



Cascade Engineering Services, Inc.

Dye and Pry of BGA Solder Joints

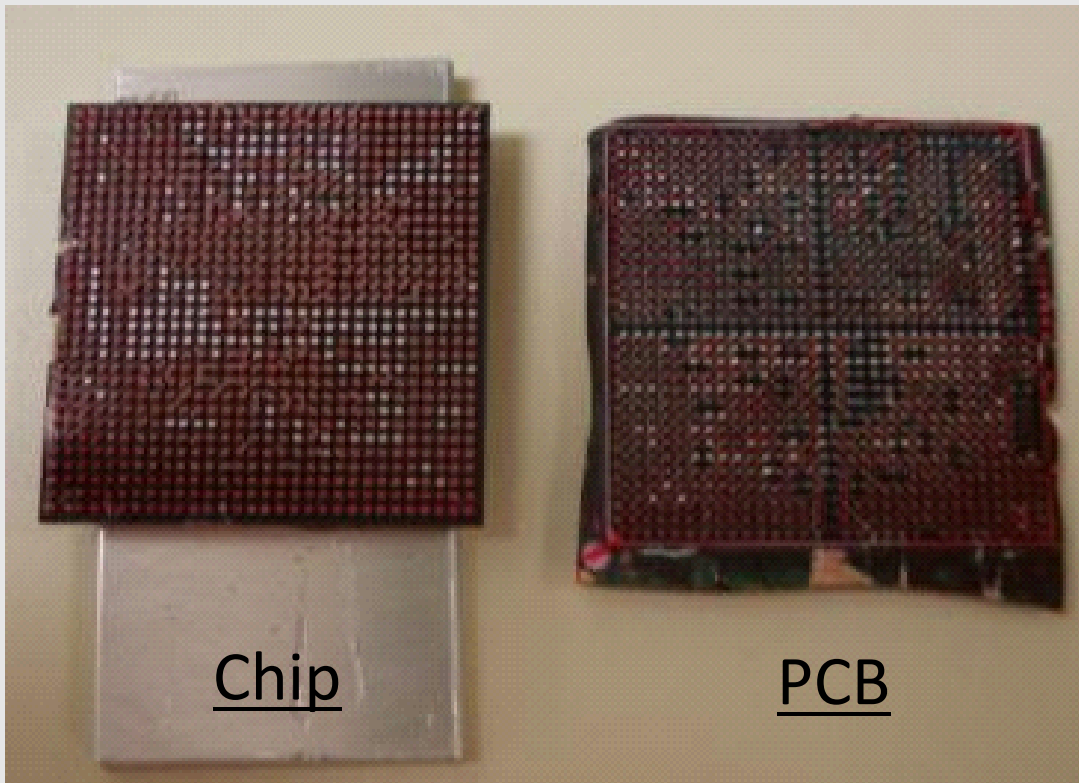
Reliability Engineering Group
Cascade Engineering Services, Inc.
6640 185th Ave NE Redmond WA 98052
(425) 895-8617 x 564

