



IEEE SW Test Workshop

Semiconductor Wafer Test Workshop

June 9 - 12, 2013 | San Diego, California

**Consolidation at the Leading Edge
Time to Review the Options**

VLSIresearch

John West

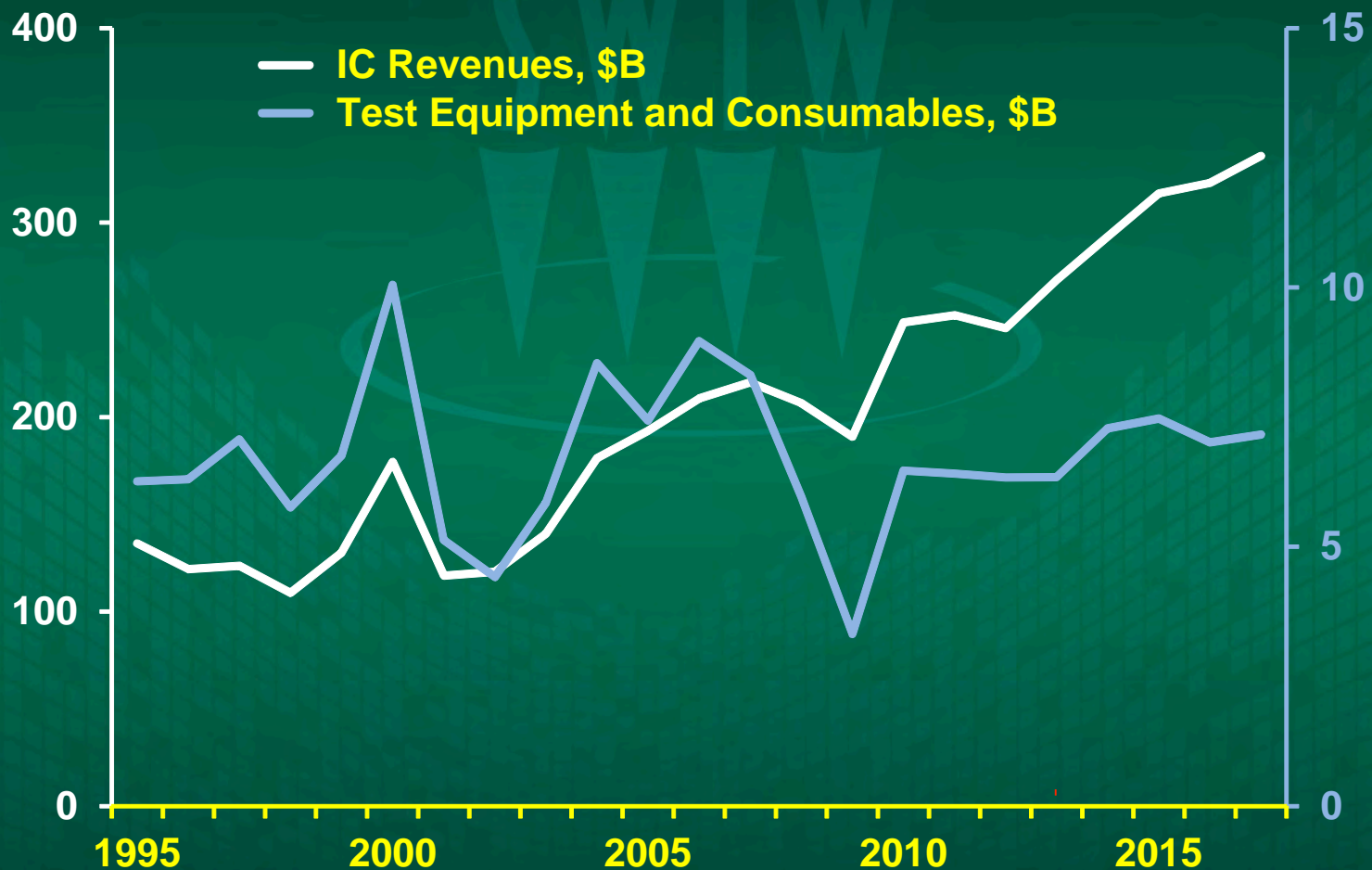
VLSI Research Europe

Presentation Overview

- **The cost of test**
 - Is there a problem?
- **Probe card industry structure**
 - Fragmented / consolidated?
- **What next?**
 - Options
- **Summary**



