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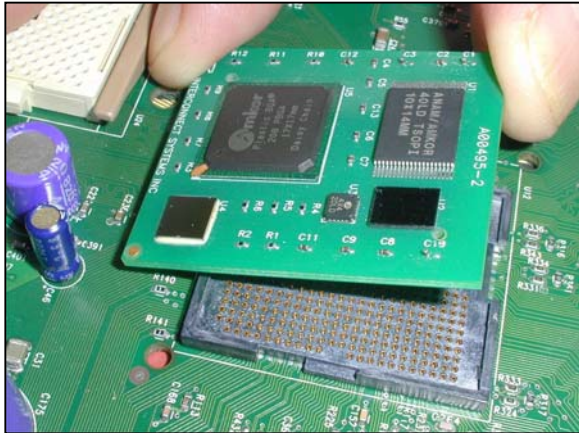
[Other Applications](#)



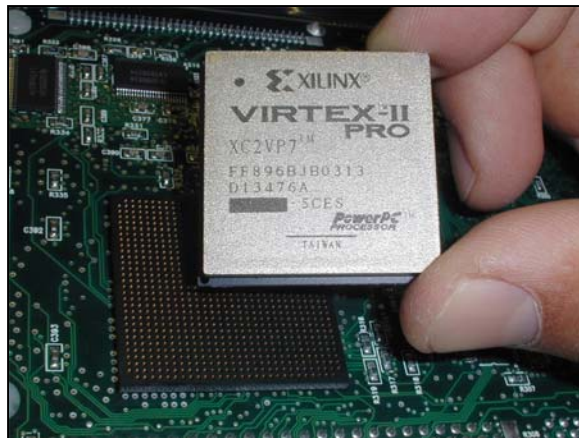
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# HiLo™ Flexible Interconnect System



Board to Board Interconnect



IC Socketing System

## Highs

- **High Density:** 1mm pitch and above
- **High Speed:** 1 dB cut-off measured at 9.3 GHz
- **High Reliability:** Proven dual-beam gold-plated beryllium copper contacts
- **High I/O:** Can be supplied with over 1500 I/O
- **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 volume
- **Low Insertion Force:** One ounce per contact
- **Low Tooling Cost:** Tooling cost for custom footprints less than \$1000

## Flexibility

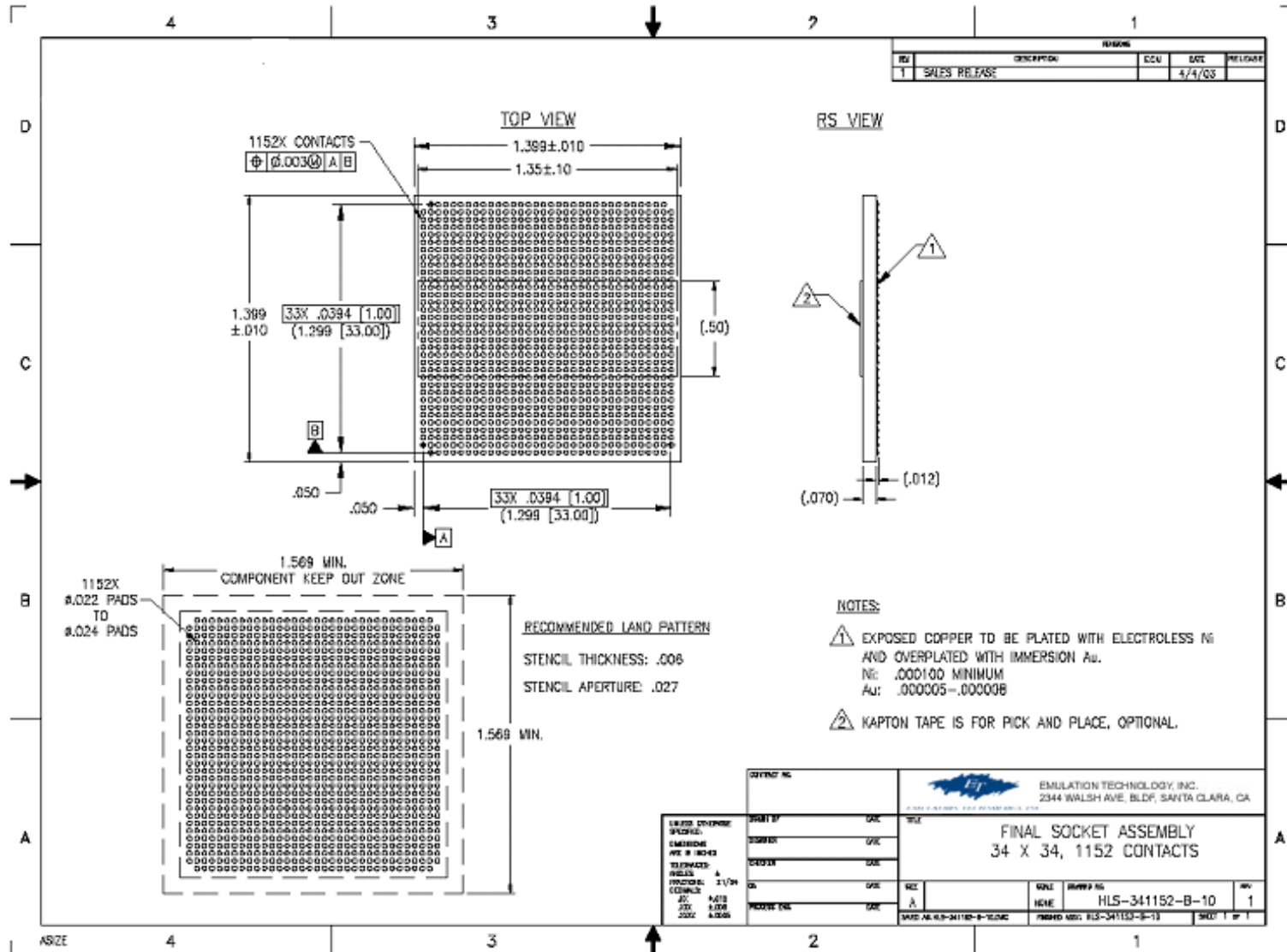
- **Any Application:** Includes both pin and socket arrays to accommodate multiple applications: Production IC socket, board-to-board connector, any creative use
- **Quick Delivery:** Prototype quantities shipped in 2 weeks
- **Any Footprint:** Not limited to standard arrays or geometries
- **CTE Compliant:** Can be designed to accommodate thermal mismatch



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# Pin Field (Male) Overall Dimensions Drawing



