Micro-Probe's Apollo™ Vertical Probe Card

presented by
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Presentation Overview

- Introduction
- DRAM Parallel Probing Evolution
- Apollo Design Features
- Apollo Performance Features
- Conclusion

Introduction

- Brief History of Micro-Probe
- Micro-Probe's Participation In The Evolution Of Parallel Testing
  - Epoxy Testing
    - Single Tier Epoxy Technology
    - Epoxy Shelf Technology
  - Micro-Probe's Entry Into The Vertical Market
    - Silicon Based Technology Research/Development
    - Apollo Research, Development and Manufacturing

DRAM Parallel Probing History

Year	Device Density	Photolithography Technology	Parallelism Probed	Total Bits Probed Per Touchdown
1983	64K	2.25 Micron	1X	64K
1984	64K	2.0 Micron	2X	128K
1985	256K	1.75 Micron	2X	256K
1986	256K	1.5 Micron	2X	512K
1987	1MEG	1.25 Micron	2X	2 MEG
1988	1MEG	1.0 Micron	2X	2 MEG
1989	1MEG	0.9 Micron	4X	4 MEG
1990	1MEG	.75 Micron	4X	4 MEG
1991	4MEG	.60 Micron	4X	16 MEG
1992	4MEG	.50 Micron	8X	32 MEG
1993	4MEG	.40 Micron	8X	32 MEG
1994	16MEG	.35 Micron	16X	256 MEG
1995	16MEG	.30 Micron	16X	256 MEG
1996	16MEG	.25 Micron	16X	256 MEG
1997	64MEG	.21 Micron	16X	1024 MEG
1998	64MEG	.21 Micron	32X	2048 MEG
1999	64MEG	.18 Micron	32X	2048 MEG
2000	64MEG	.15 Micron	32X	2048 MEG
2001	128MEG	.13 Micron	64X	8192 MEG
	>200,000%	95% Geometry Reduction	6,300%	>13,000,000%

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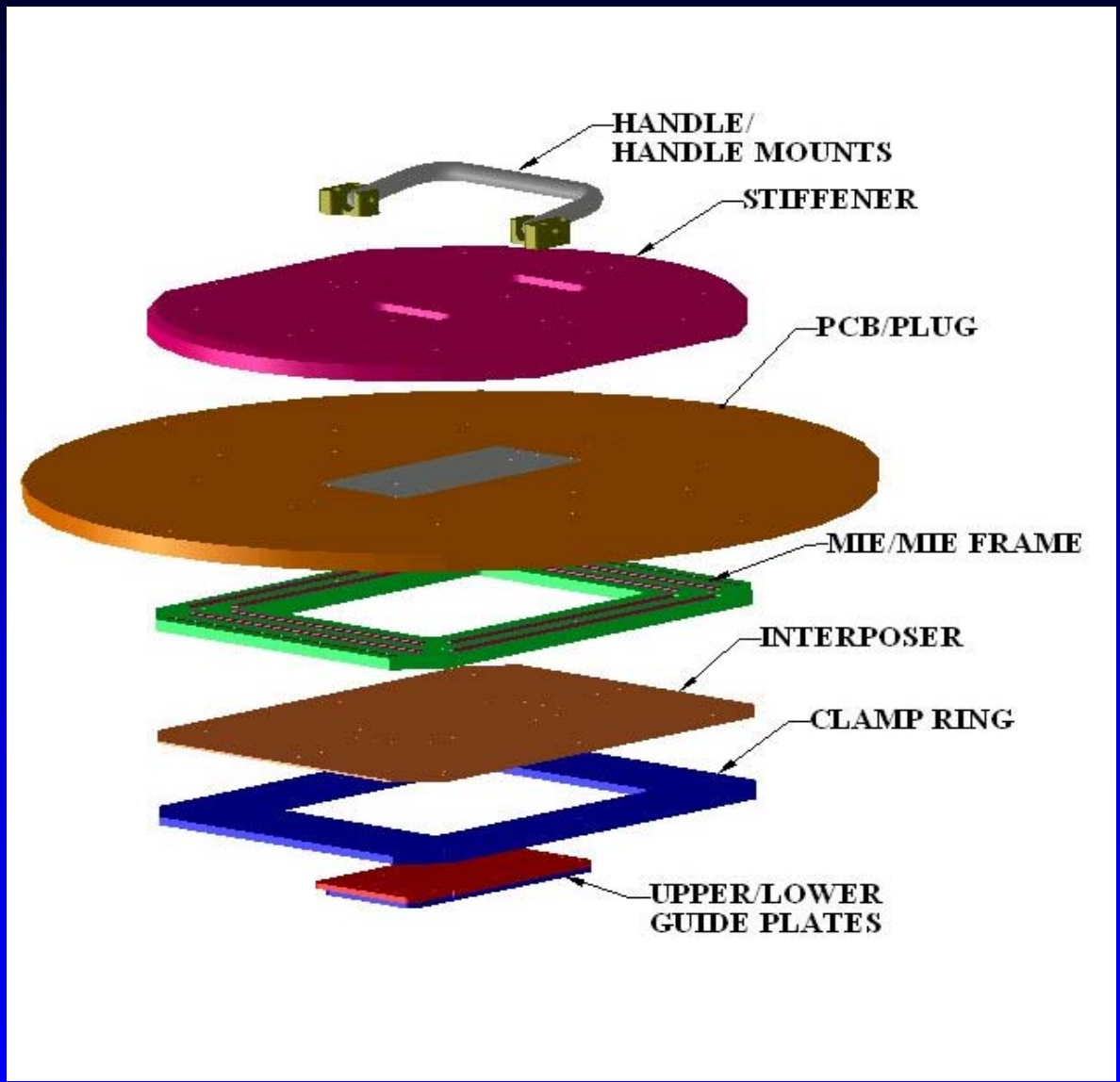
DRAM Parallel Probing History

