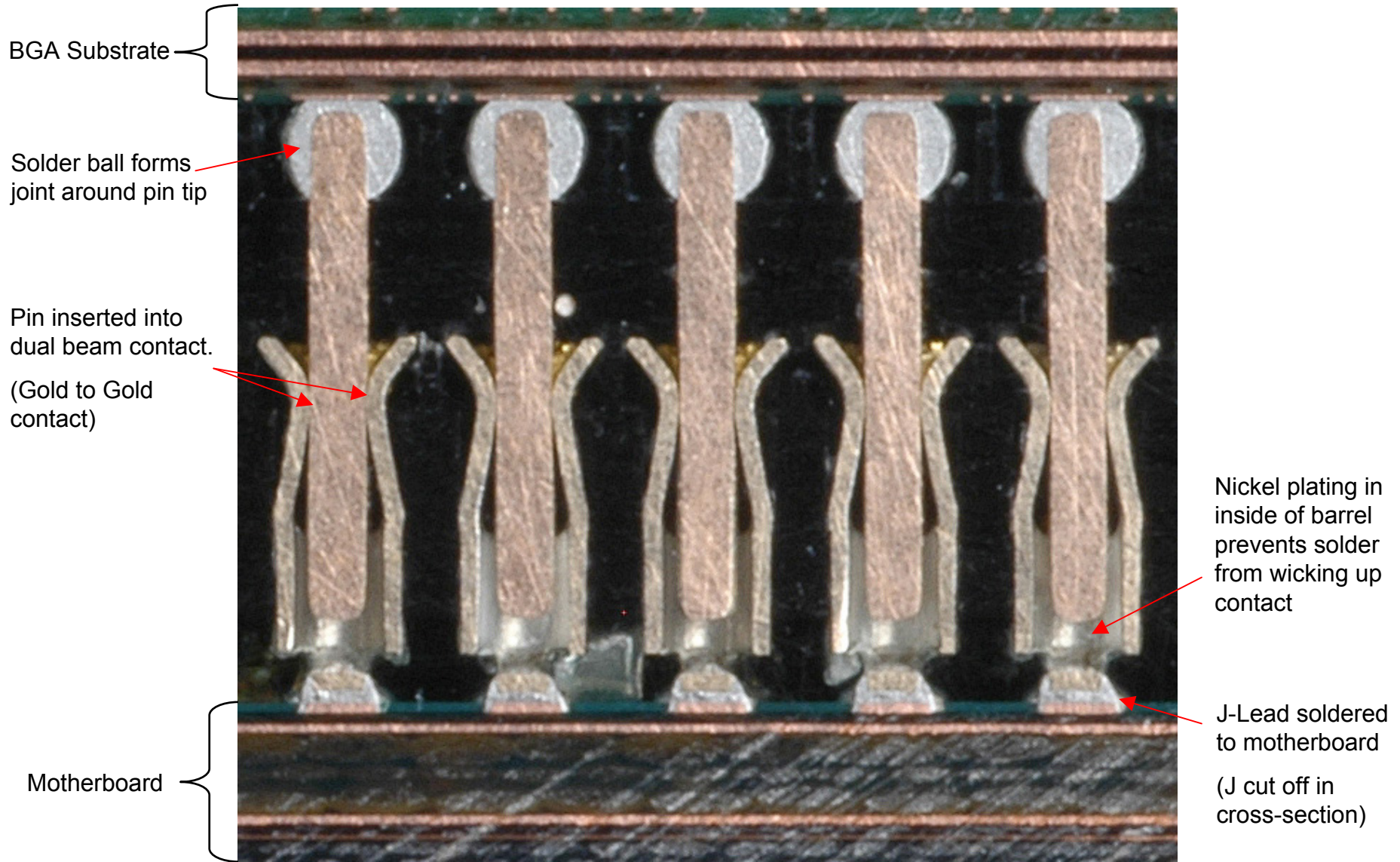
- Socket contacts are captured in three layers of laminate.
- Bottom layer holds contact barrel and serves as main structural body of socket.
- Center layer is drilled at a larger diameter to allow contact beams to move
- Thin top layer serves as a guide when inserting pin field

Note: Drawings shown are for reference only. ISI manufactures with different materials, dimensions, etc. to suit various applications.