**Pin Material**  
 Phos-Bronze  
 plated with Gold  
 over Nickel

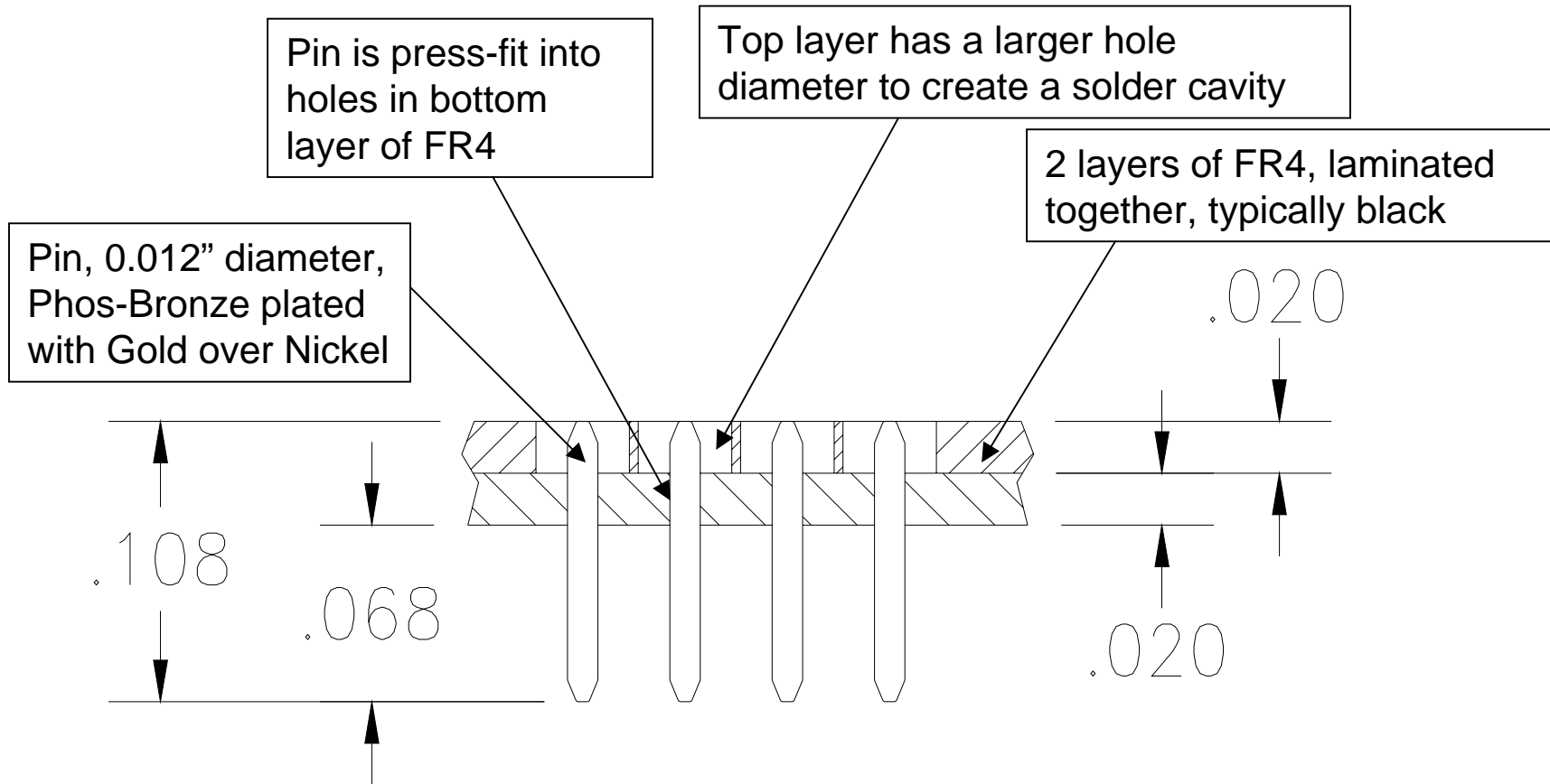
**Pin Carrier**  
 FR4 – Black  
 (other materials  
 available)



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# Pin Field (Male) Cross Section Drawing



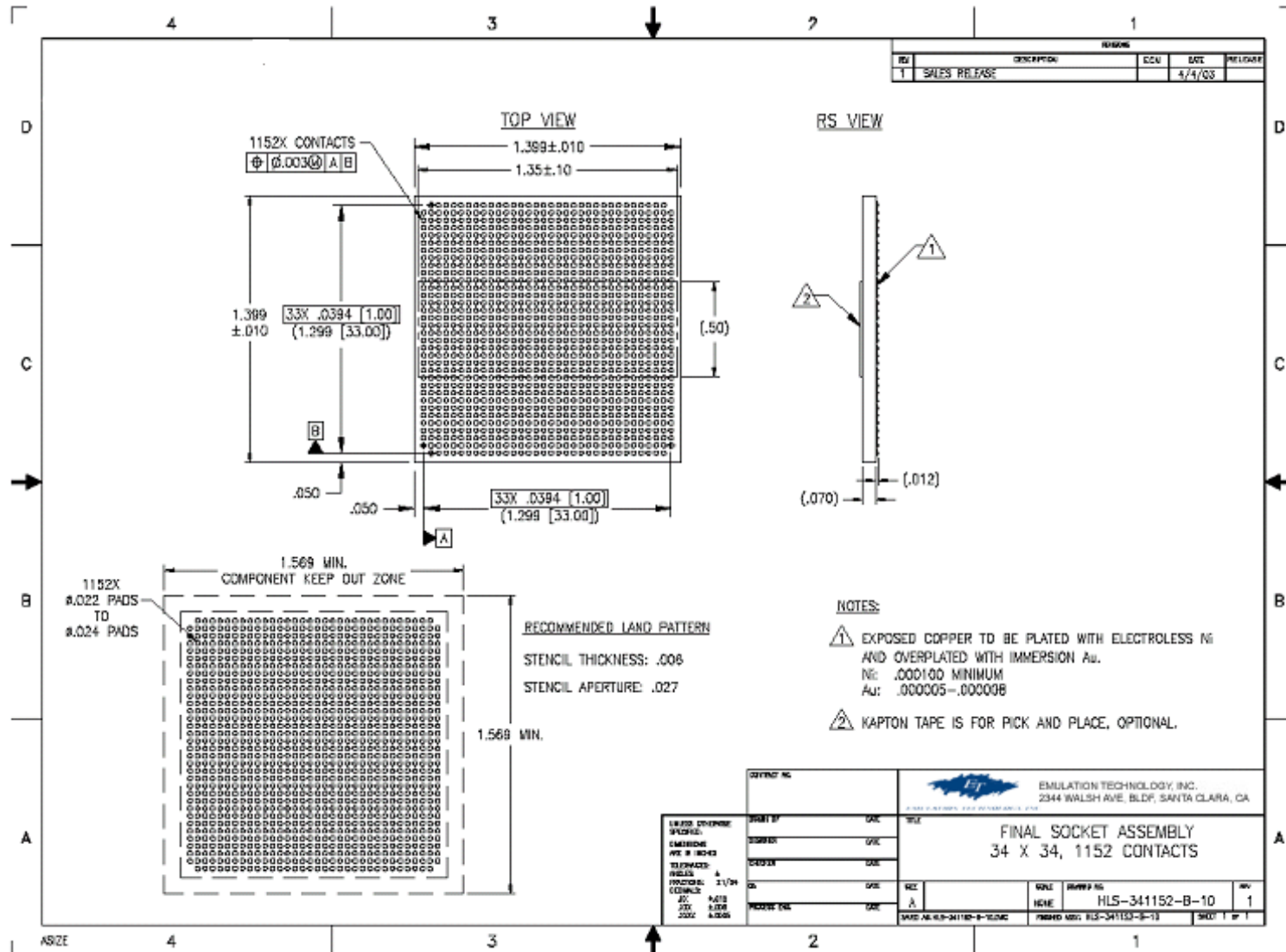
Note: This drawing represents the standard product configuration. ET can increase the length of the pin and the thickness of the FR4 to increase board-to-board separation



