

Gluing

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Silicon /pcb assembly

Previously

Using Sony Robot and precision dispenser

Have established acceptable glue dot parameters

Dot electrical resistances $< 0.005 \text{ Ohm}$ (Gold /dot/Gold)

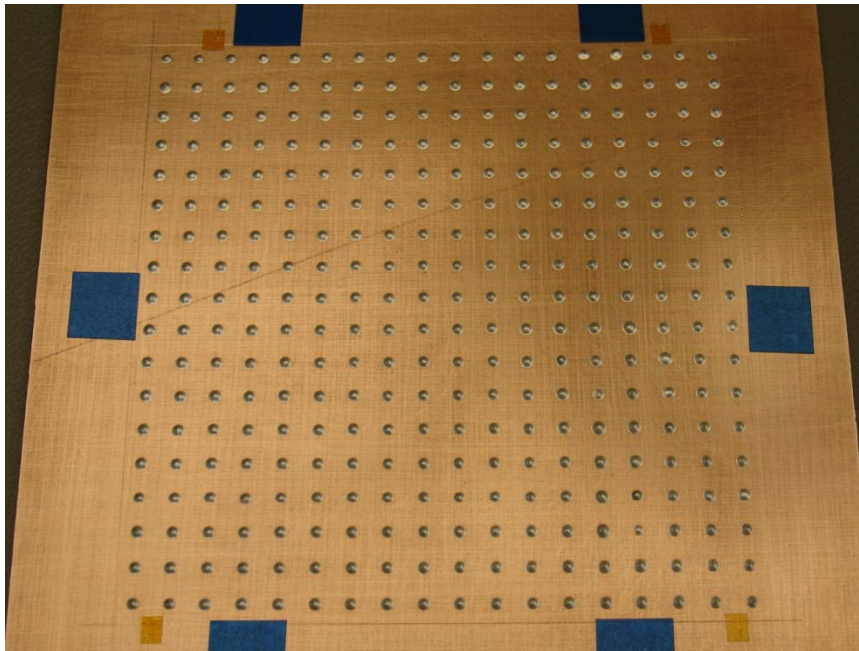
Need good control on gap thickness

Now modifying commercial BGA workstation as demonstration pick and place tool to position wafers on glued pcb.

