



IEEE SW Test Workshop
Semiconductor Wafer Test Workshop

June 12 to 15, 2011
San Diego, CA

Probe Card Cost Drivers from Architecture to Zero Defects

Ira Feldman

Feldman Engineering Corp.

Overview

- **Cost, Price, & Cost Drivers**
- **Serial Processing – Drilling Example**
- **NRE**
- **Advanced Process Technology**
- **Profitless Prosperity**
- **Cost Savings**
- **Summary**

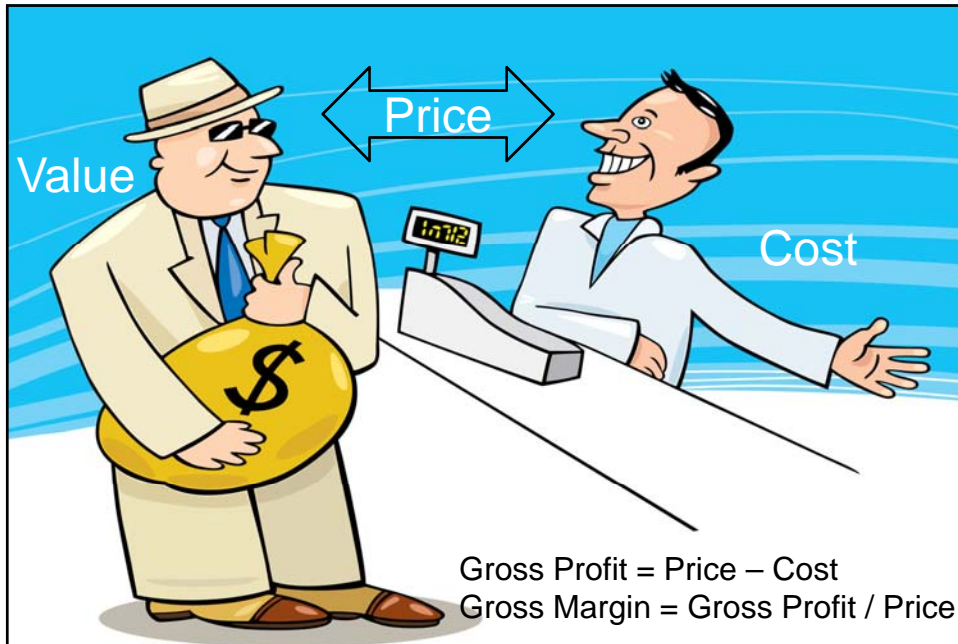
Note: price/cost examples are approximate and from multiple vendors not necessarily those identified or shown.