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# Socket (Female) Overall Dimensions Drawing



**Socket Contact Material**  
 Beryllium  
 Copper plated with Gold over Nickel

**Socket Body**  
 FR4 – Black  
 (other materials available)



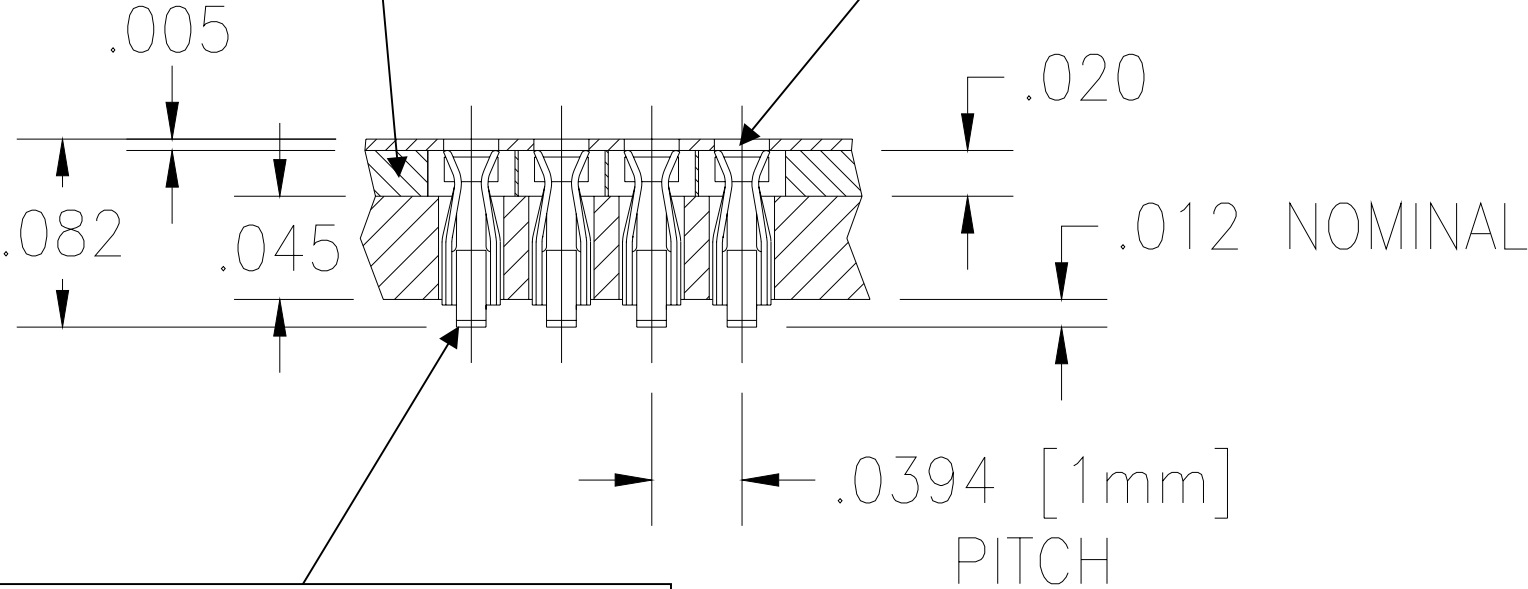
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# Socket (Female) Cross Section Drawing

Three layers of FR4, laminated together, typically black

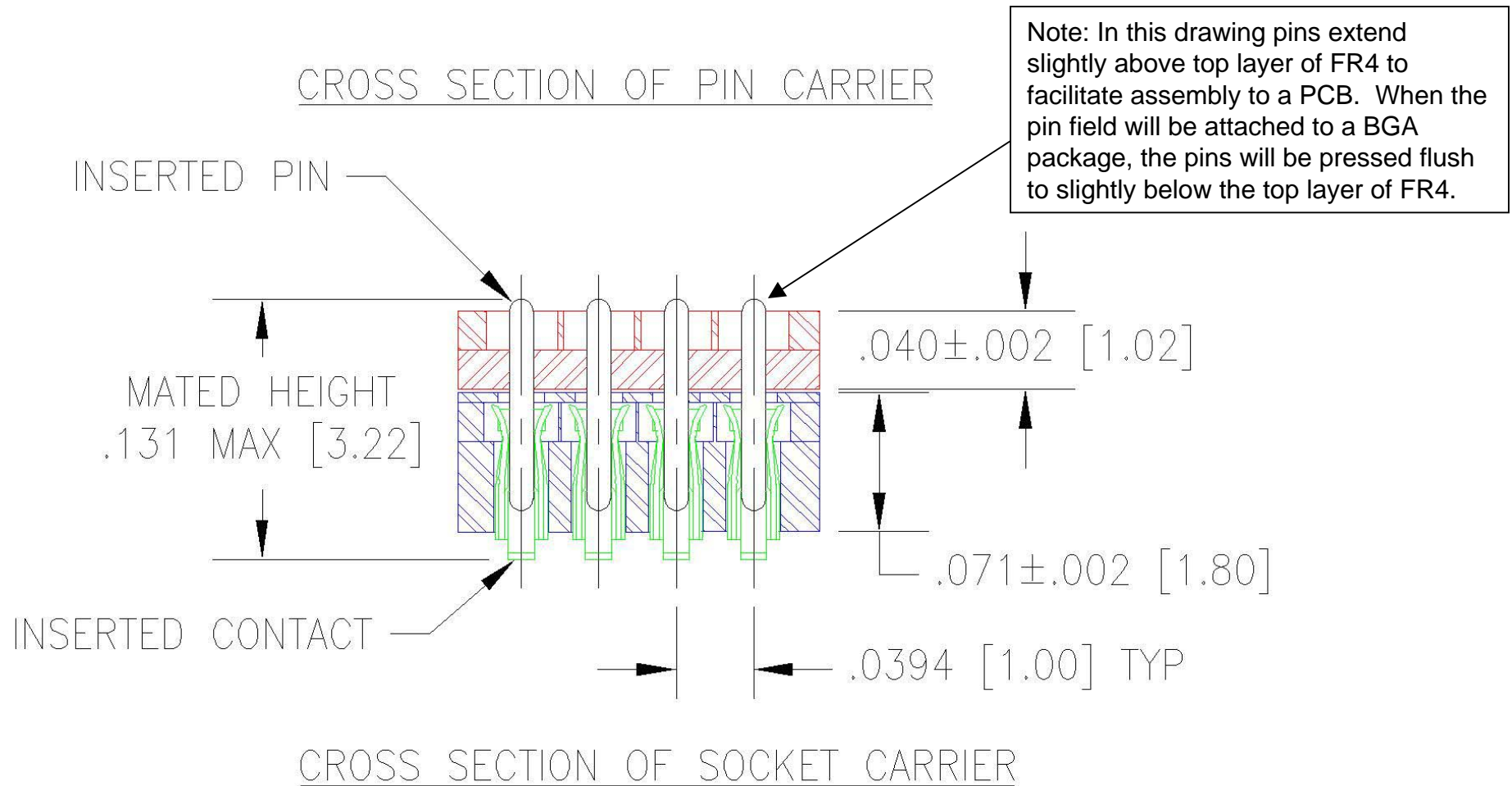
Top layer has a larger hole diameter and serves as a pin guide