The Cost of Test



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The Cost of Test

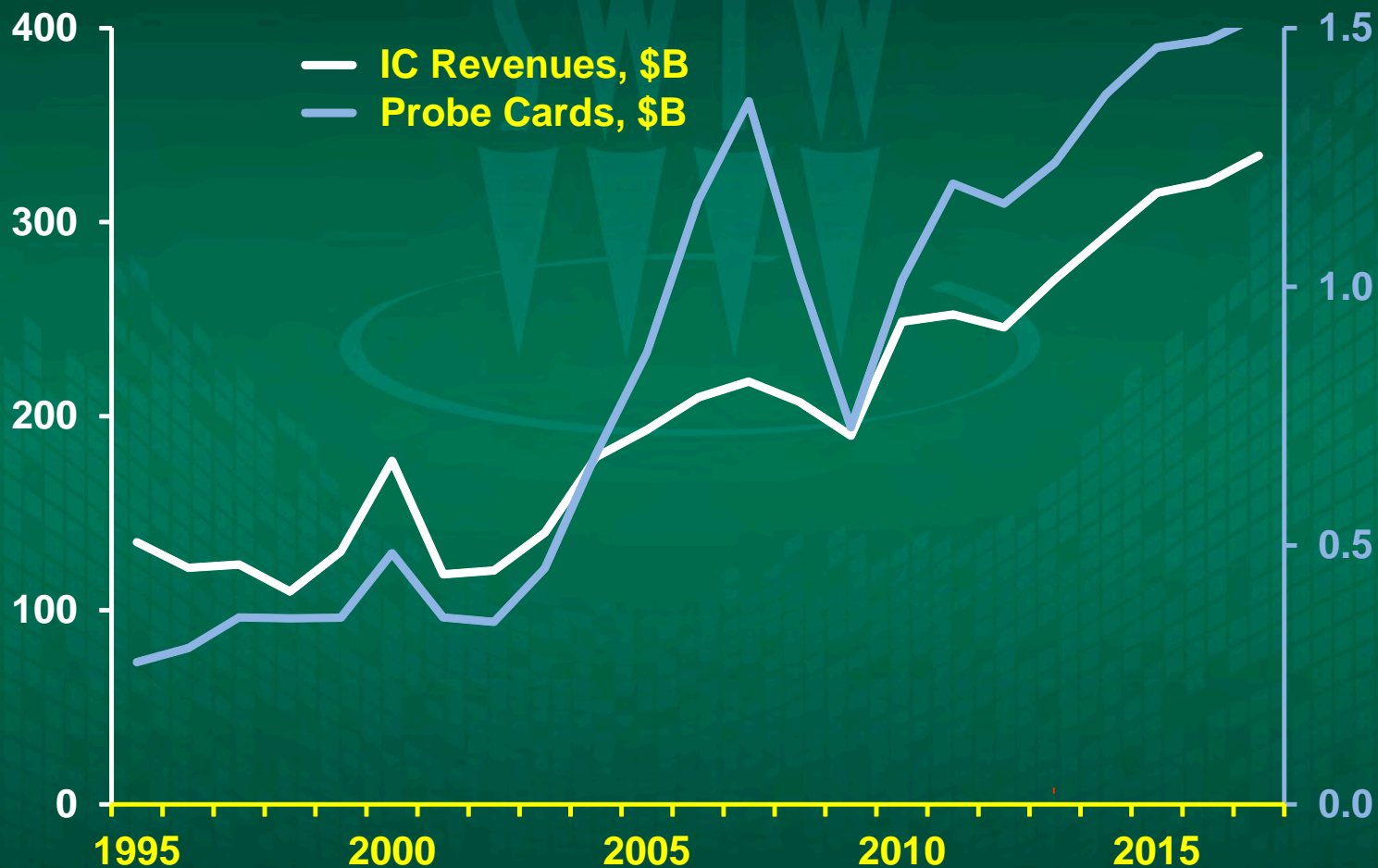


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Probe Card Cost as a % of IC Revenues