June 12 to 15, 2011

IEEE SW Test Workshop

2



Value

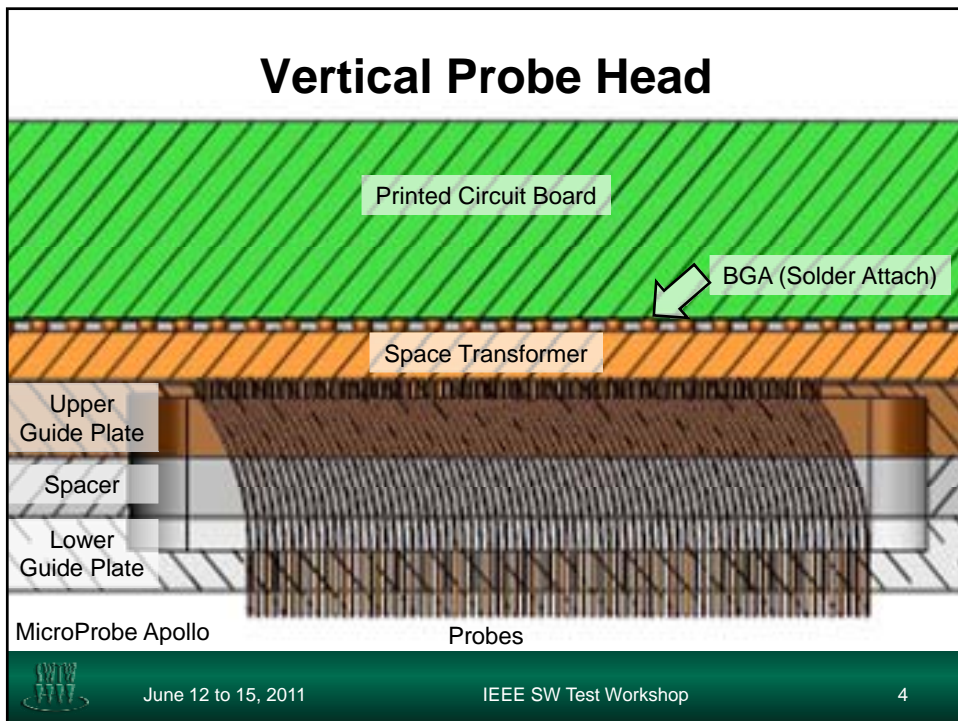
Price

Cost

Gross Profit = Price – Cost
Gross Margin = Gross Profit / Price

WTW
June 12 to 15, 2011 IEEE SW Test Workshop 3

Vertical Probe Head



Printed Circuit Board

BGA (Solder Attach)