www.cascade-eng.com

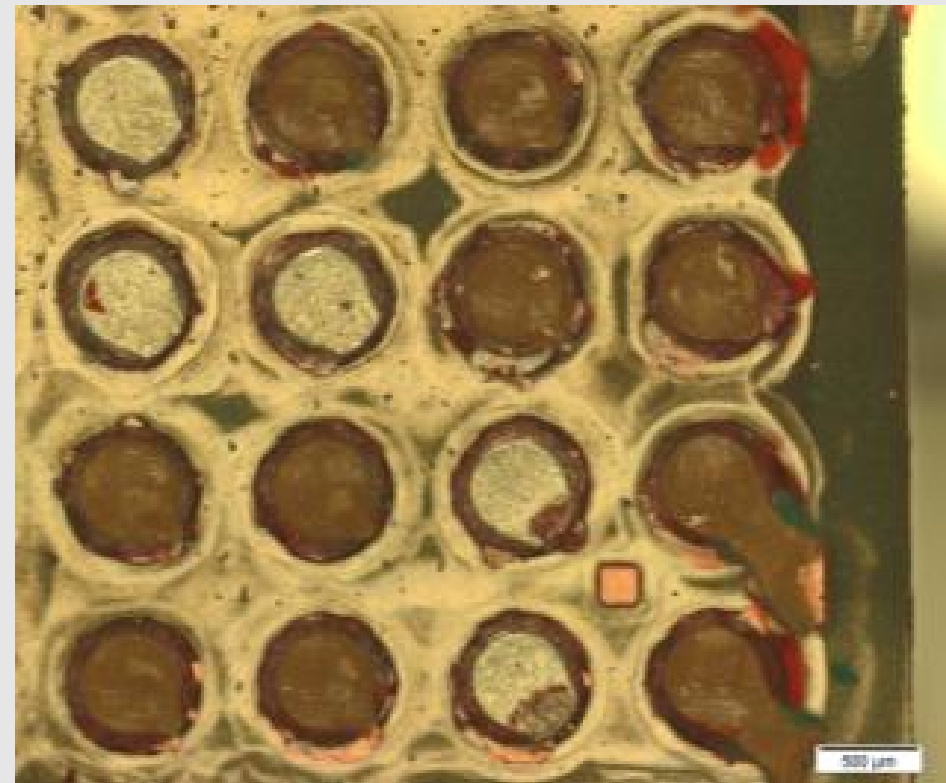
CPU Failure Investigation

Equipment Used

- Dye and Pry Technique



Optical Image with Extended Focal Imaging Stitching



Solder-Chip Ok	Solder-PCB Ok	Solder-PCB Ok	Solder-PCB Ok