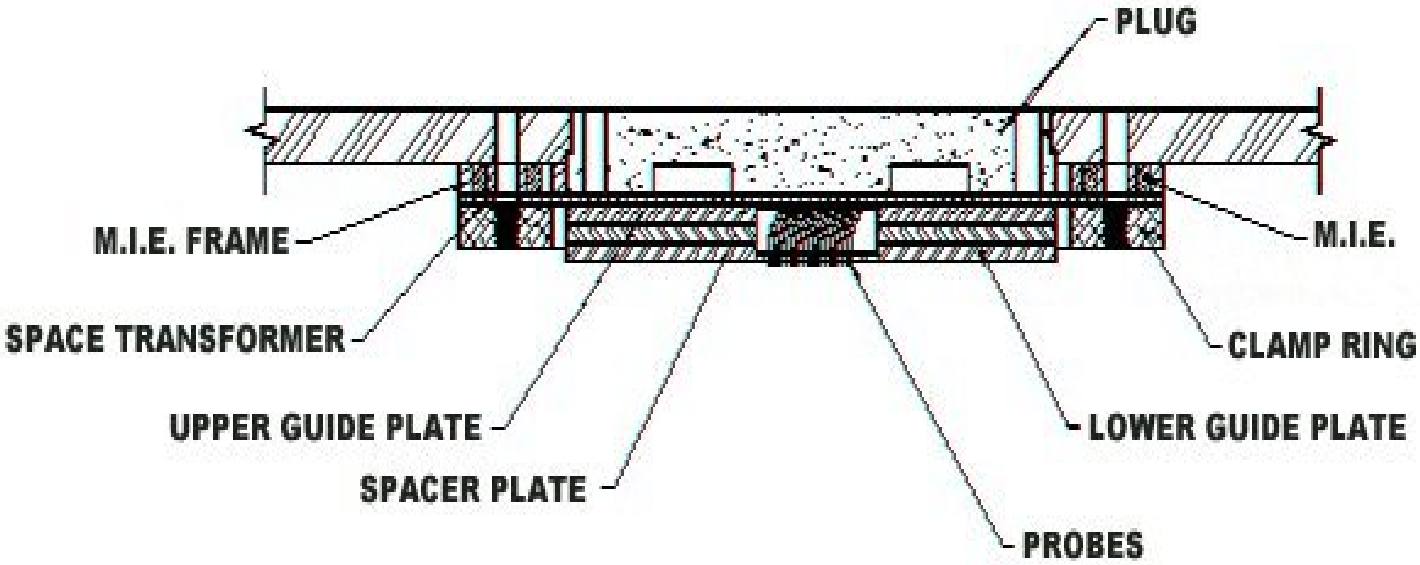
DRAM Evolution Summary Since 1983:

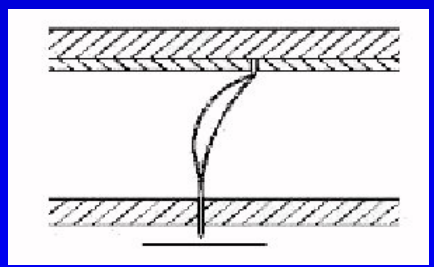
- DRAM device bit density has increased from 64K to 128 Meg - over 200,000% increase
- DRAM photolithography geometry reduced from 2.25 micron to .13 micron technology - 95% geometry reduction
- DRAM probing parallelism increased from single site testing (1X) to 64 site testing - 6300% increase
- The total number of DRAM bits probed per touchdown increased from 64K in 1983 to 8192 Meg in 2001 - 13,000,000% increase