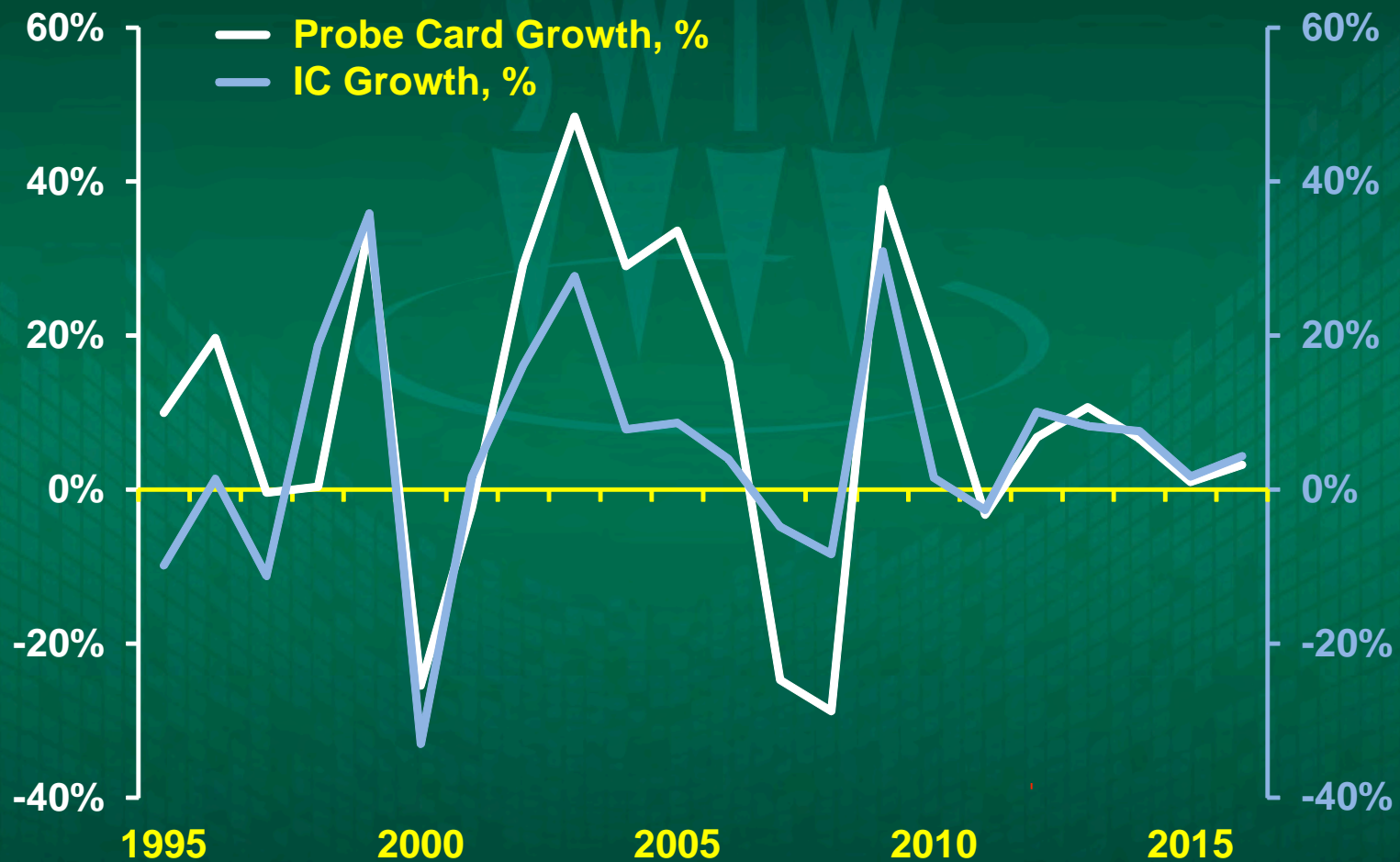


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Why are probe costs not falling?

- **Transition to sub 120nm**
 - an inflection point
- **Transition from Cantilever to Advanced**
 - doesn't drive down cost per device tested
- **Average Selling Prices are Falling**
 - but at the same rate as IC average selling prices
- **Too Many Suppliers?**
 - Still over 50 suppliers, top 10's share of market not increasing