Wafers not handled manually

Manual operation of workstation but shows automated concept

Glue Dot dispensing



Sony dispensing robot

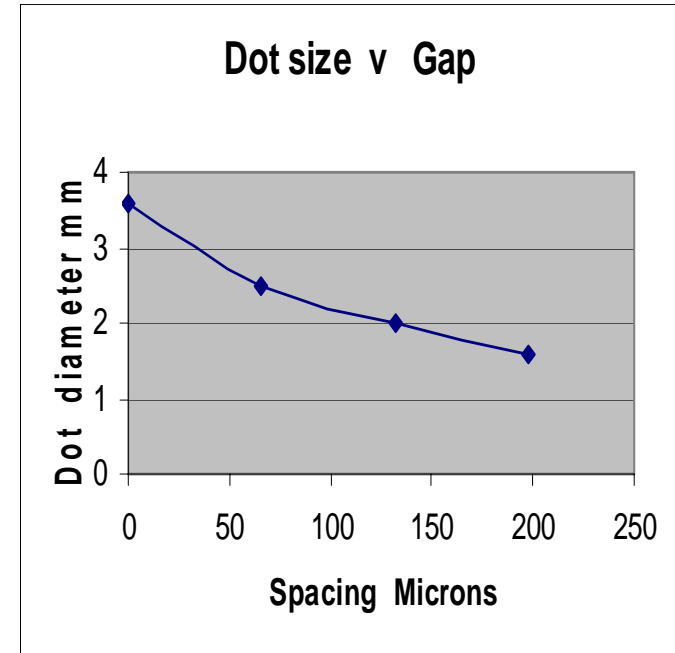
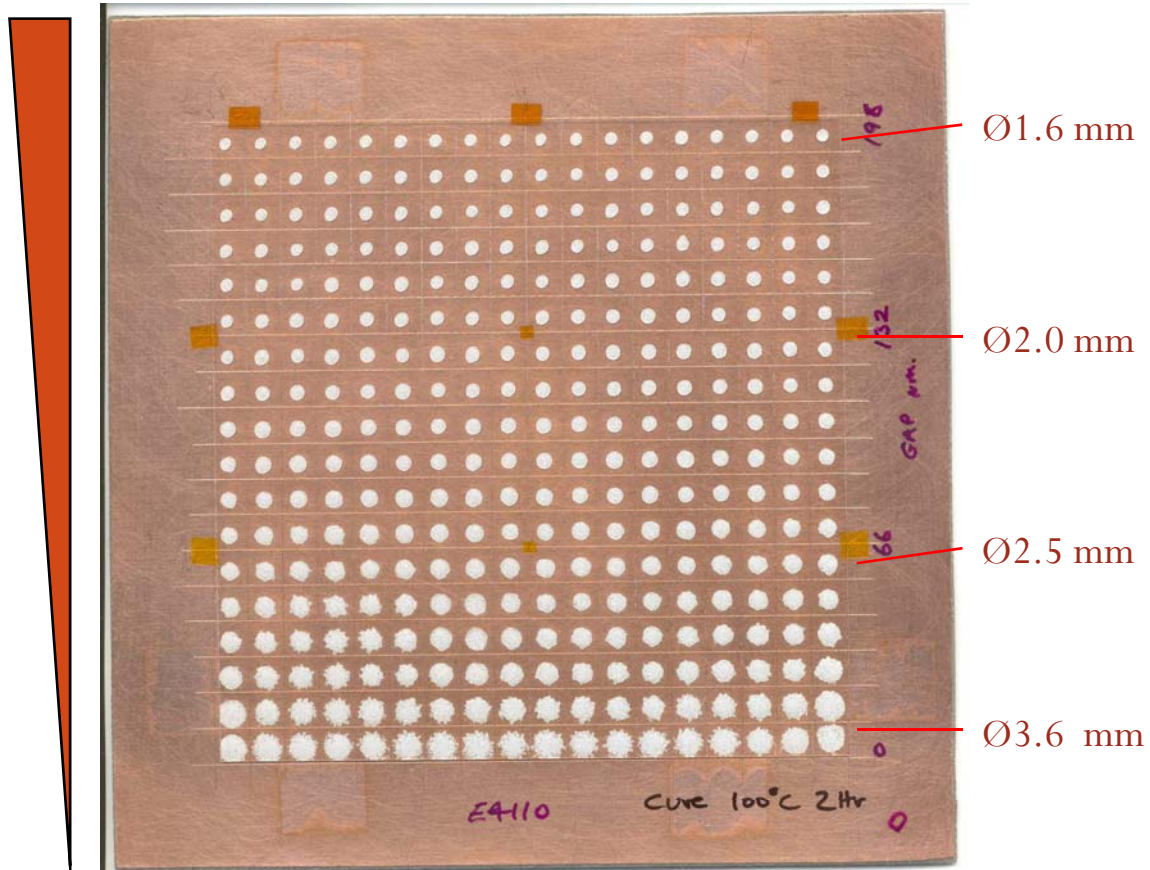
Placing glue dots
18 x 18 (324) dots on 5mm grid
(1 wafer) 0.2 sec/ dot
takes ~ 5min