Apollo Component Stack-up

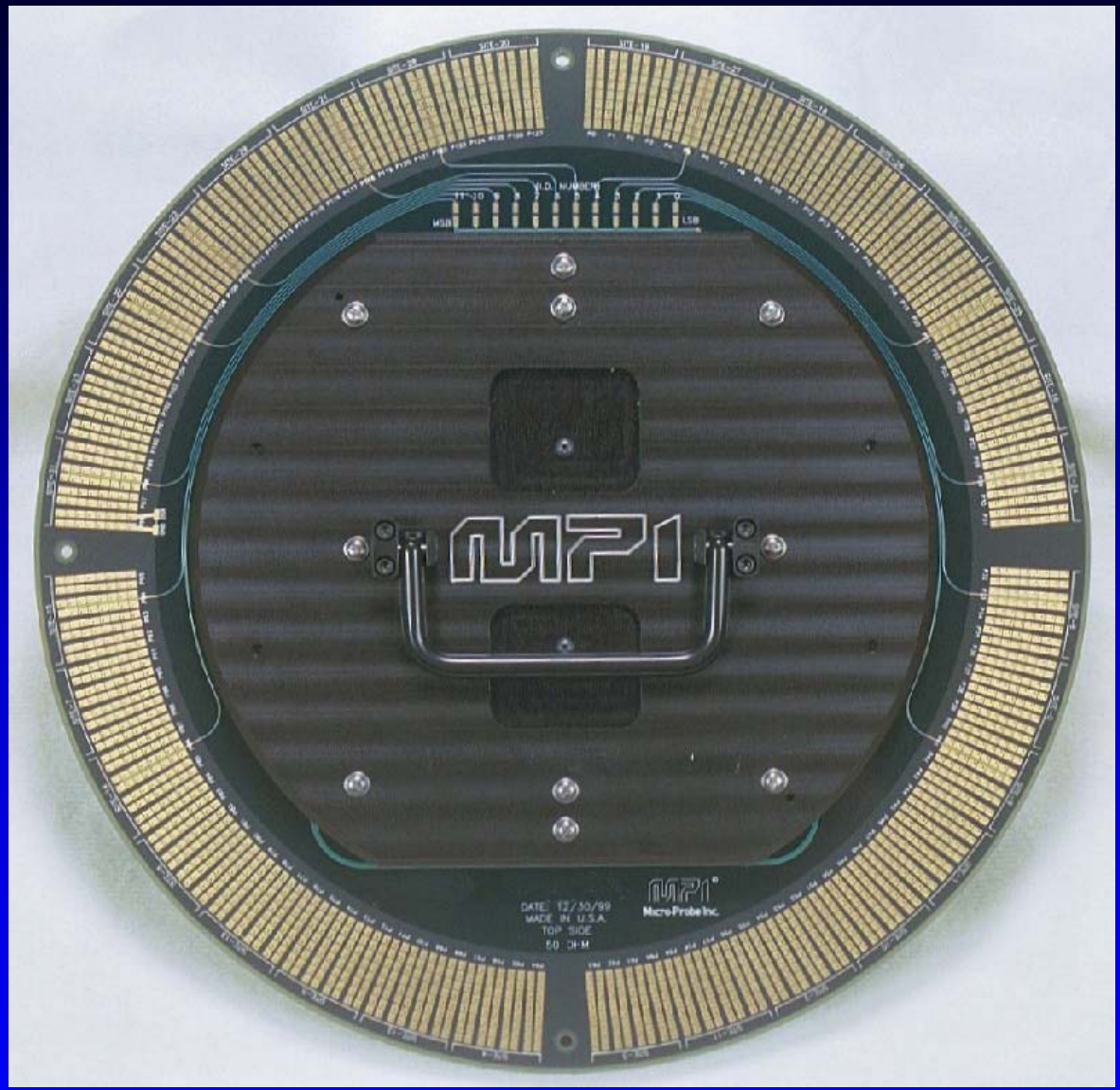


Apollo Cross Sectional View

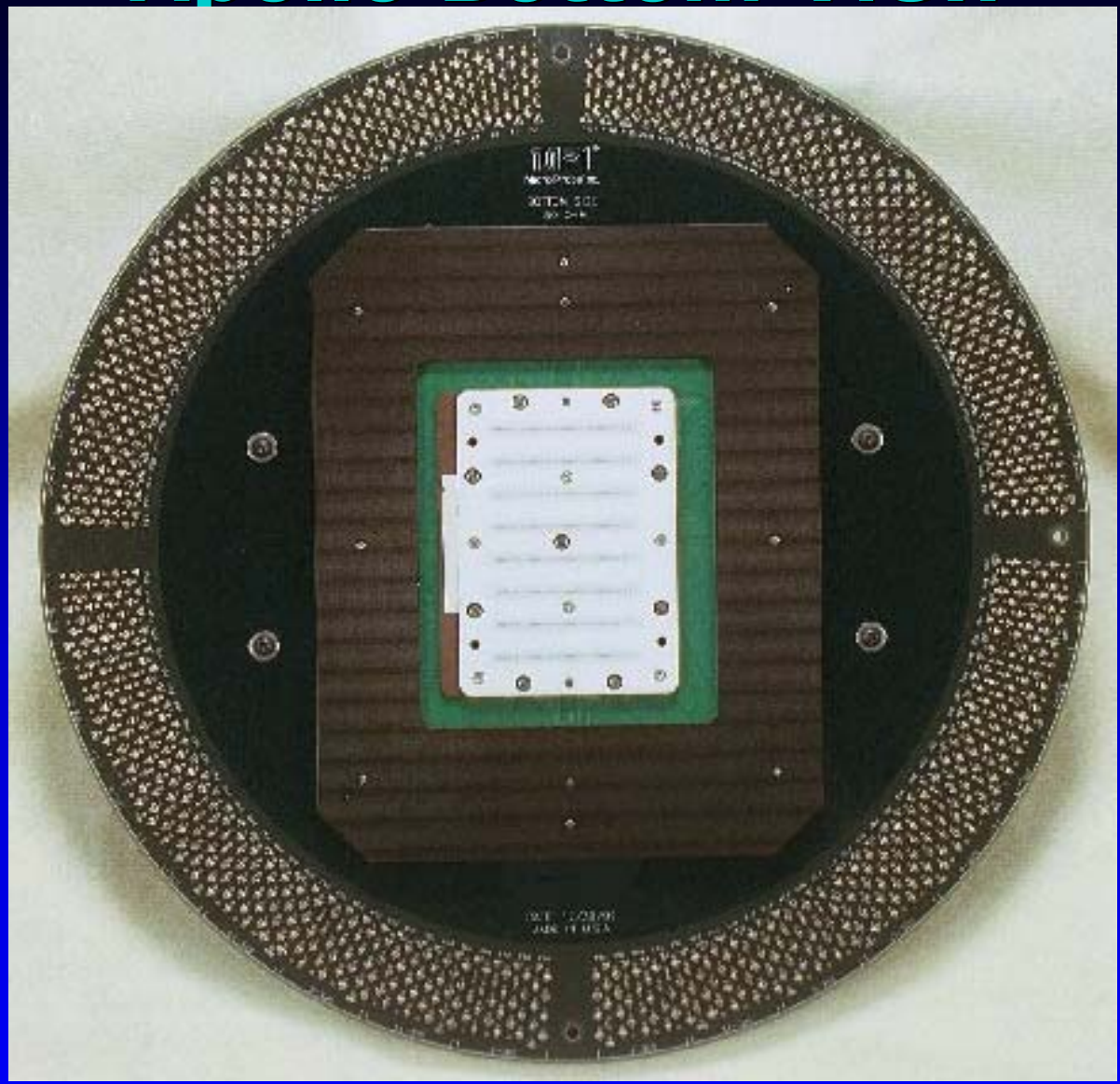




Apollo Top View



Apollo Bottom View



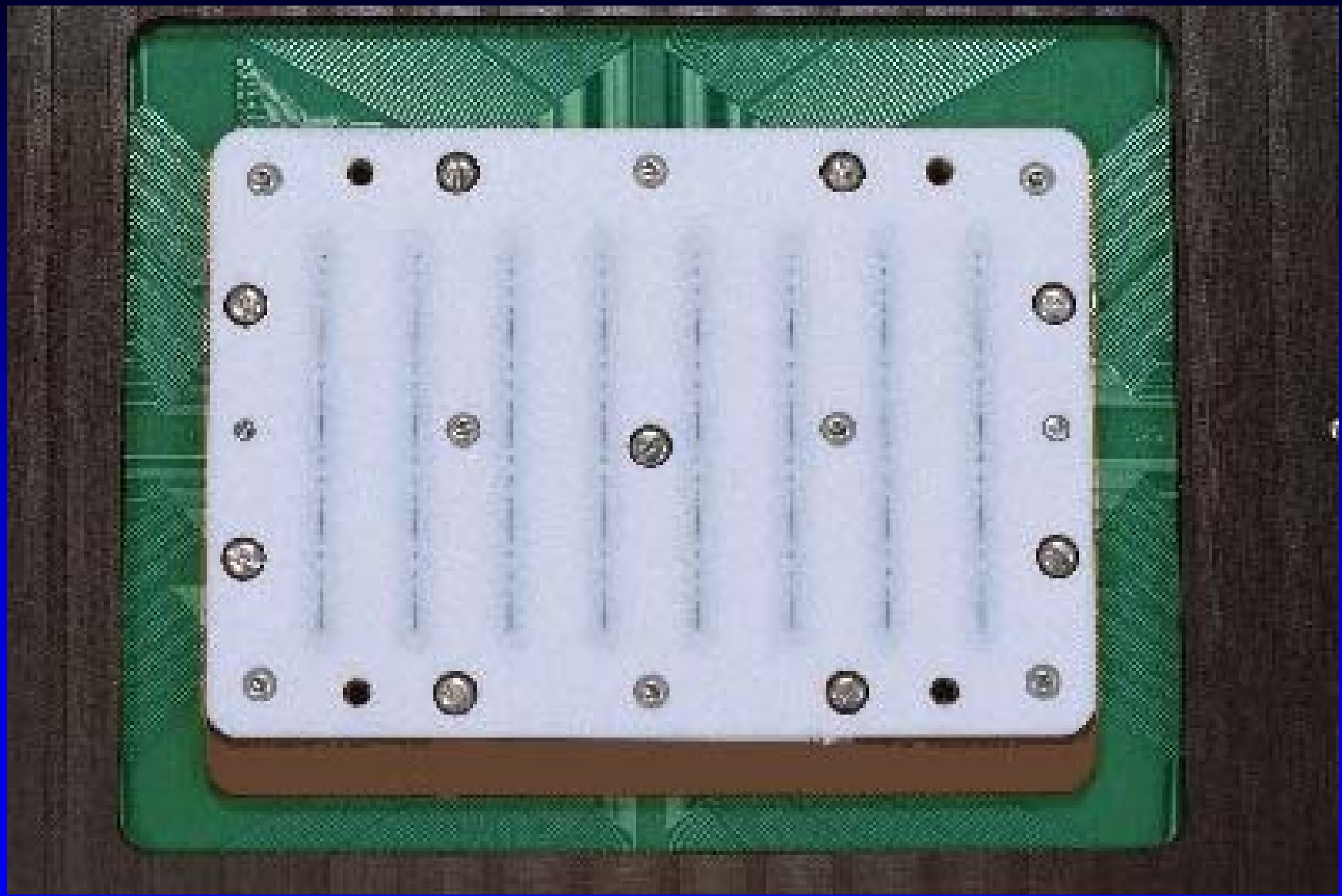
Apollo Design Features

- Head Design
  - Innovative implementation of ceramic lower guide plate
  - Optimized probe design to assure durable, reliable performance
  - Attractive manufacturing costs and lead-times
  - 3 mil. diameter probe with .5 mil. diameter tip utilized for layouts down to 130 micron pitch
  - Development in progress to reduce pitch capability of existing head design

Apollo Design Features (cont.)

