Dye and Pry of BGA Solder Joints

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CPU Failure Investigation

Equipment Used

- Dye and Pry Technique

Conclusions

- Majority of failures (cracks from mechanical bend overstress test) observed at Solder-Chip interface

<table>
<thead>
<tr>
<th>Solder-Chip Ok</th>
<th>Solder-PCB Ok</th>
<th>Solder-PCB Ok</th>
<th>Solder-PCB Ok</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder-Chip ~5%</td>
<td>Solder-Chip Ok</td>
<td>Solder-PCB Ok</td>
<td>Solder-PCB Ok</td>
</tr>
<tr>
<td>Solder-PCB Ok</td>
<td>Solder-PCB Ok</td>
<td>Solder-Chip ~10%</td>
<td>Solder-PCB Ok</td>
</tr>
<tr>
<td>Solder-PCB Ok</td>
<td>Solder-PCB Ok</td>
<td>Solder-Chip ~20%</td>
<td>Solder-PCB Ok</td>
</tr>
</tbody>
</table>

- Summary of % area cracked at each interface in the area of interest

Optical Image with Extended Focal Imaging Stitching
DRAM Failure Investigation

Equipment Used

- Dye and Pry Technique

Conclusions

- Interfacial fracture / cracks observed at two locations: Solder-CU-PCB Interface and Solder Chip interface

<table>
<thead>
<tr>
<th></th>
<th>Chip</th>
<th>PCB</th>
<th>Solder-chip</th>
<th>Solder-PCB</th>
<th>Solder-Chip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solder-chip</td>
<td>~80%</td>
<td>~50%</td>
<td>~5%</td>
<td>~40%</td>
<td>~50%</td>
</tr>
<tr>
<td>Solder-chip</td>
<td>~50%</td>
<td>~40%</td>
<td>~5%</td>
<td>~30%</td>
<td>~15%</td>
</tr>
<tr>
<td>Solder-chip</td>
<td>~50%</td>
<td>~15%</td>
<td>~10%</td>
<td>~20%</td>
<td>~10%</td>
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</tbody>
</table>

- Summary of % area cracked at each interface in the area of interest
Equipment Used
- Dye and Pry Technique

Images show the fracture surface after three point bending test. Presence of red dye indicates cracks in the area of interest.
DRAM Failure Investigation (Continued)

Equipment Used
- Dye and Pry Technique

Images show the fracture surface after three point bending test. Presence of red dye indicates cracks in the area of interest.