“THE IMPACT OF NEW APPLICATIONS AND INCREASING DEVICE COMPLEXITY ON THE FUTURE OF TESTING”

Steven R. Appleton
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ABSTRACT

THE EMERGENCE OF CONSUMER APPLICATIONS, coupled with advances in highly integrated packages, has significantly changed both the economic equation and the technical challenges for testing new complex devices.

The wide variety of applications requiring various levels of quality and reliability, combined with their vastly different product life cycles, also poses a need to rethink the industry’s historical perspective of "one size fits all".

We will explore these topics in light of current market trends and their impact on test costs and strategies moving forward.

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Impact of New Applications and Increasing Device Complexity on the Future of Testing

Steve Appleton
Chairman, CEO, President

Burn-in and Test Socket Workshop
March, 2007

Why Test?

(x) (x) (x) (x) =

90 Day Warranties
OR
New Mobile Applications

- Image Sensor
- Mobile DRAM
- CellularRAM™
- Multichip Package
- Flash Card
- Managed NAND
  - 4 Gb NAND
  - 1 Gb Mobile DRAM

New Automotive Applications

- Adaptive Cruise Control
- Night Vision
- Urban Cruise Control
- Sign Recognition
- Lane Change Assist
- Occupant Classification System
- Drowsy Driver
- Lane Departure Warning
- Headlamp Control
- Driver Recognition
- Multi-Application Cameras
New Medical Applications

Capture
Worldwide Digital Imaging Forecast

<table>
<thead>
<tr>
<th></th>
<th>Still Images</th>
<th>Video</th>
<th>CMOS Image Sensor Units</th>
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<tbody>
<tr>
<td></td>
<td>2005</td>
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<td>Worldwide Digital Image Capture Volume by Device: Camera Phones, Digital Still Cameras &amp; Digital Camcorders</td>
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<tr>
<td>Still Images</td>
<td>284 Million GB</td>
<td>2 Billion GB</td>
<td>542 Million</td>
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<td></td>
<td>2005</td>
<td>2010</td>
<td>2005</td>
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<tr>
<td>Worldwide Personal Video Capture Volume by Device: Camera Phones, Digital Still Cameras &amp; Digital Camcorders</td>
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<tr>
<td>Video</td>
<td>15 Billion GB</td>
<td>27 Billion GB</td>
<td>2005</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>2010</td>
<td>2005</td>
</tr>
</tbody>
</table>

Sources: IDC, Micron Market Research
Move

- Worldwide Broadband Household Penetration*
  - 2005: 13.8%
  - 2010: 37%

- User-generated Video Downloads/Views
  - 2005: 2 Billion
  - 2010: 112 Billion

- Estimated Size of These Downloads/Views
  - 2005: .012 Billion GB
  - 2010: 2 Billion GB

- DRAM in Communications**
  - 2005: 11 Million GB
  - 2010: 131 Million GB

* Broadband includes Cable, DSL, and IPTV Subscribers
** Communications (mobile handsets, LAN switches, LAN Routers, etc.)

Store

Worldwide NAND Gigabyte Consumption by Application*

- Communications
  - 2005: 0.01B
  - 2010: 4.5B

- Consumer
  - 2005: 0.06B
  - 2010: 1.3B

- Computing / USB Drives / Flash Cards
  - 2005: 0.16B
  - 2010: 9.2B

* Worldwide NAND Megabyte Consumption by Application; Communications includes embedded NAND for mobile handsets, other communications devices. Consumer includes embedded NAND for DSCs, DCCs, digital portable players, game consoles, etc.
** Communications include embedded NAND for mobile handsets, other communications devices.

Sources: Gartner, Micron Market Research
New Complexities

Wafer Sales

March 11 - 14, 2007
Environmental Testing

Historical Perspective
Test vs. Litho Costs

LITHO TEST

1986

3%

2006

13%

Area CAPEX as a % of Total CAPEX

Frontend

Backend

FY-01 FY-02 FY-03 FY-04 FY-05 FY-06 FY-07

March 11 - 14, 2007
Real-Life Testing

Summary

1. Testing today must extend beyond the lab and include real life experiences.
2. Not everything needs to last 100 years – there is a cost to ensuring this.
3. Design and manufacturing groups must be joined at the hip when developing test strategies.
4. The consumer product cycle has made everyone an expert – Get use to it.