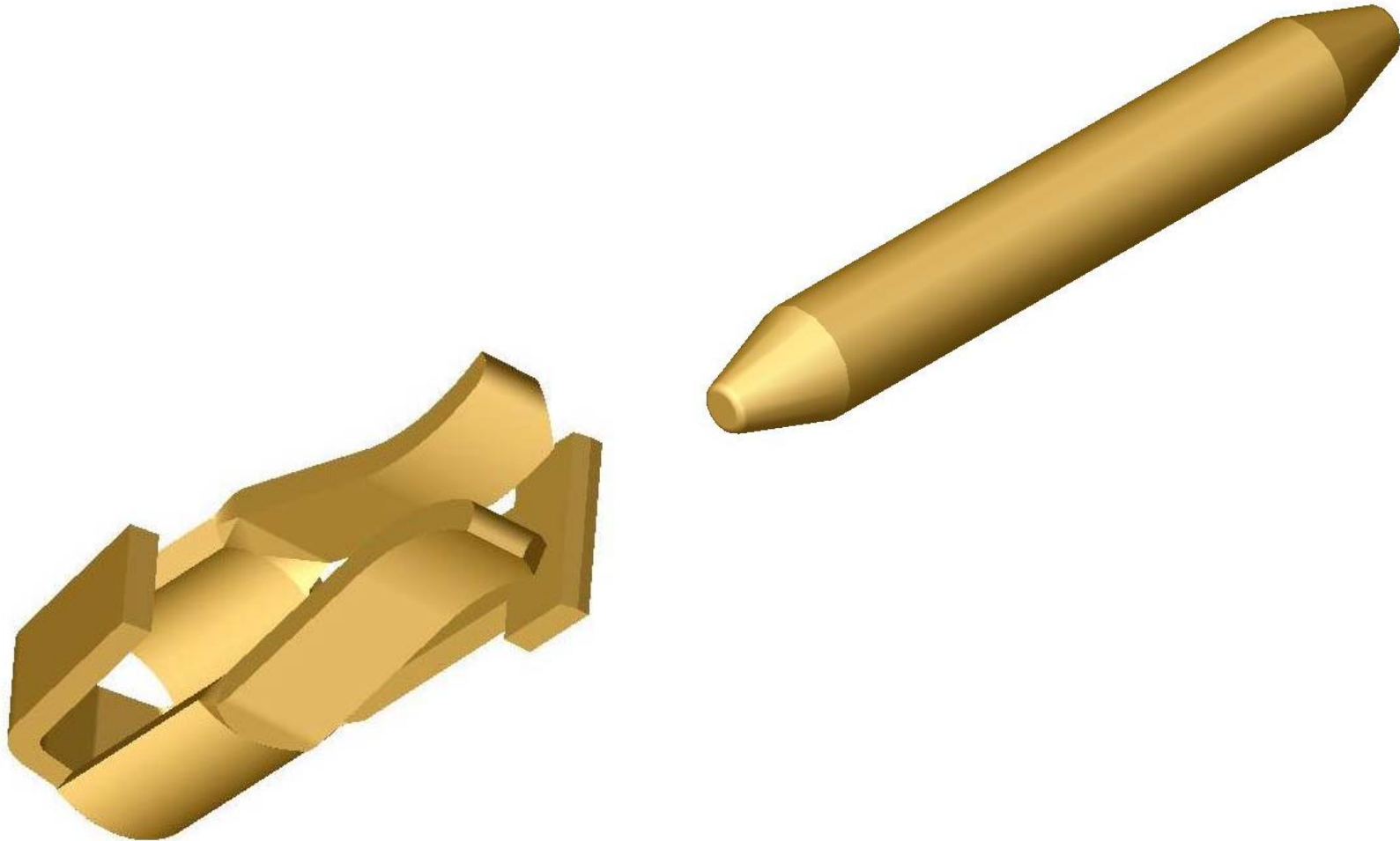
J-lead on bottom of contact solders to motherboard



# Cross Section Drawing of Mated Pair



# HiLo – Pin and Socket Contacts

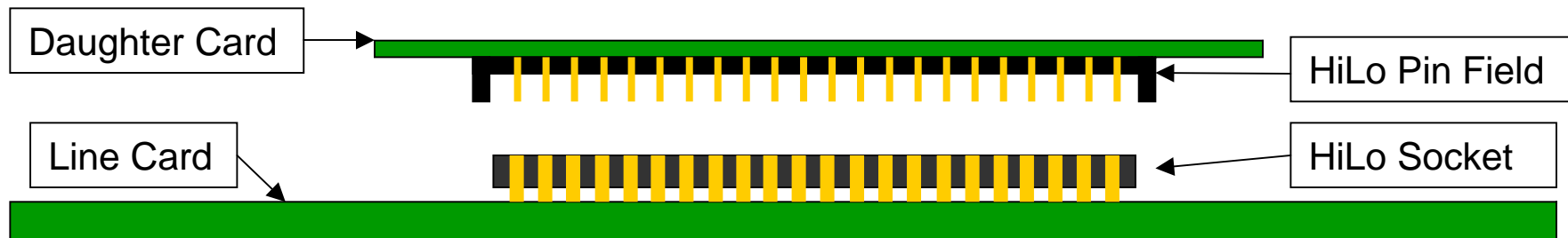




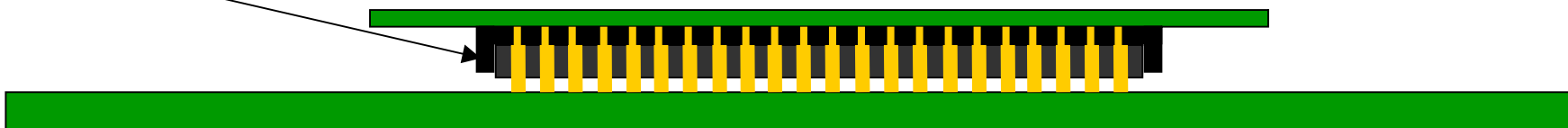
# HiLo - Board to Board Interconnect

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:

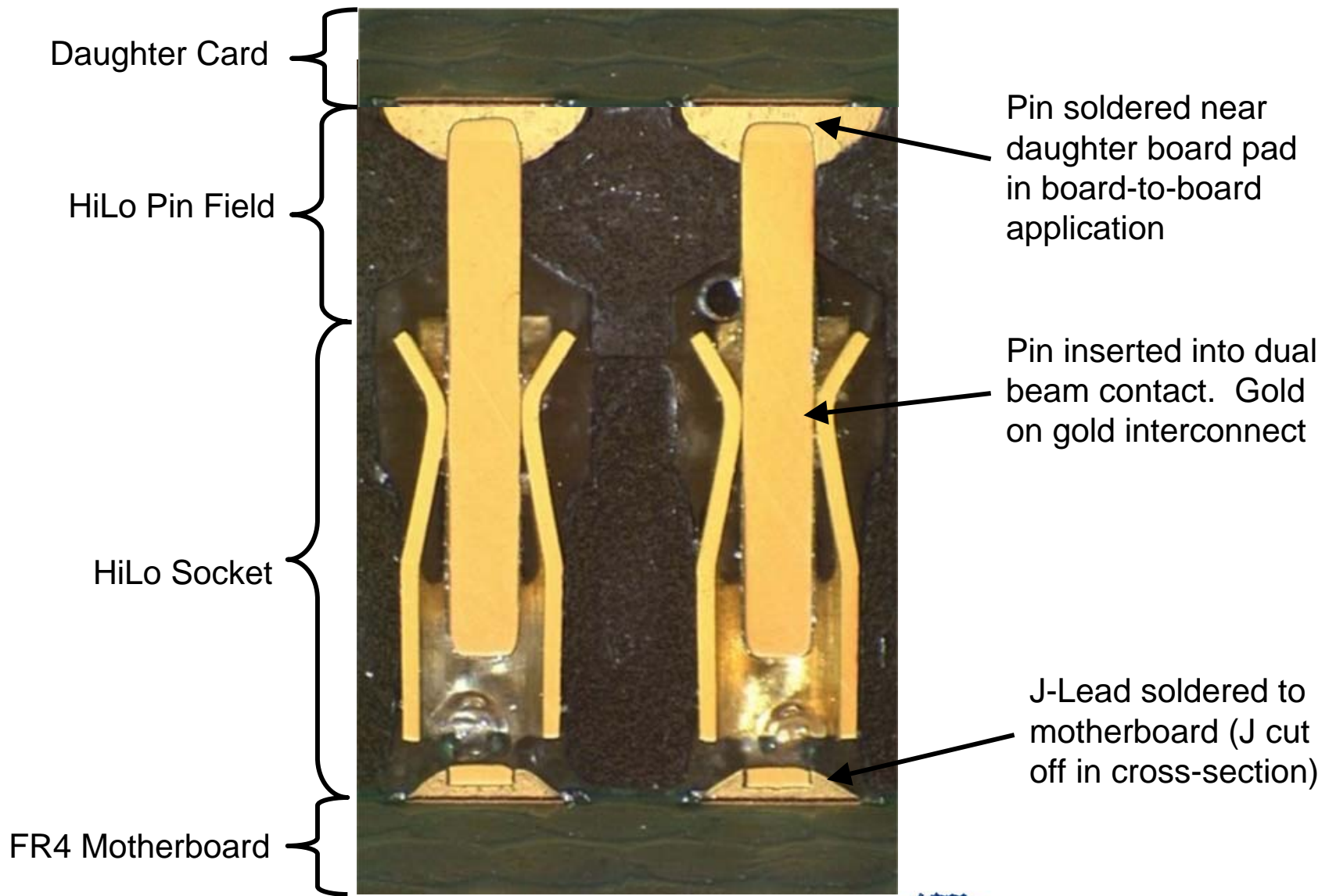
- Mezzanine Boards
- Daughter Cards
- Modules
- Interposers



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



# Cross Section – Board to Board Application



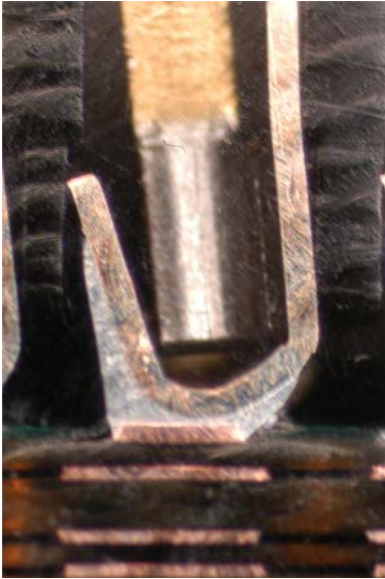
*Edited photo*



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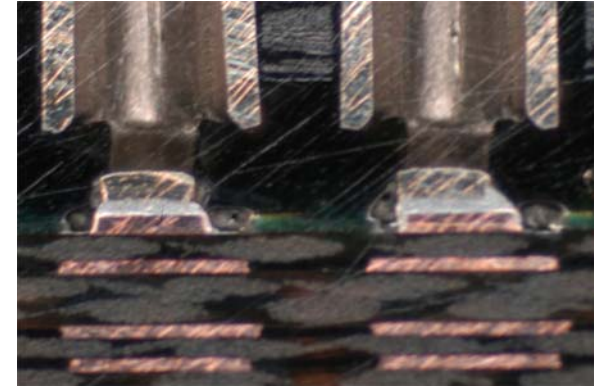
# Cross Section Photos



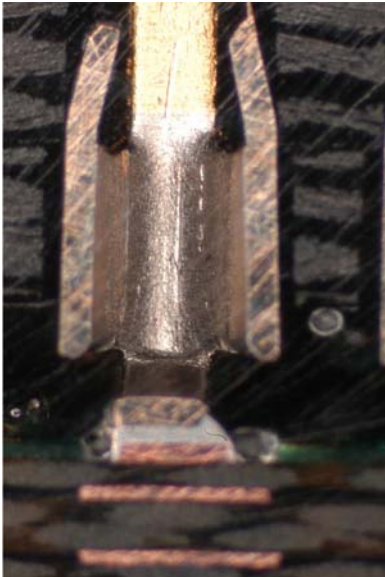
A'-A''



A'-A''



B'-B''



B'-B''

Cross Section Samples Indicate:

- Good alignment of socket 'J' lead to PCB pad
- Uniform wetting of solder



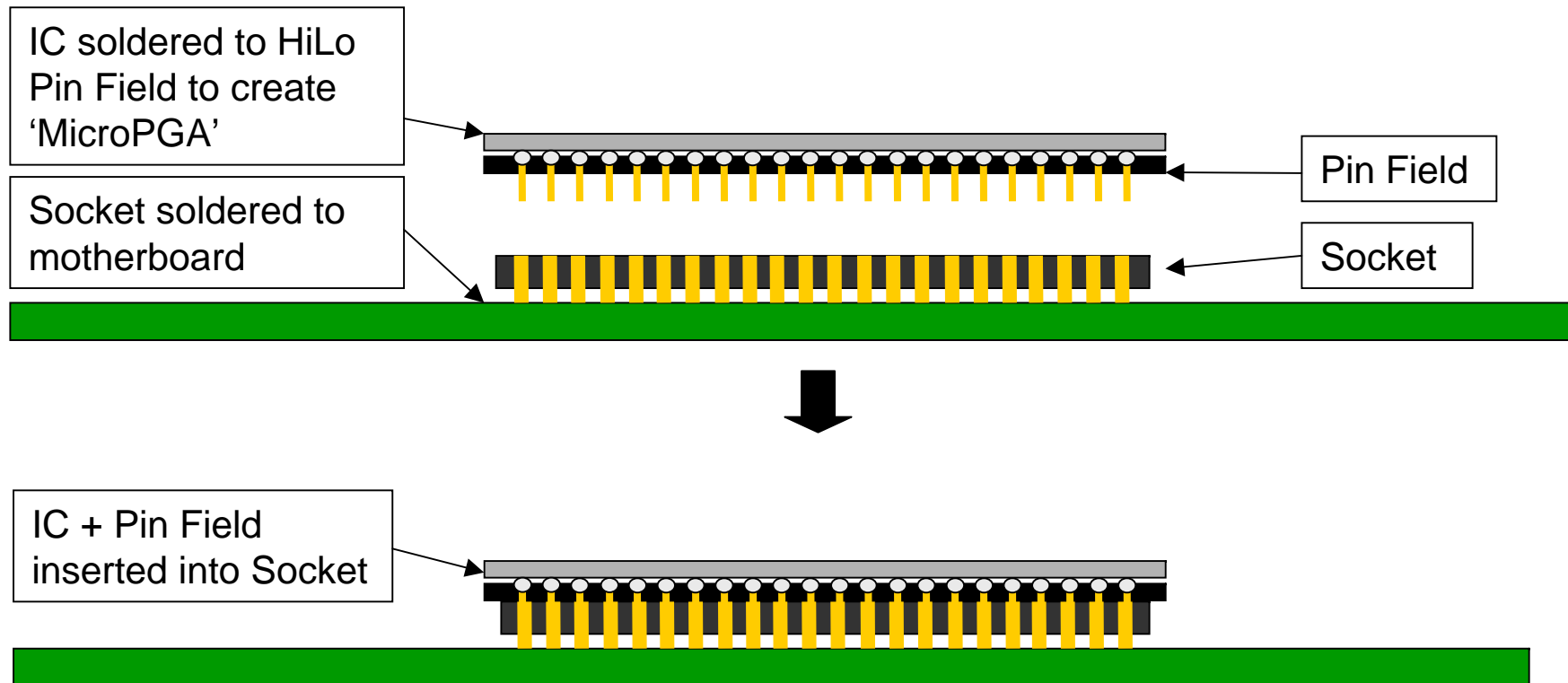
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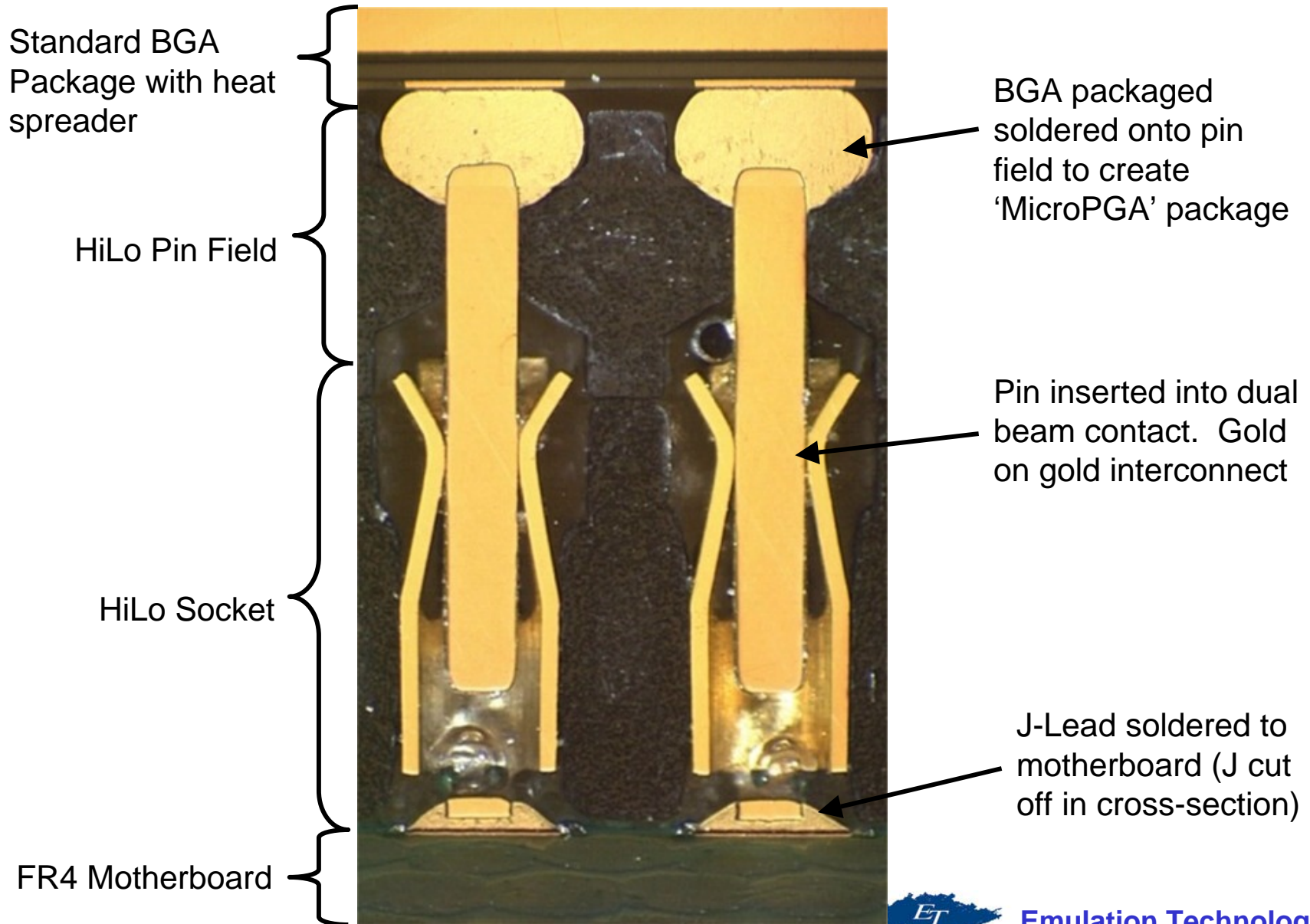
# IC Socketing

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

- 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 (ET pin field not required)



