Inspection Features

P-8 Prober Family
PMI-on line

• Introduced in the late 80’s as a response to:
  – Prober Inaccuracy and lack of repeatability under changing conditions
  – ProbeCard deficiency in Probe tip placement
• Today:
  – Probers have evolved to an unprecedented level of alignment and indexing stability across wide temperature ranges
  – ProbeCards have improved pin placement accuracies across wide temperature ranges
• As a result most customers do not use PMI either because:
  – Prober/ProbeCard combination is reliable enough
  – PMI takes too long and is not 100% reliable
  – PMI is not a value-added function and takes time-off Tester up-time
Minimize Prober/Tester Overhead

Max throughput = Max Tester Run Time = Min \( (\text{Prober Run} + \text{Dead Time}) \)

**Full Inspection**

- Wafer handling
- PMI
- PCI
- Idle
- Prober
- Dead Time
- Test Run Time

**Minimal Inspection**

- Wafer handling
- PMI/PCI
- Idle
- Prober
- Dead Time
- Test Run Time

Test time: 60sec with 14 contacts/wafer
PCI: 2000pin (1000pin twice/wafer)
PMI: 8000pad (1000pad 8 times/wafer)
Pad Shape Recognition

- Pad shape
  - a: Rectangular Shape (Include Square)
  - b: Polygonal Shape
  - c: Cross Shape
  - d: Trapezoidal
Inner Most Edge Finding

- Typical Two Edges on the Pad.
- PMI Identifies Inner Most Edge (Glass Edge) as a Pad.

![Diagram showing Glass Edge and Pad Edge]
Probe Mark Information

- **Distance**
  - Type 1: \( \min(\ C\_{top}, \ C\_{bottom}, \ C\_{left}, \ C\_{right} ) \)
  - Type 2: \( \abs( D\_x - E\_x ) \) and \( \abs( D\_y - E\_y ) \)

- **Area**
  - Type 1: \( \frac{B}{( A\_x \cdot A\_y )} \) \( \ldots \ldots \% \)
  - Type 2: \( B \) \( \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \) \( m^2 \)

- **A**: Pad Size \((x, y)\)
- **B**: Area of Probe Mark. \(A\_x\)
- **C**: Distance between Probe Mark to Edges.
- **D**: Center of mass of the pad. \(A\_y\)
- **E**: Center of mass of the probe mark.
Probe marks, probe marks...
## Probe Card

<table>
<thead>
<tr>
<th></th>
<th>Wire PC</th>
<th>Membrane PC</th>
<th>Vertical PC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probe Pin Load</strong></td>
<td>5-8g/pin &lt;50 µmO.D&gt;</td>
<td>5-10g/pin &lt;50-300 µm &gt;</td>
<td>Vertical Tip</td>
</tr>
<tr>
<td><strong>32Multi(2080pins)</strong></td>
<td>Max. 23Kg Over Drive:70 µm</td>
<td>Max. 21Kg Over Drive:70 µm</td>
<td>Cobra PC</td>
</tr>
<tr>
<td><strong>32X65pin/die</strong></td>
<td></td>
<td></td>
<td>Max. 48Kg Over Drive:70 µm</td>
</tr>
<tr>
<td><strong>Planarity(First)</strong></td>
<td>15-20 µm 30 µm</td>
<td>2-8 µm ------</td>
<td>Max. 23Kg Over Drive:70 µm</td>
</tr>
<tr>
<td><strong>(Last )</strong></td>
<td></td>
<td></td>
<td>15-20 µm 30 µm</td>
</tr>
<tr>
<td><strong>Probe Mark</strong></td>
<td>-By P-8</td>
<td>-On Al Pad -By P-8</td>
<td></td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

**Test System Division**
 PCI

- **Original Position of the PCI**
  - \( C(x,y,z) \) : Original Position of the PCI
  - \( Cc(x,y,z) \) : Center of the mass of 4 Tips of the Probe Card.
  - \( Cw(x,y,z) \) : Center of the mass of 4 Pads of the Wafer.
  - \( C = Cc = Cw \)
**Calculation**

- Derived Spatial Position of the Pad
- Tip + Center of mass of simulated circle y z+ Center of mass x of the Pad Average Height of n Probetips.
Manual Inspection

- Manual Probe Mark Inspection

You can Check NG Pin from NG Pad.

- Manual Probe Card Inspection
Contact failure recovery sequence

Contact failure
→ Manual probe mark inspection

Manual probe card inspection
→ Case 1
Probe polish
operate by manually
→ Restart Testing

Case 2
Probe card change by SACC
Probe card alignment

Automation

You can see actual probe tip from the prober LCD so it will help to solve problems such as:
- Overdrive parameter change
- Execute probe polish

- Particles on the tip
- Height deference

OK

OK

Case 1

Case 2

No

No

Good

Good

No

No

Good

Test System Division
Inspection Timing

can be done….

• In the beginning of the lot
• After every wafer change
  – all or specified number of pins/pads judged worst in the previous inspection.
• After every probe-polishing
• In the end of the lot
• After every probe card change
• In the middle of testing
  – the probe card can be replaced
    • no need to set-up again, realign wafer or start the lot all over
  – followed by probe card inspection.