Space Transformer

Upper Guide Plate

Spacer

Lower Guide Plate

MicroProbe Apollo

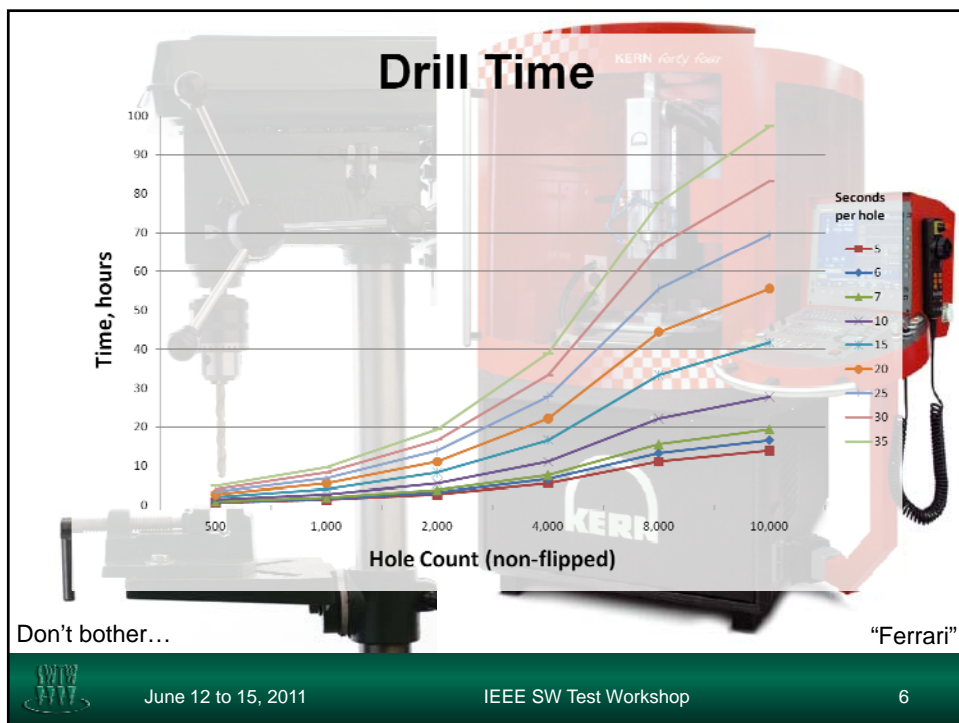
Probes

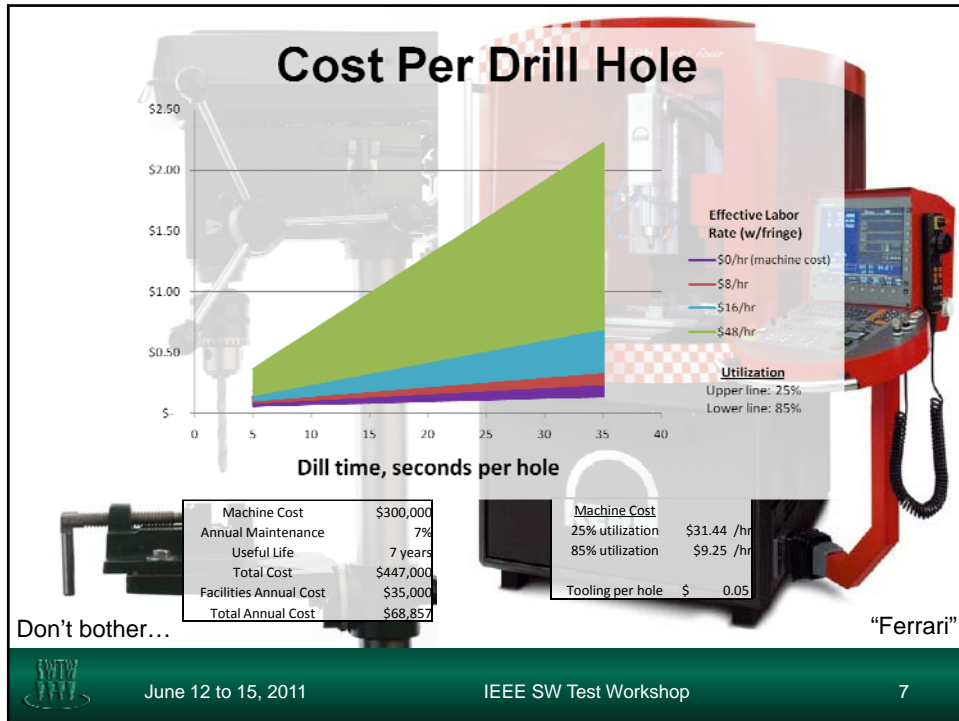
WTW
June 12 to 15, 2011 IEEE SW Test Workshop 4



Machine Shop
Cost Drivers
 Programming
 Material
 Setup Time
 Run Time
 Inspection
 Yield

June 12 to 15, 2011 IEEE SW Test Workshop 5





Non Recurring Engineering Expense

Architecture	Design	Tester	Customer
R&D	NRE	NRE	NRE
Design Input	X		X
Probes			?
Guide Plates	X		
Space Transformer	X		
Interposer	?		
PCB Design	X (External?)	X	?
PCB Fab	External	?	?
Mechanical H/W	?	X	?
Electronics	?	?	?
Metrology	X	X	?
Packaging		X	?