- Head Design (cont.)
  - Precision micro-drilling technology delivers accurate probe positioning
  - Identification bit capabilities within the head

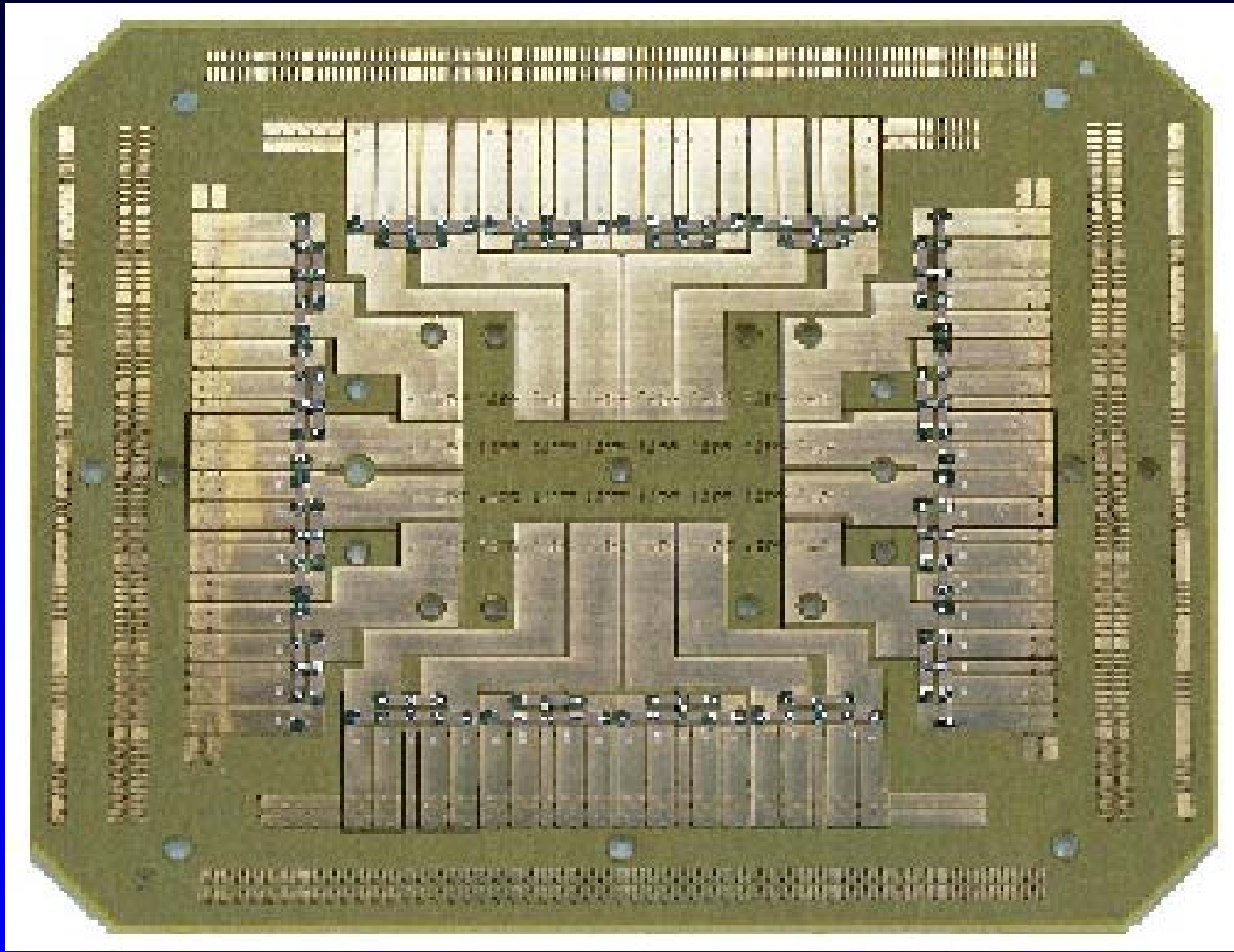
Apollo Head



Apollo Design Features (cont.)