Solder-Chip ~5%	Solder-Chip Ok	Solder-PCB Ok	Solder-PCB Ok
Solder-PCB Ok	Solder-PCB Ok	Solder-Chip ~10%	Solder-PCB Ok
Solder-PCB Ok	Solder-PCB Ok	Solder-Chip ~20%	Solder-PCB Ok

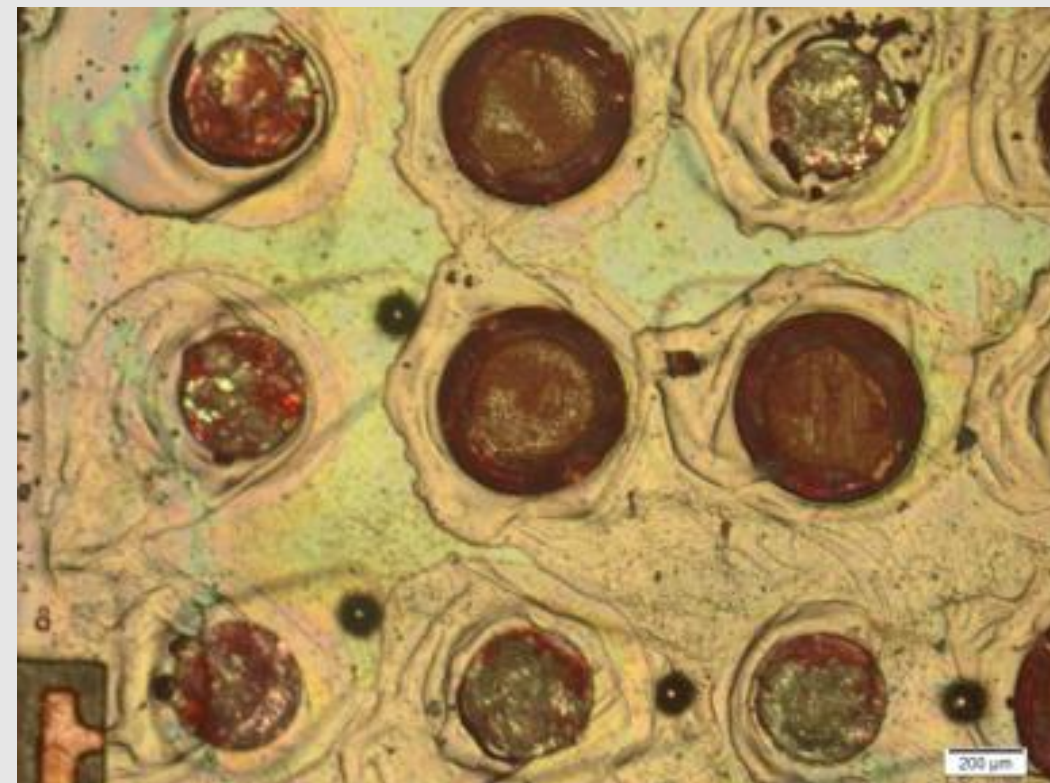
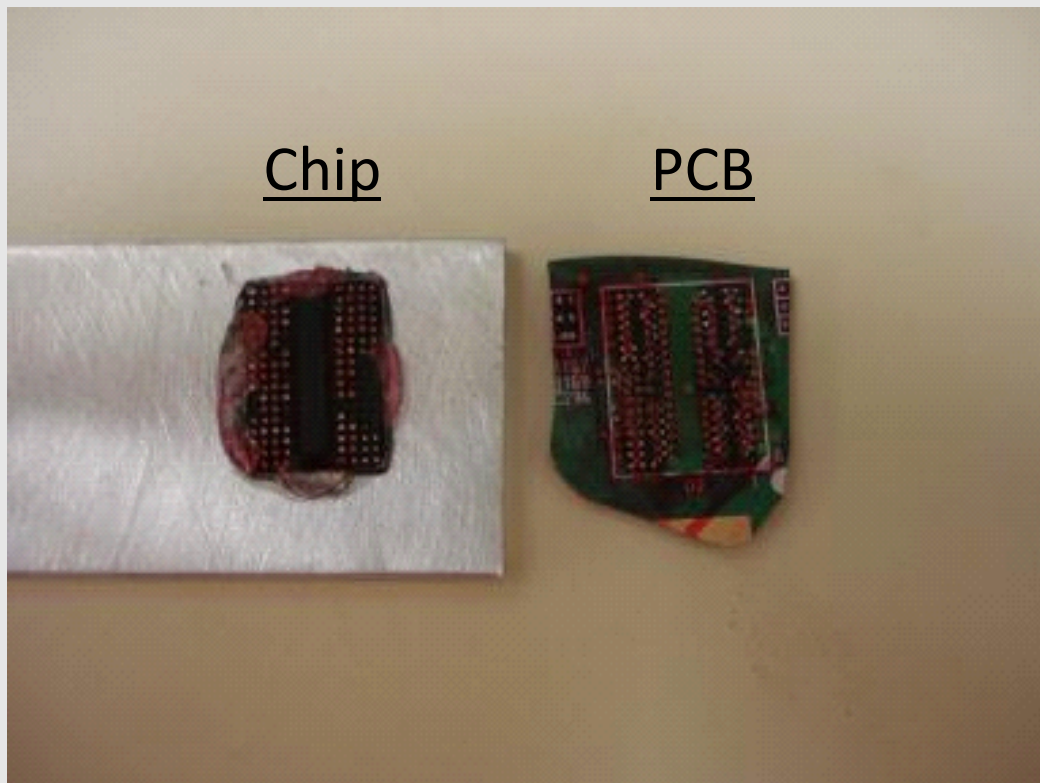
Conclusions