June 12 to 15, 2011

IEEE SW Test Workshop

9

Outgoing Metrology



June 12 to 15, 2011


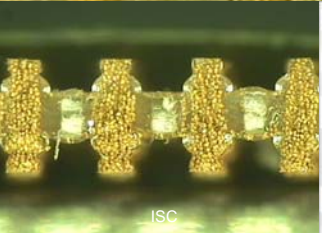

IEEE SW Test Workshop

10


Interposers

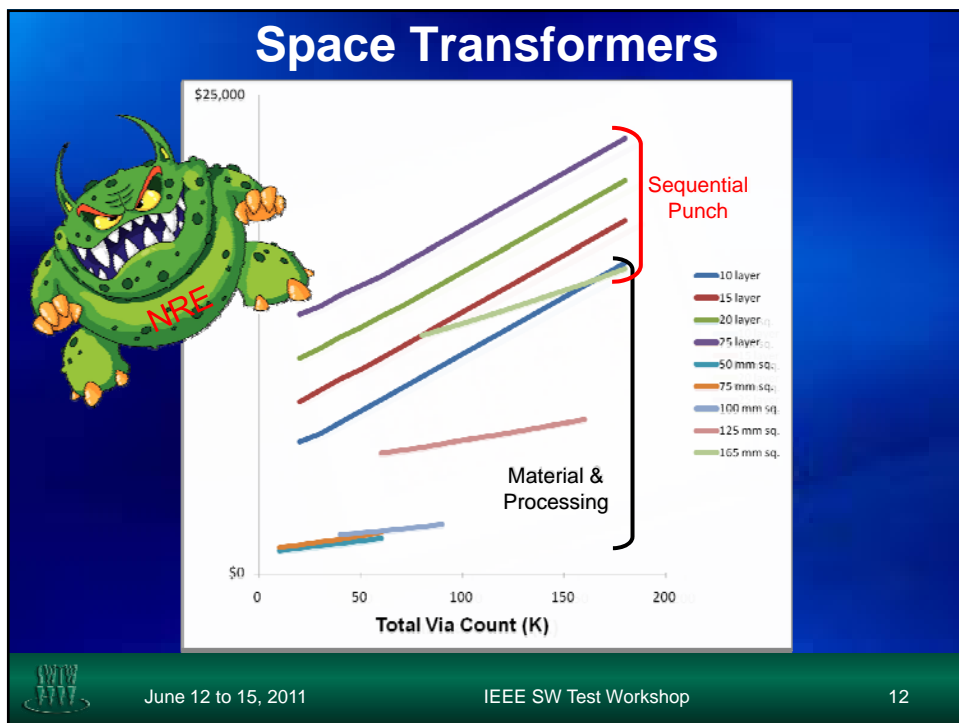
ISC

		Spring Pin	Elastomeric	Molded Frame
Small Area	NRE	\$.5 - 1 K	\$2 - 3 K	\$20 - 30 K
	\$ / contact	\$1 - 10	\$.50 - .60	< \$.20 - .40
Large Area (1/4 wafer +)	NRE		\$10 - 15 K	\$100 - 150 K
	\$ / contact		\$.40 - .50	< \$.10 - .20

www.ksdk.co.jp
ISC
InterCon Systems


June 12 to 15, 2011
IEEE SW Test Workshop
11



Advanced Process Technology

Cost Drivers

- Process Steps
- Masks
- Substrates
 - Material
 - Active Area
- Yield
 - Defect Density
 - Layers
- Equipment
- Rework / Repair

