Special Panel

Next Generation Packaging and Integration

- The Transformed Role of Packaging Foundry

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Siliconware Precision Industries Co., Ltd.
Outline

- Market Trend (by PKG & END Product)
- Electronic Product Packaging Trend
  - SPIL Packaging Technology Roadmaps
- Summary
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Market Trend- End Product

● For mobile/communication devices:
  • *Continue driving to smaller system ‘form factor’* more devices pack into a monolithic volume-vertically
    • Shortening inter-IC/IC to board interconnect length *better system performance and lower power consumption*
    • Make room for bigger battery
    • System manufacturing flexibility (e.g. PoP)

● For other like ‘consumer’ applications utilizing legacy packaging:
  • *Seeking cost effective solution* to cope with world wide materials supply chain situations
## Example of End Product Trend: Apple’s iPads

<table>
<thead>
<tr>
<th></th>
<th>iPad (1) 3G</th>
<th>iPad 2 3G</th>
<th>New iPad (3) 4G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System dimensions</strong></td>
<td>242.8<em>189.7</em>12.7</td>
<td>241.2<em>185.7</em>8.8</td>
<td>241<em>186</em>9.4</td>
</tr>
<tr>
<td><strong>System Volume</strong></td>
<td>585.0</td>
<td>394.2</td>
<td>421.0</td>
</tr>
<tr>
<td><strong>Volume change %</strong></td>
<td>1</td>
<td>67.4%</td>
<td>72.0%</td>
</tr>
<tr>
<td><strong>Logic Board</strong></td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td><strong>Communication Board</strong></td>
<td>![Image]</td>
<td>![Image]</td>
<td>![Image]</td>
</tr>
<tr>
<td><strong>Battery Power</strong></td>
<td>24.8</td>
<td>25</td>
<td>42.5</td>
</tr>
<tr>
<td><strong>Battery change x</strong></td>
<td>1</td>
<td>1</td>
<td>1.71 x</td>
</tr>
<tr>
<td><strong>Source:</strong></td>
<td>internet</td>
<td></td>
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</tr>
</tbody>
</table>

A4:53.3 mm^2            A5X: 165mm^2
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Summary I: New Generation of Packaging

- **Package More** ICs (dies) into monolithic package
  - Package on Package
  - FCCSP, multi-dies embedded WLP
  - 2.5D IC (on Si interposer), 3DIC

- **Use Less** for cost effectiveness
  - Use less expensive materials -> Gold wire -> Cu (or Ag) wire
  - Use less amount of materials – reduced trace pitch/ laminate substrate layers or alternatives; wafer level packaging (substrate-less)
Summary II: Transformed Role of Packaging Foundry

- Expanded role in system integration and final quality
  - Further integration role of the entire supply chain
    - Upstream: direct and indirect materials (lead frame/substrate) quality control, urgent demand, and quick turn around time for problem solving
    - Downstream: EMS side final assembly issue solving

- The rise of wafer level packaging/3DIC also draw new competition from major wafer foundries
  - The handling of the foundry–OSAT’s ‘Coopetition’ - market eventually will select the models (maybe multiple models to co-exist)