- Majority of failures (cracks from mechanical bend overstress test) observed at Solder-Chip interface
- Summary of % area cracked at each interface in the area of interest

DRAM Failure Investigation

Equipment Used

- Dye and Pry Technique



Solder-chip ~80%	Solder-PCB ~50%	Solder-chip ~5%
Solder-chip ~50%	Solder-PCB ~40%	Solder-PCB ~50%
Solder-chip ~50%	Solder-chip ~15%	Solder-Chip ~10%

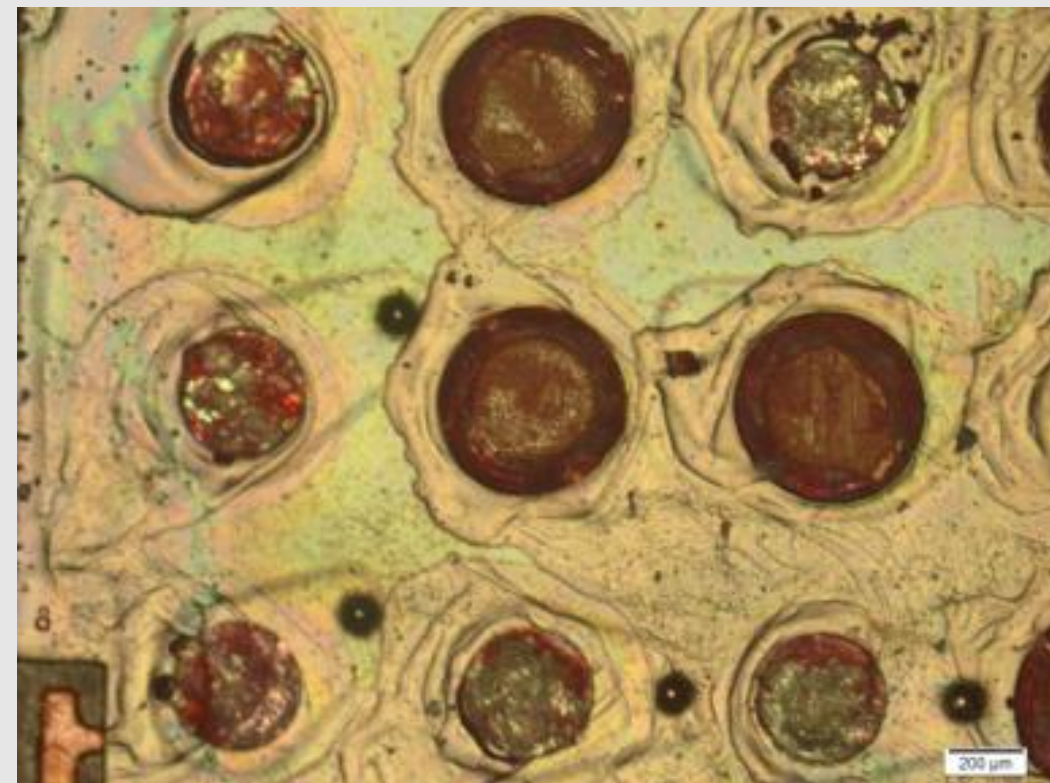
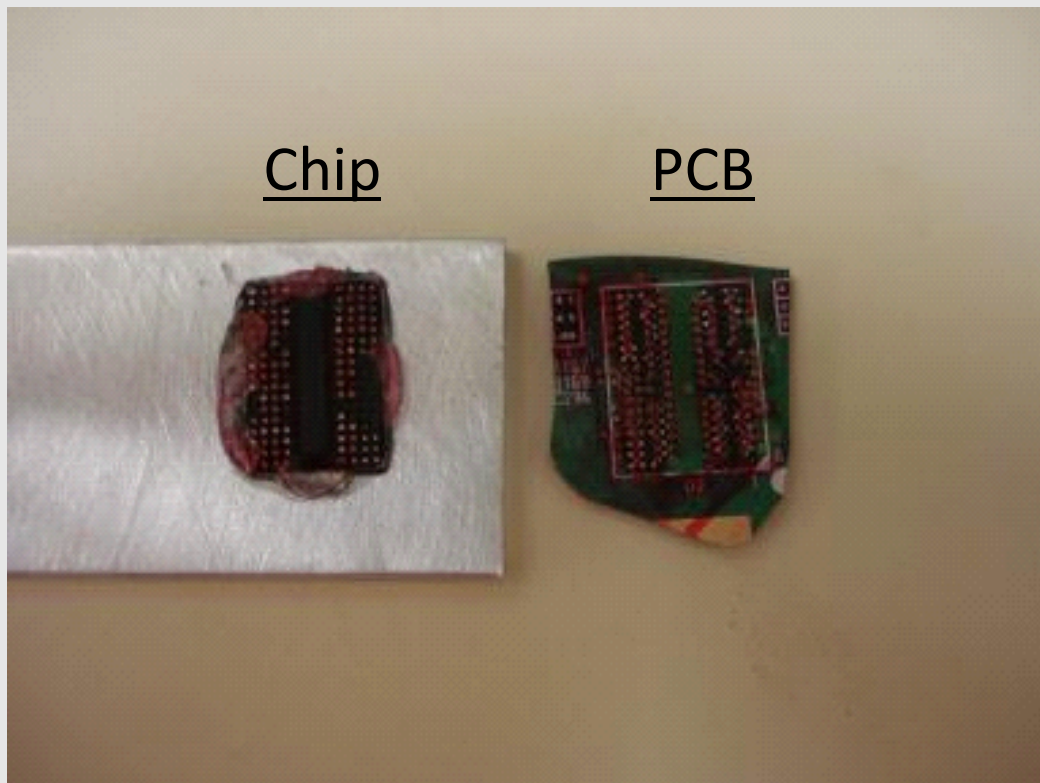
Conclusions

- Interfacial fracture / cracks observed at two locations: Solder-CU-PCB Interface and Solder Chip interface
- Summary of % area cracked at each interface in the area of interest

DRAM Failure Investigation (Continued)