# Cross Section – BGA Socketing Application



# FPGA Standard Products

## 1mm Pitch Standard Products for FPGA BGA Packages

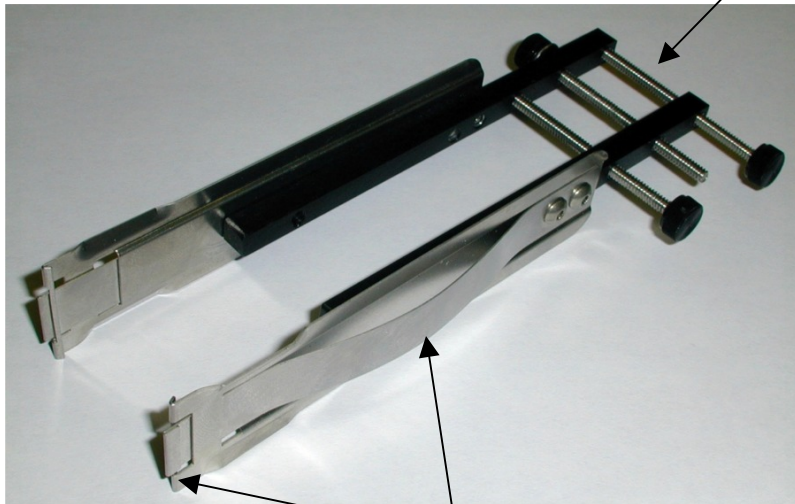
Pin Count	Socket Part #	Pin Field Part #	Actel	Altera	Quick Logic	Xilinx	Package Reference
100	HLS-100100-B-10	HLP-100100-B-10		x			
144	HLS-120144-B-10	HLP-120144-B-10	x				FG 144
256	HLS-160256-B-10	HLP-160256-B-10	x			x	FG256, FT256
324	HLS-180324-B-10	HLP-180324-B-10	x				
324	HLS-220324-B-10	HLP-220324-B-10				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
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			
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



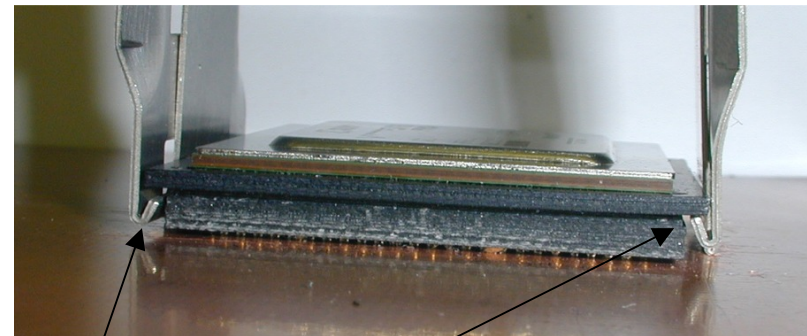
# Removal Tools

ET offers a removal tools that can be used with HiLo BGA socketing systems

1. Adjust tool to proper width with three adjustment bolts



P/N E00001-2: recommended for HiLo systems up to 700 positions



2. 'Hook' end of tool under pin field

3. Press on edges of tool to extract pinned IC

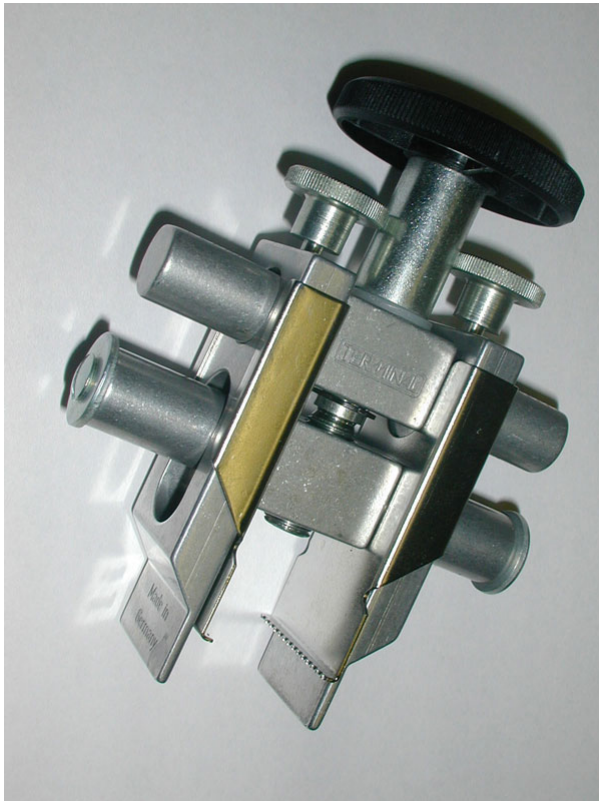


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# Removal Tools

Removal tools for HiLo systems with more than 700 positions



P/N E00002-1: 2-sided tool  
recommended for HiLo systems with 700 to  
1200 positions



P/N E00004-1: 4-sided tool  
recommended for HiLo systems with over 1200  
positions, or over 45mm in size

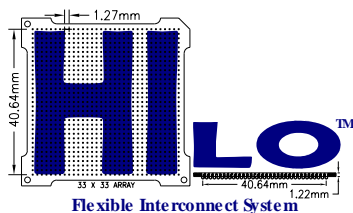
Note: Please contact ET to discuss which  
removal tool is appropriate for your application



# HiLo™ Flexibility

Unique ability to provide a high-performance, socketed interconnect system that with a pin-out optimized to the application, with a short lead time, and low NRE and production costs