Please consult ISI for accurate drawings for your application.



### HiLo™ Cross Section - BGA Socketing Application



## Optimize interconnect for your application without increasing cost or lead-time

- Any Pitch (& Mixed Pitch!)
- Any Pattern
- 2500+ Positions
- Mounting hardware and alignment features available

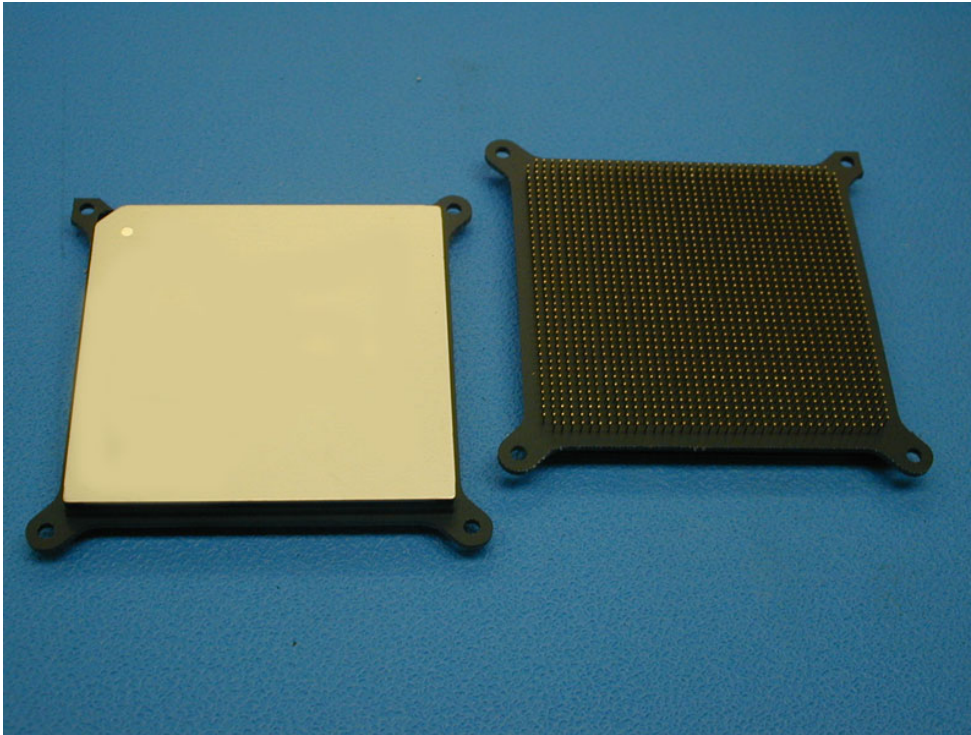
These drawings and specifications are the property of Interconnect Systems Inc., and shall not be reproduced, or copied, or used without prior written permission.

REVISIONS				
REV	DESCRIPTION	ECH	DATE	APPROVAL

CONTRACT NO.

INTERCONNECT SYSTEMS INC.  
708 VIA ALONDRA, CAMARILLO, CA 93012

**Challenge:** An OEM wants to make high pin count ASIC a Field Replaceable Unit.



**Solution:** HiLo Flexible Interconnect System

- Socket solders to existing SMT footprint
- Suitable for high speed applications
- Does not require mounting holes or backer plates
- Coplanarity of IC and PCB not as critical as when LGA socketing solutions are used
- Motherboard does not require hard gold pads
- Low NRE for non-standard footprints
- Laminate construction provides advantages in assembly process and reliability
- Low profile design allows room for heatsink
- Alignment features and mechanical retention features can be added as required

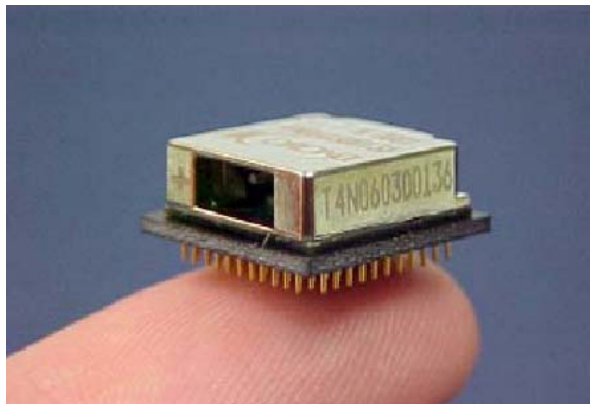
**Challenge:** You do not want to commit expensive FPGAs to your prototype and development boards.