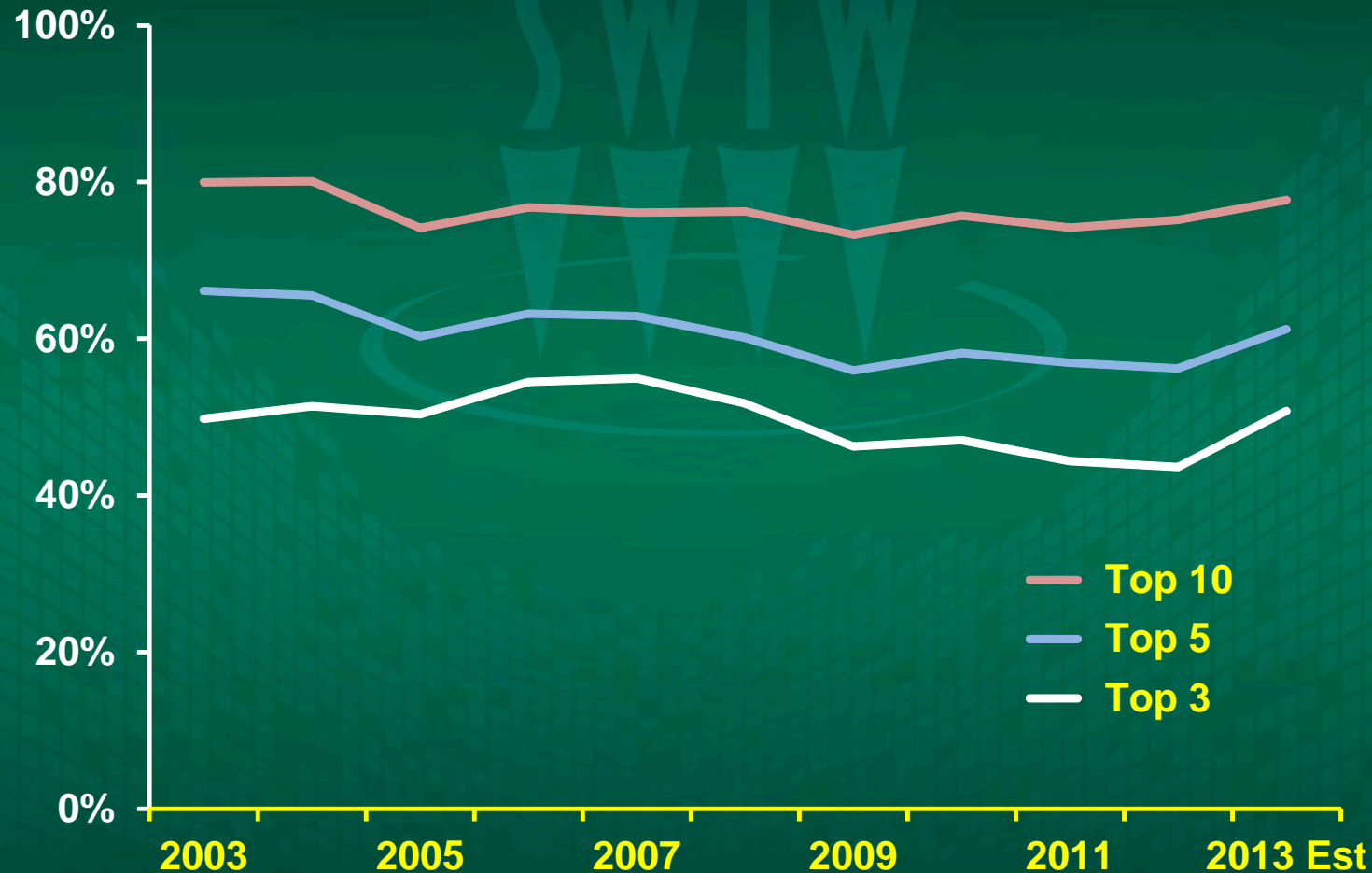


Probe Card Industry Characteristics

- **Small number of probe card technologies**
 - Blade, Epoxy/Cantilever, MEMS, Vertical, Membrane...
- **Prices of leading edge probe cards increasing with each technology node transition**
 - R&D costs
 - Manufacturing complexity
- **Fragmented**
 - Relatively low barriers to market entry
 - Too many suppliers???