- High lead count
- Full array
- Perimeter array
- Custom grid
- Mixed pitch

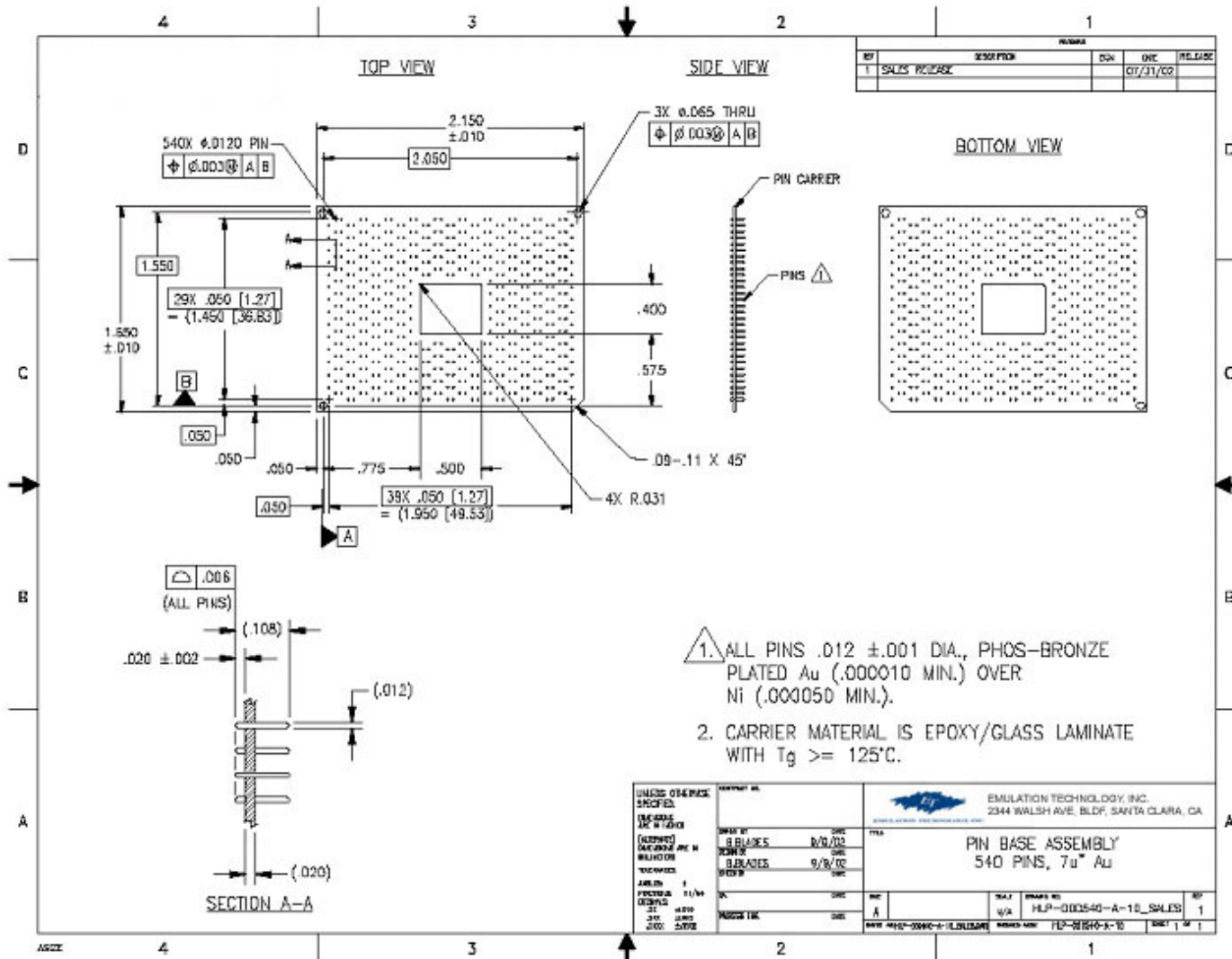


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# Unique Pin Geometry

Custom pin population example. Every other pair depopulated to allow routing channels for differential pairs.

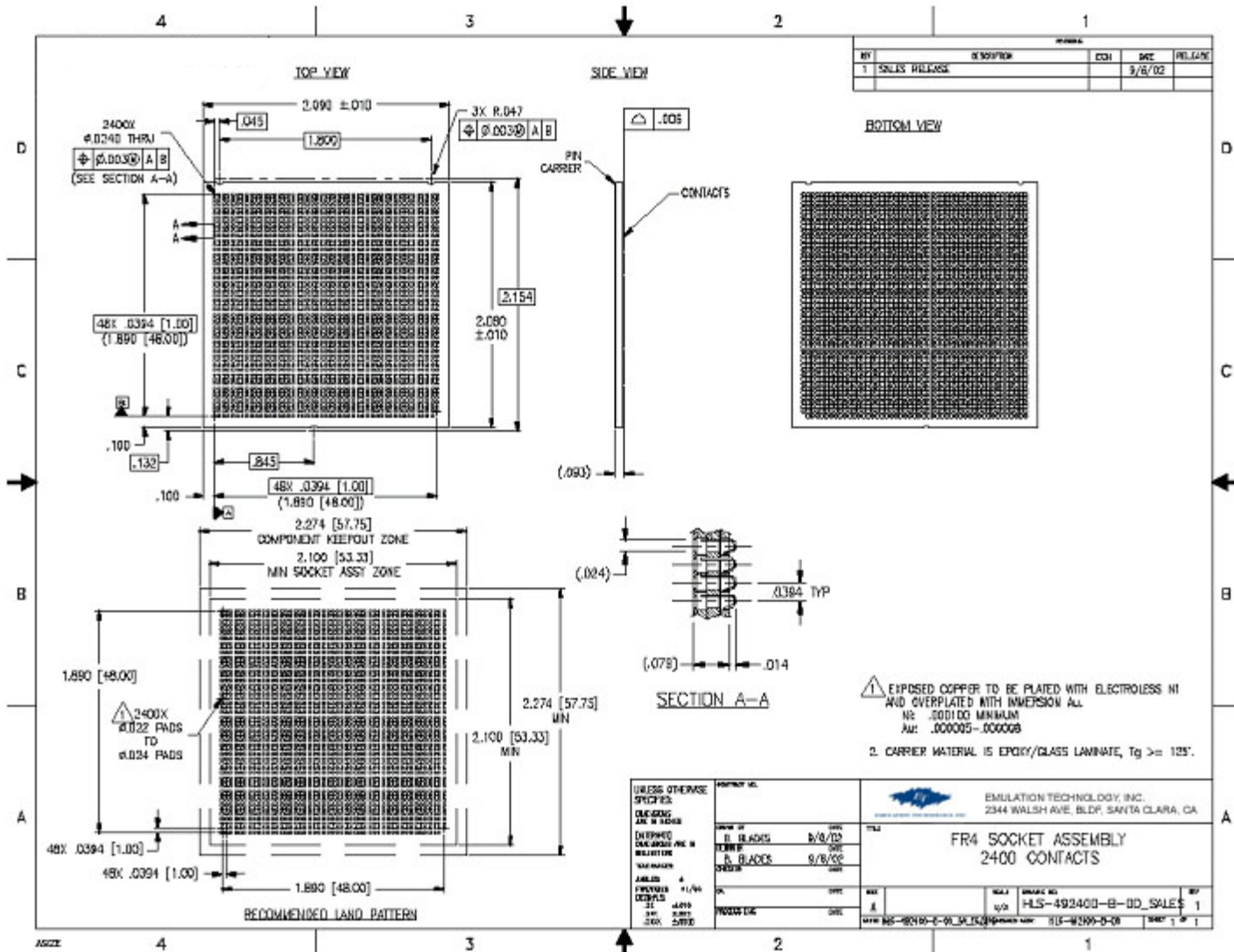


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# High Pin Count

2400 I/O socket!



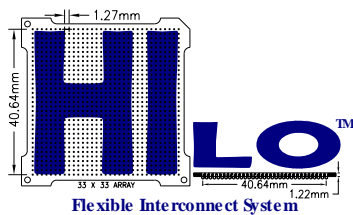
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# Other Applications

Here are some other creative ways the HiLo system can be used to solve interconnect problems:

- Flex Circuit to Rigid Board Connector
- Flex Circuit to Flex Circuit Connector
- Backside ASIC Test Access
- ASIC Emulation Modules



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## Supporting Documentation

[Reliability Test Data](#)

[Electrical Characterization](#)

[Socket Assembly Guidelines](#)