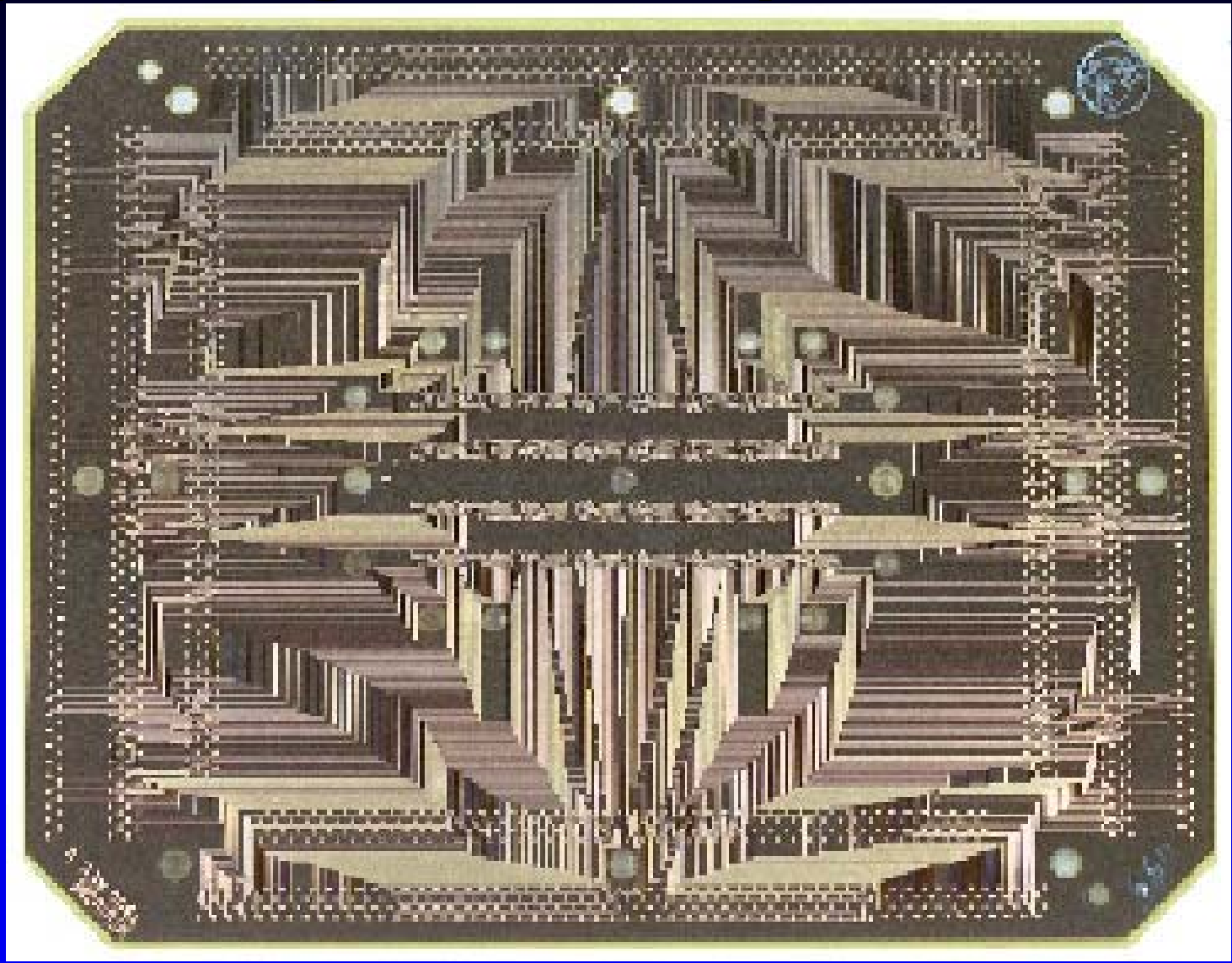
- Organic Interposer Design
  - Apollo Organic Flex Circuit Interposer provides sound electrical and mechanical performance
    - Electrical characteristics and impedance requirements can be tightly controlled to the DUT
    - De-coupling capacitors are installed on the interposer in close proximity to the DUT
    - Mechanical durability has proven very reliable
    - Thin, streamlined interposer design provides mechanical stack-up flexibility