Probe Card Suppliers' Market Share

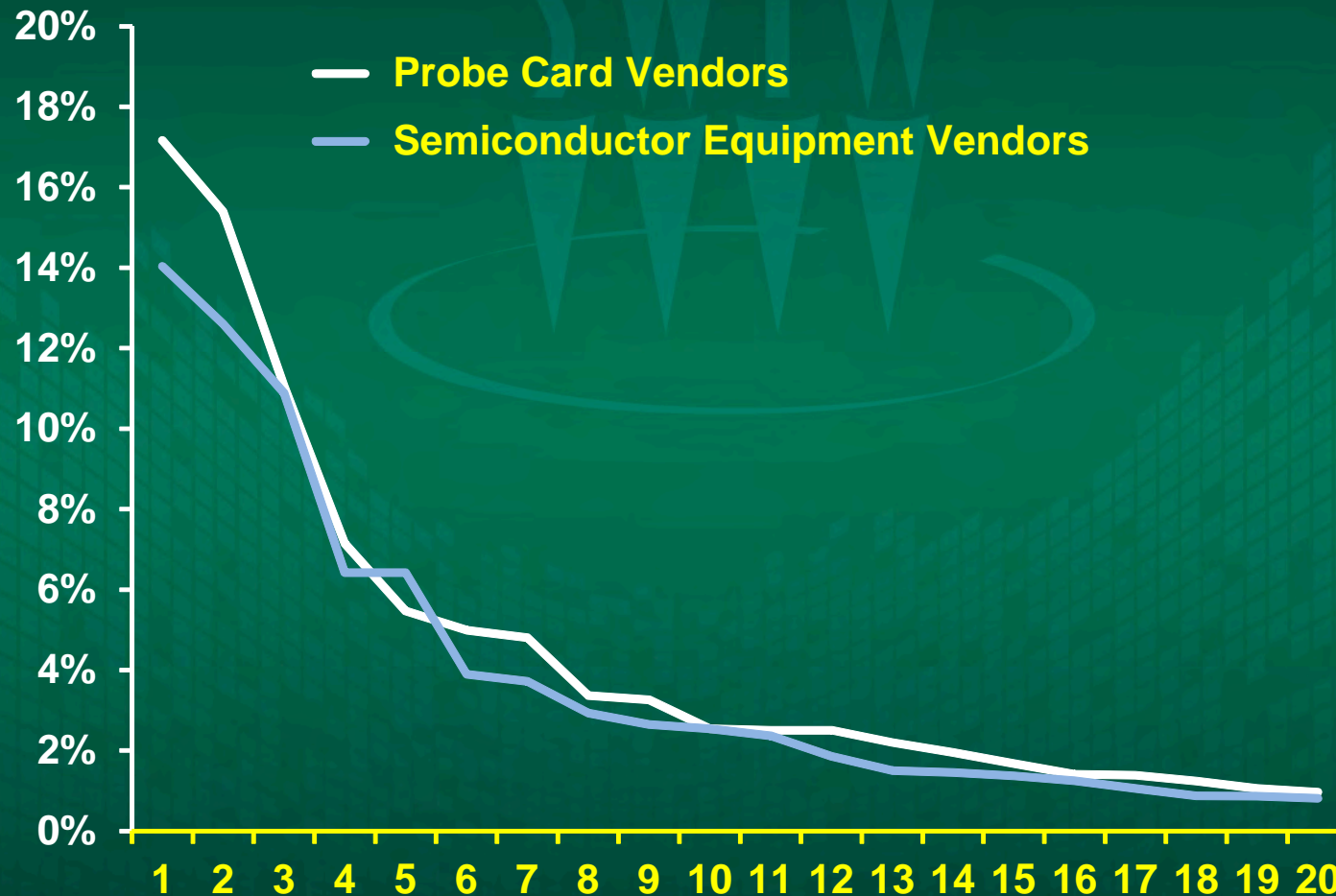


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Consolidation Profile – Share vs. Rank



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Non-Memory

- **Overall**

- In 2008 the top 5 suppliers accounted for 40% of market, they now supply over 60% of the market

- **Epoxy/Cantilever**

- top 5 share of epoxy/cantilever probe cards stuck between 60% to 70%

- **Vertical**

- top 5 share of vertical probe cards stuck at 50% to 60%

- **MEMS**

- Dominated by two suppliers (only one in 2013)



Memory

- **Overall**
 - No consolidation: top 5 account for over 80%
- **Vertical for NAND Flash**
 - 3 Suppliers dominate with more than 90%
- **MEMS for DRAM**
 - Top 2 account for over 85%
- **MEMS for NAND Flash**
 - Top 3 account for around 70%



Review

- **Limited scope for further consolidation**
 - Non-memory epoxy/cantilever
 - Non-memory vertical
- **Increasing cost of probe cards as a % of IC revenues results in...**
 - Continued Pricing Pressure
 - Seeking Alternative Solutions
 - Educating customers about your business model



Summary

- **Semiconductors**

- 2013: revenues up 9.9%, units up 7.2%

- **IC Probe Cards**

- 2013: up 6.8% to \$1.24Bn



VLSI Research Customer Satisfaction Survey - 2013

- **Probe card users asked to rate suppliers on:**
 - Technical leadership, commitment, trust in supplier partnering, process support, field engineering support, spares support, after sales support, product performance, useable performance, quality of results, cost of ownership, uptime, software
- **Top Probe Card Suppliers for 2013**
 - 1 Japan Electronic Materials
 - 2 MPI Corporation
 - 3 SV Probe