**Solution:** HiLo FPGA Socketing

- ISI has standard designs for all 1mm pitch FPGA BGA packages, up to 1704 I/O
- Socket can be soldered to existing footprint on motherboard
- Allows customers to utilize footprint compatible products within FPGA product family
- Reduces development costs by re-using expensive FPGAs

**Challenge:** A semiconductor company has product in BGA or SMT packages, but wants to accommodate customers who want a socketed solution



[Emcore Opticube Datasheet](#)

## **Solution:**

Semiconductor co. and ISI partner to offer pinned package as a standard product offering.

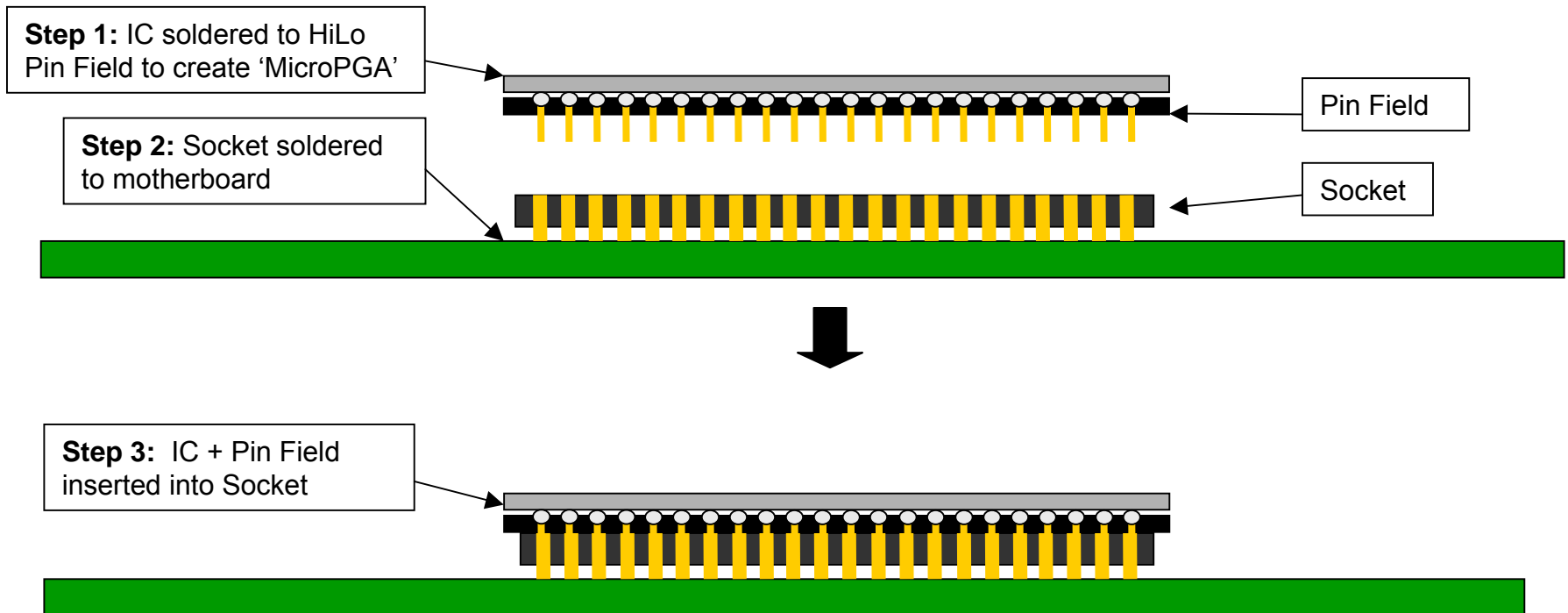
We currently have programs in place with semiconductor companies including:

- Emcore/Corona Optical
- Intel (IC R&D)
- Fairchild Semiconductor
- Quicklogic

## IC Socketing

In this application, the pin field is typically soldered directly to the IC, and the socket is soldered to the motherboard

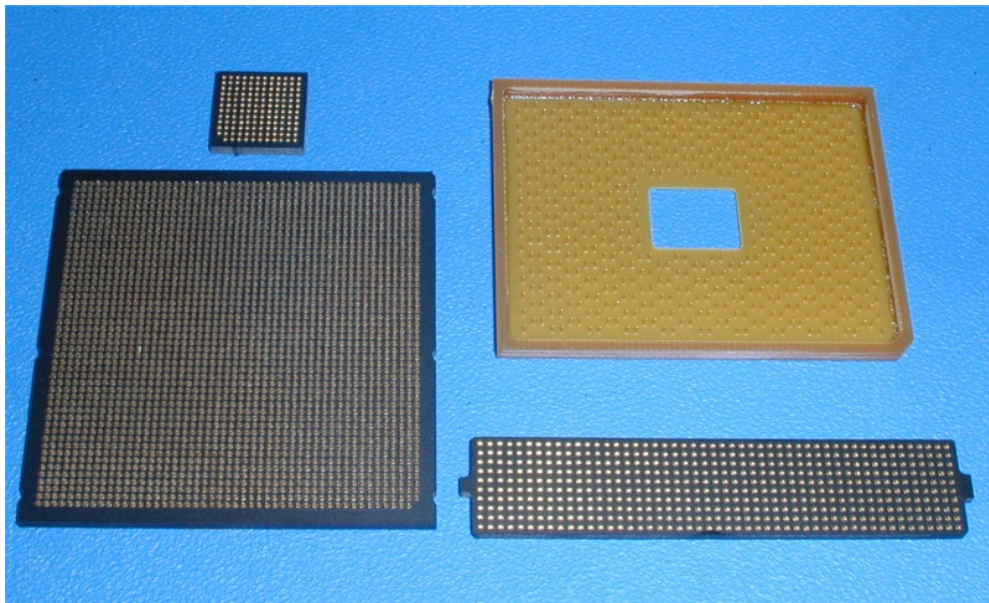
- Ball Grid Array (BGA) Socket – standard product line for FPGAs from Xilinx, Altera, Actel
- Land Grid Array (LGA) Socket
- Ceramic Column Grid Array (CCGA) Socket
- Micro Pin Grid Array ( $\mu$ PGA, mPGA) Socket for Intel & AMD devices (ISI pin field not required)



## HiLo™ Standard Products for FPGA BGA Packages

Pin Count	Socket Part #	Pin Field Part #	Actel	Altera	Quick Logic	Xilinx	Package Reference
100	HLS-100100-B-10	HLP-100100-B-10		x			
144	HLS-120144-B-10	HLP-120144-B-10	x				FG 144
256	HLS-160256-B-10	HLP-160256-B-10	x			x	FG256, FT256
324	HLS-180324-B-10	HLP-180324-B-10	x				
324	HLS-220324-B-10	HLP-220324-B-10				x	FG324
456	HLS-220456-B-10	HLP-220456-B-10				x	FG456
484	HLS-220484-B-10	HLP-220484-B-10	x	x			FG 484 full array
484	HLS-260484-B-10	HLP-260484-B-10	x		x		PS 484, FG 484 perimeter
556	HLS-300556-B-10	HLP-300556-B-10				x	FG556
668	HLS-260668-B-10	HLP-260668-B-10				x	FF668
672	HLS-260672-B-10	HLP-260672-B-10		x		x	FF672
676	HLS-260676-B-10	HLP-260676-B-10	x			x	FG676
680	HLS-390680-B-10	HLP-390680-B-10				x	FG680
780	HLS-280780-B-10	HLP-280780-B-10		x			
860	HLS-420860-B-10	HLP-420860-B-10				x	FG860
896	HLS-300896-B-10	HLP-300896-B-10	x			x	FF896, FG896
900	HLS-300900-B-10	HLP-300900-B-10				x	FG900
1020	HLS-321020-B-10	HLP-321020-B-10		x			
1148	HLS-341148-B-10	HLP-341148-B-10				x	FF1148
1152	HLS-341152-B-10	HLP-341152-B-10	x			x	FF1152, FG1152
1156	HLS-341156-B-10	HLP-341156-B-10				x	FG1156
1508	HLS-391508-B-10	HLP-391508-B-10		x			
1513	HLS-391513-B-10	HLP-391513-B-10				x	FF1513
1517	HLS-391517-B-10	HLP-391517-B-10				x	FF1517
1696	HLS-421696-B-10	HLP-421696-B-10				x	FF1696
1704	HLS-421704-B-10	HLP-421704-B-10				x	FF1704
1760	HLS-421760-B-10	HLP-421760-B-10				x	FF1760