Apollo Organic Interposer-Top

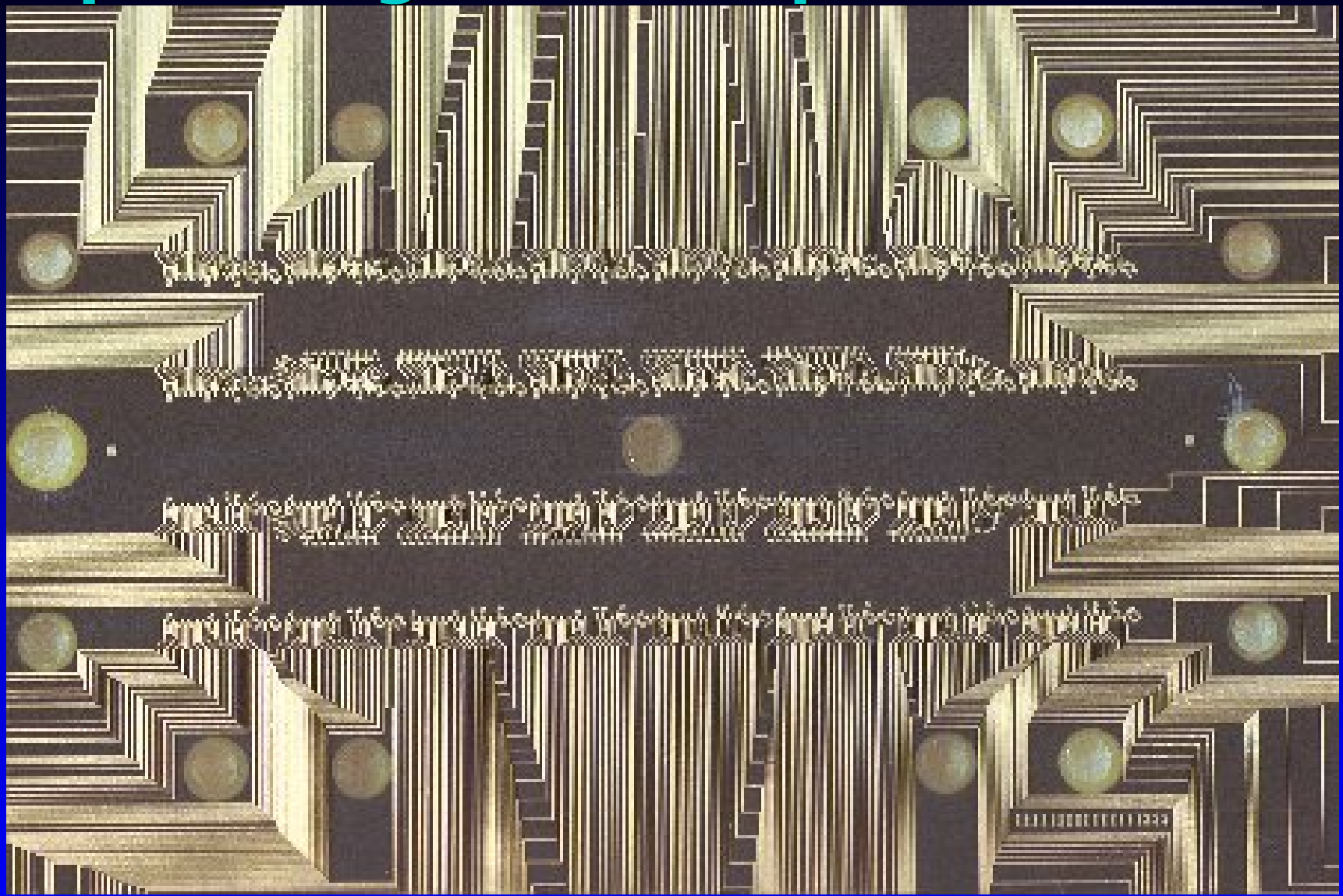


Apollo Organic Interposer-Top

Apollo Organic Interposer-Bottom



Apollo Organic Interposer-Bottom



Apollo Design Features (cont.)

- Metal In Elastomer (MIE) Interposer to PCB Interconnect Technology
  - Economical, Simple and Reliable
  - Easily adaptable to varying design requirements
  - MIE thickness can be varied to meet an array of probe depth requirements

Apollo Performance Features

- Dependable, robust electrical and mechanical performance on the production floor
  - Very reliable contact performance between the distal (upper) end of the probe and the interposer contact pads

Apollo Performance Features (cont.)

- Limited maintenance required
  - Smooth/conical profile of the Paliney probe tip coupled with the succinct scrub action of the probe eliminates regimented card cleaning requirements

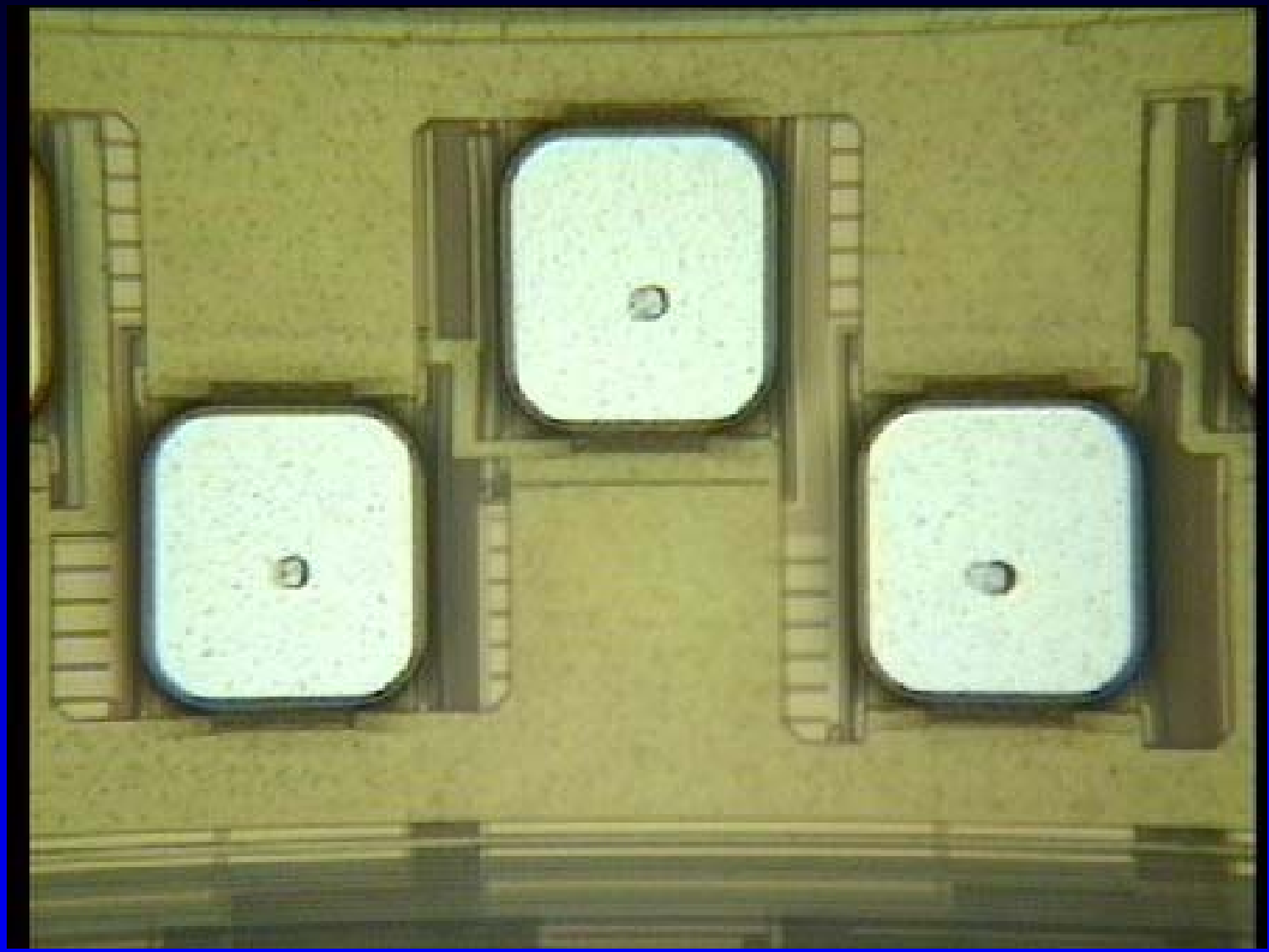
Apollo Performance Features (cont.)