Equipment Used

- Dye and Pry Technique

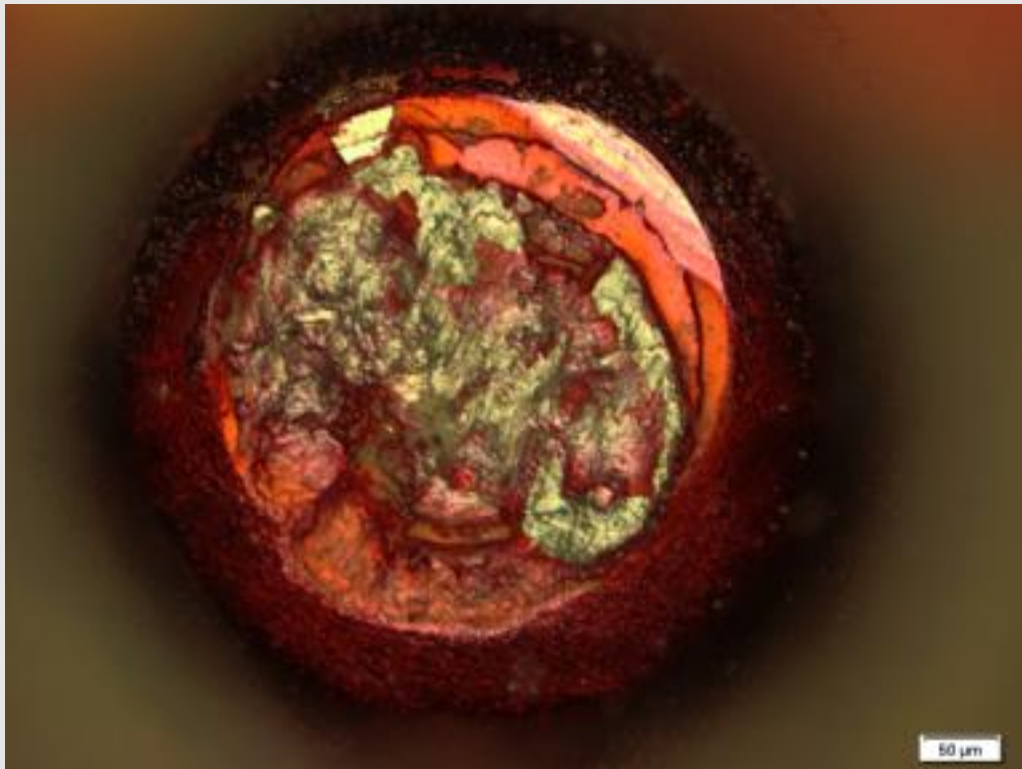


Images show the fracture surface after three point bending test.
Presence of red dye indicates cracks in the area of interest

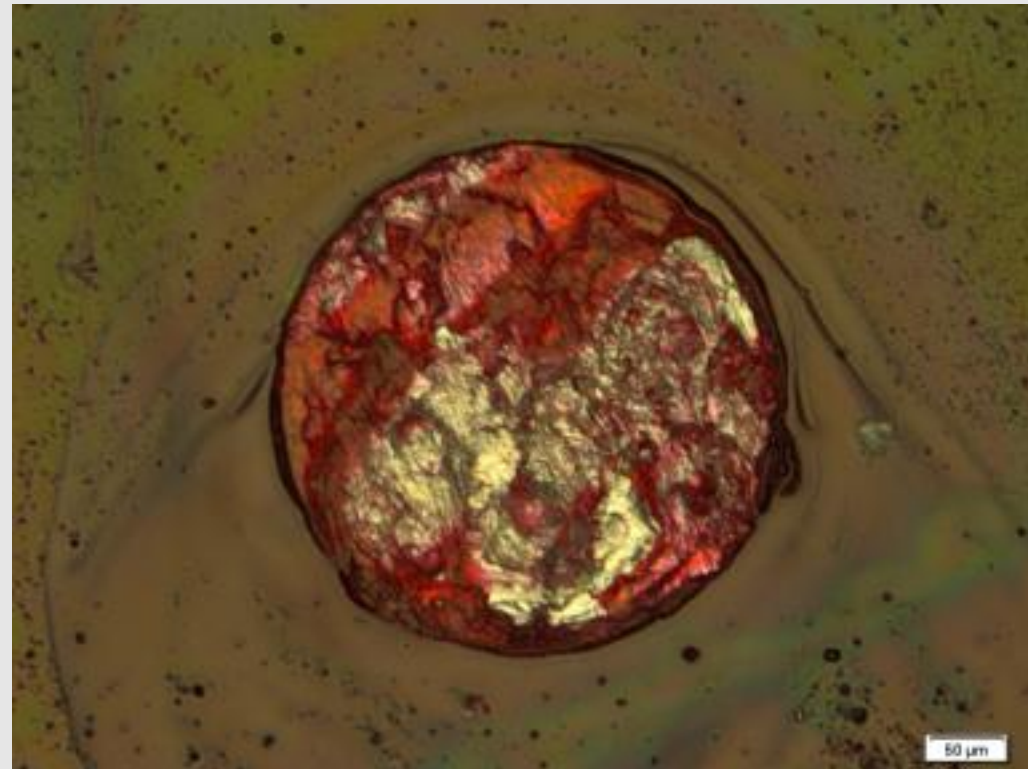
DRAM Failure Investigation (Continued)

Equipment Used

- Dye and Pry Technique



A solder joint on the PCB side



A solder joint on the chip side

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