**Challenge:** Your new module requires a custom board-to-board connector with a specific footprint, high reliability, and excellent electrical performance



**Solution:** HiLo Flexible Interconnect System

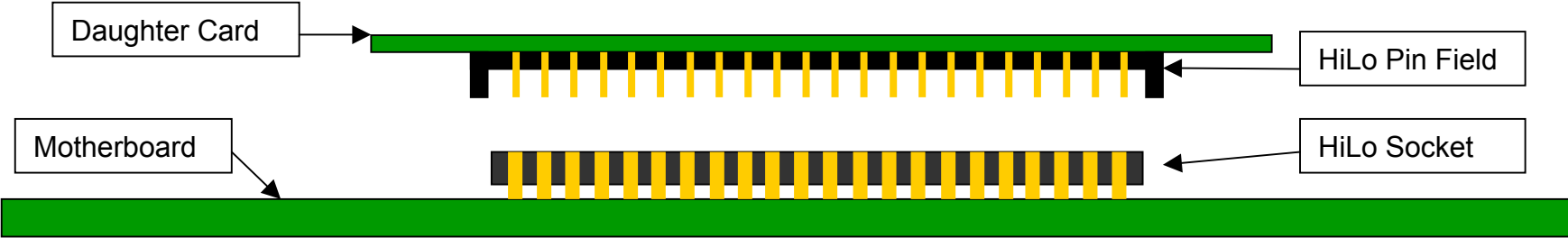
- Carrier material can be selected to match the CTE of the motherboard
- Pin out can be optimized to the design without increasing cost
  - Non-standard pitches
  - Mixed-pitch solutions to optimize signal and power and ground routing density
  - Depopulated to accommodate differential pair routing
- Z-height can be tailored to application

**Volumes:** 100s to 100,000s+

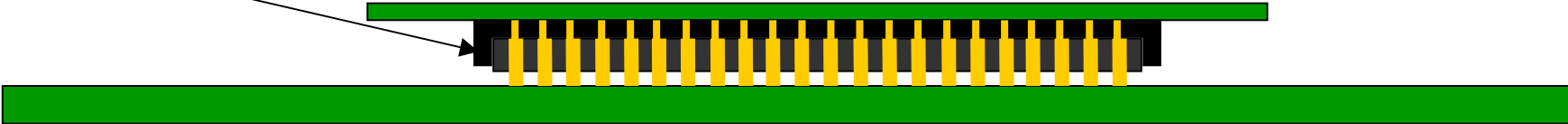
### Board to Board Interconnect

In this application, the socket is typically soldered to the motherboard, and the pin field is soldered to a second PCB or substrate. Applications include:

- Mezzanine Boards
- Daughter Cards
- Modules
- Interposers



Board-to-board spacing can be changed by increasing pin length and pin carrier thickness





Electrical Characterization Test Report (Gigatest Labs)

Socket Assembly Guideline

Qualification Data / Reliability Testing (Contech Research)

Low Level Circuit Resistance (LLCR)

Vibration

Mechanical Shock

Insulation Resistance (IR)

Dielectric Withstanding Voltage (DWR)

Thermal Shock

Humidity (Thermal Cycling)

Engagement and Separation Force

Mating and Unmating Force

Thermal Aging

Durability

Normal Force

Gas Tightness (separate report)

**Mixed Flowing Gas (separate report)**

Current Carrying Capacity

Characteristic Impedance

Voltage Standing Wave Ratio (VSWR)

Propagation Delay Via Time Domain Transmission (TDT)

Crosstalk Via Network Analysis (Frequency Domain)

Loop Inductance