- Dry brush/dry air is all that is normally necessary to keep probe tips and guide plate clean of any incidental contaminants
  - Solvents are never recommended to clean probe tips or guide plate
  - The use of abrasive substrates and Gel Pak cleaning materials found necessary on other vertical technologies have been qualified for use on the Apollo, but are not necessary under normal production conditions
  - Abrasive cleaning is recommended only after contamination build-up is not effectively resolved with dry cleaning

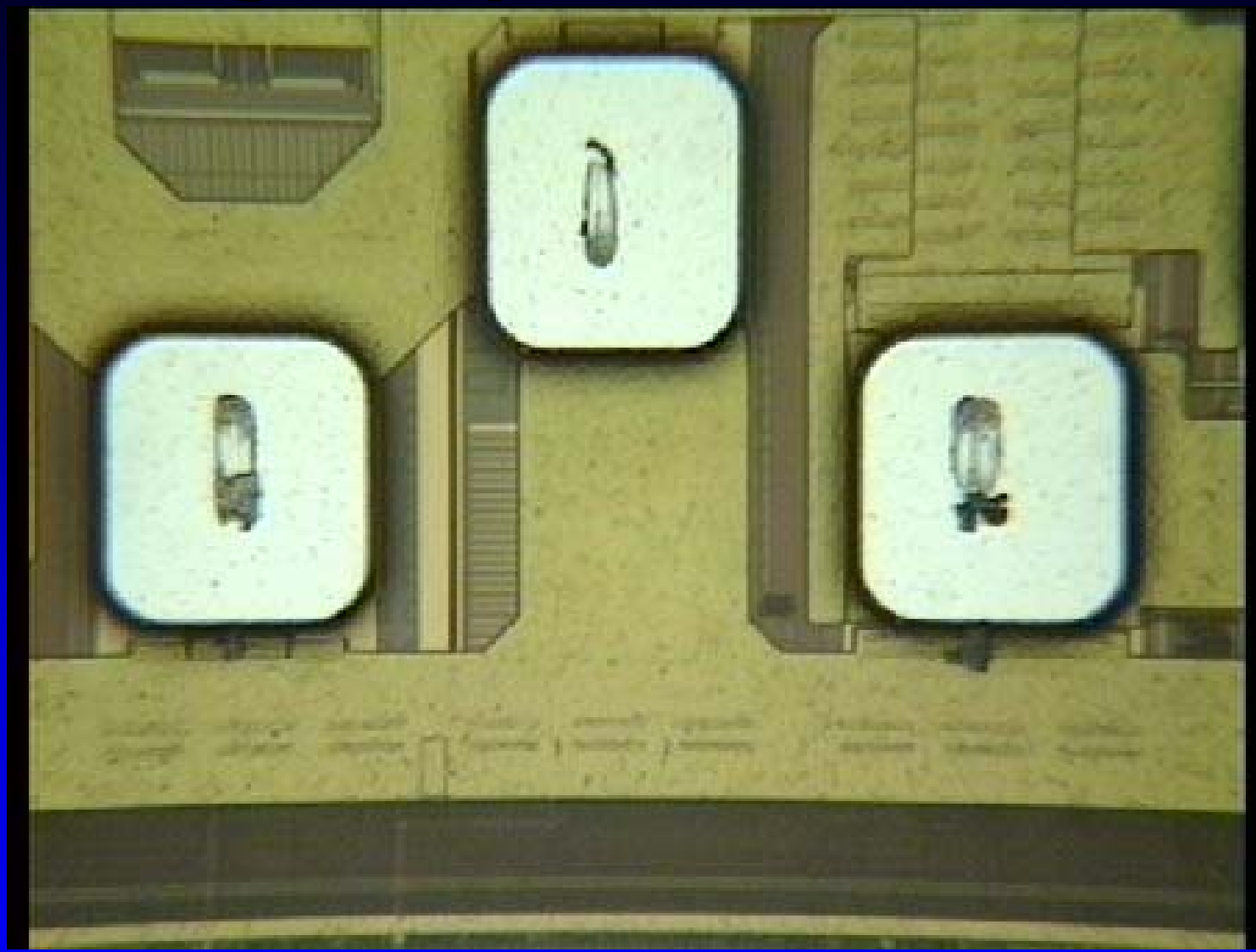
Apollo Performance Features (cont.)

- The Apollo's precise probe placement, small 12.5 micron tip diameter probe tip and concise scrub action allow semiconductor manufacturers the advantage to proceed with pad dimension reductions

Apollo Probe Marks



Leading Competitor Probe Marks



Apollo Performance Features (cont.)

- The durability of the Apollo is unmatched in comparison to other multi-site vertical solutions on the market
  - Excessive overtravel applied to the probe card is the most common cause of early card retirement

Apollo Performance Features (cont.)

- The Apollo has demonstrated the ability to withstand excessive overtravel and continue to operate in production
  - Instances have been documented of 32 site Apollo probe cards enduring maximum overtravel and continuing to operate effectively in production
  - Further design efforts are in progress to assure that Apollo probe cards have the ability to withstand maximum overtravel without incurring damage to the probe card

Conclusion

- The Apollo Vertical Probe Card line has addressed the fundamental requirements of today's multi-site applications:
  - Design innovation supports economical cost of ownership and dependable lead times
  - Design features provide reliable, durable performance
  - Design flexibility will provide solutions for a large spectrum of multi-site layout variances
- Micro-Probe thanks you for your attention!