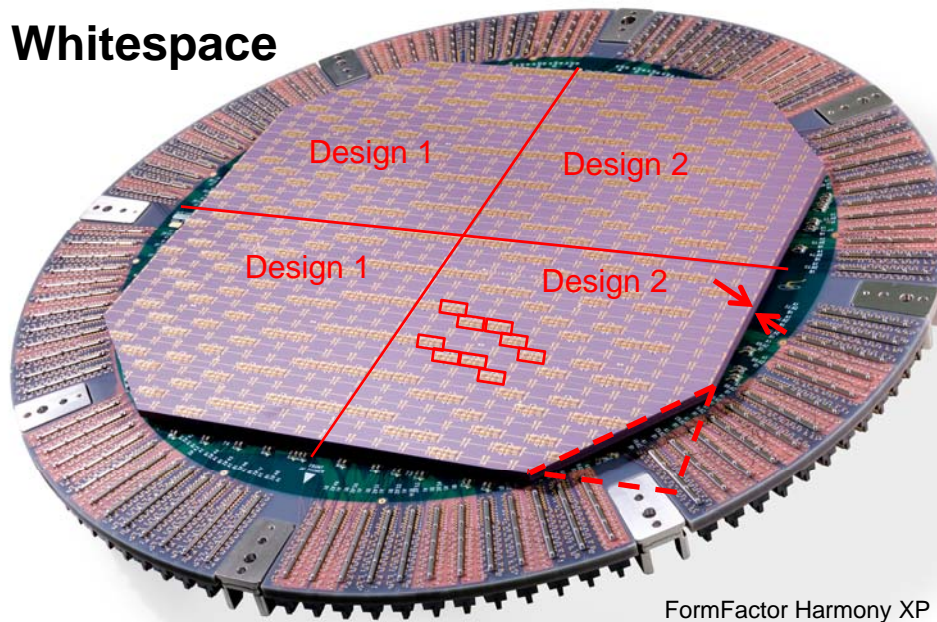


June 12 to 15, 2011

IEEE SW Test Workshop

13

Whitespace



FormFactor Harmony XP

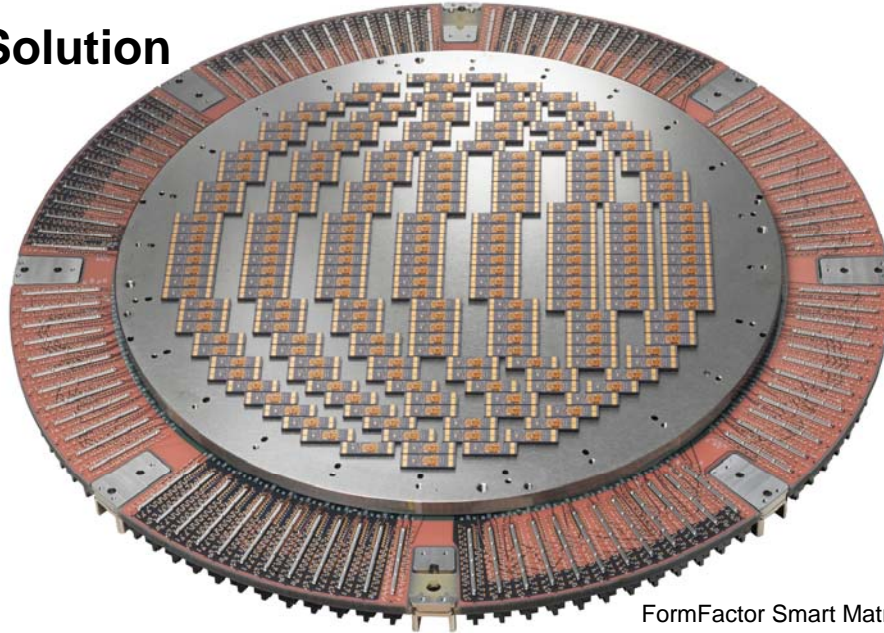


June 12 to 15, 2011

IEEE SW Test Workshop

14

Solution



FormFactor Smart Matrix

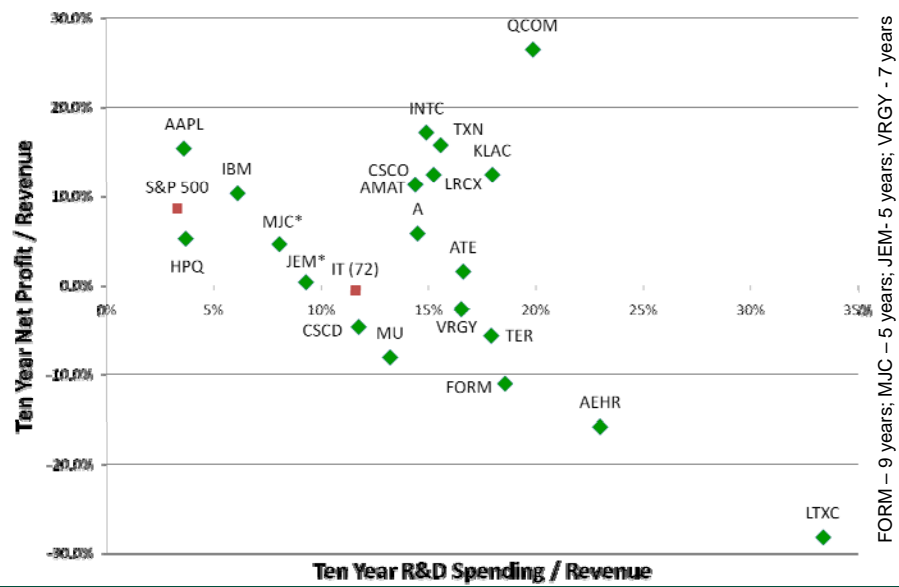


June 12 to 15, 2011

IEEE SW Test Workshop

15

Ten Year Profitability



June 12 to 15, 2011

IEEE SW Test Workshop

16

Costs Savings

STANDARDS

Input Data Formats
Probe Depth
Testhead Configurations
Specifications



June 12 to 15, 2011

IEEE SW Test Workshop

17

Summary

- **Understand true cost of architectures**
 - Beware of NRE
 - New architectures needed for cost reductions
- **Maintain sufficient Gross Margin**
 - Company health
 - Funding for R&D
- **Honest supplier – customer partnerships**



June 12 to 15, 2011

IEEE SW Test Workshop

18

Acknowledgments

- Amphenol InterCon Systems
- BucklingBeam
- FormFactor
- ISC
- Kern
- Robin McAdams
- MicroProbe
- Sergio Perez
- SV Probe
- Frank Swiatowiec



June 12 to 15, 2011

IEEE SW Test Workshop

19

Thank You!

Ira Feldman

ira@feldmanengineering.com

Visit my blog

www.hightechbizdev.com

for my summary of SWTW



June 12 to 15, 2011

IEEE SW Test Workshop

20