Highly reproducible

Dot size dependence on gap spacing

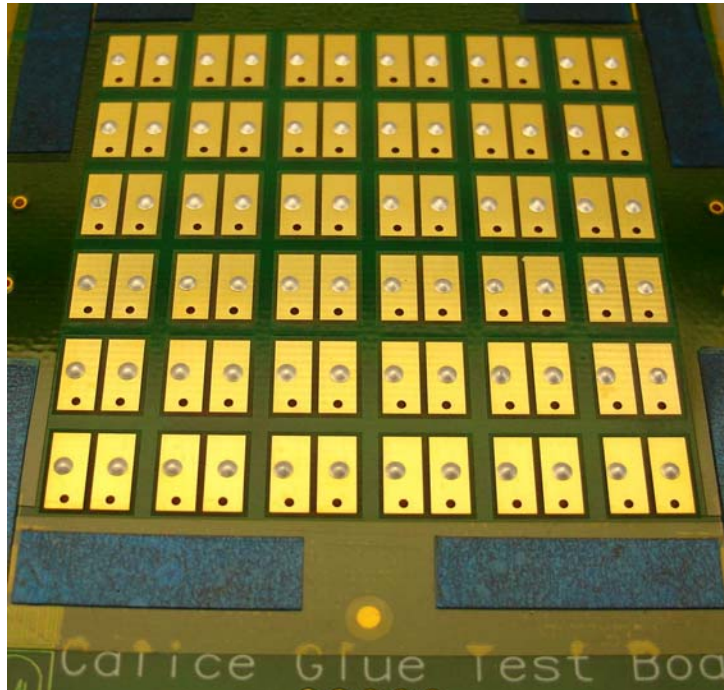
200 μ

Glass plate wedge spacing



+/- 50 micron gap =
+/- 0.5 mm diameter

Dot resistance tests



12 x 6 dots @0.2 sec on CALICE test board

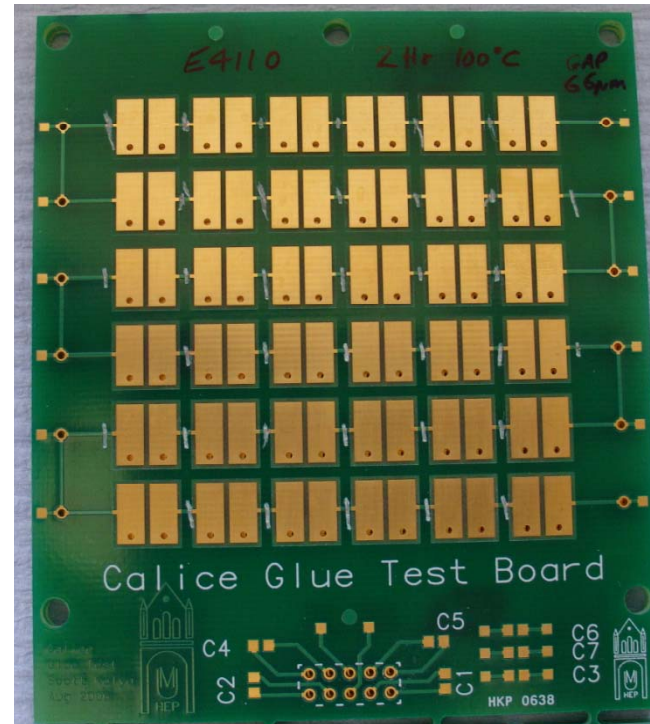
Each pad probe able from rear

Two boards sandwiched together, 66 μ m gap

Interpad links cut on top board

4 Terminal resistances between overlapping pads measured –

<0.005 Ω per pad



Needs repeating with silicon wafer

Wafer Pick and place demonstrator

Modifying existing commercial BGA placement station to pick and place wafers on to glued pcb held on vacuum jig.

Alignment via split prism viewing system.

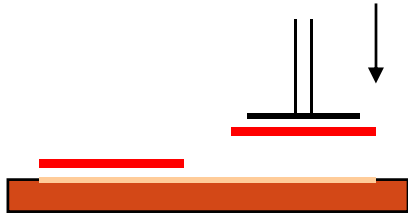
Align images of wafer pixels and PCB pixels. Manual operation could be automated with pattern recognition

- rebuild pick up vac chuck for 90 mm wafer
- base vac chuck to hold PCB
- Investigate spacing control ideas
 - vacuum transfer chuck

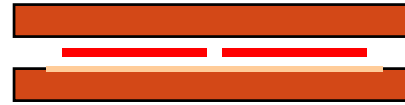


Assistance from Scott Kolya

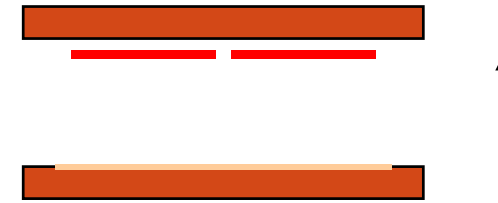
hematic of wafer assembly steps



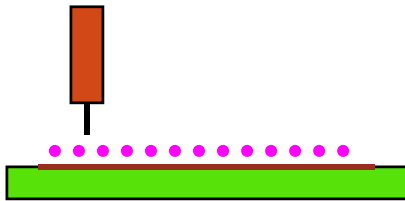
1. 4 wafers (red) picked and aligned on BGA station relative to pcb pattern (orange) . Held in position by vacuum.



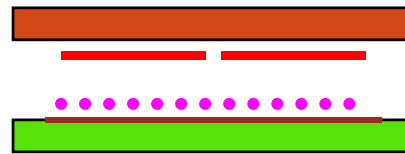
2. Transfer chuck lowered on top. Vacuum top on, bottom off. Wafers now held on transfer chuck



3. Remove transfer chuck from BGA workstation maintaining vacuum



4. Pcb (blue) held flat in bottom vac jig . Glue robot dispenses dots



5. Transfer chuck with wafers placed on bottom jig.
Alignment dowels/touch bearings
Fine tune height. Maintain vac during cure



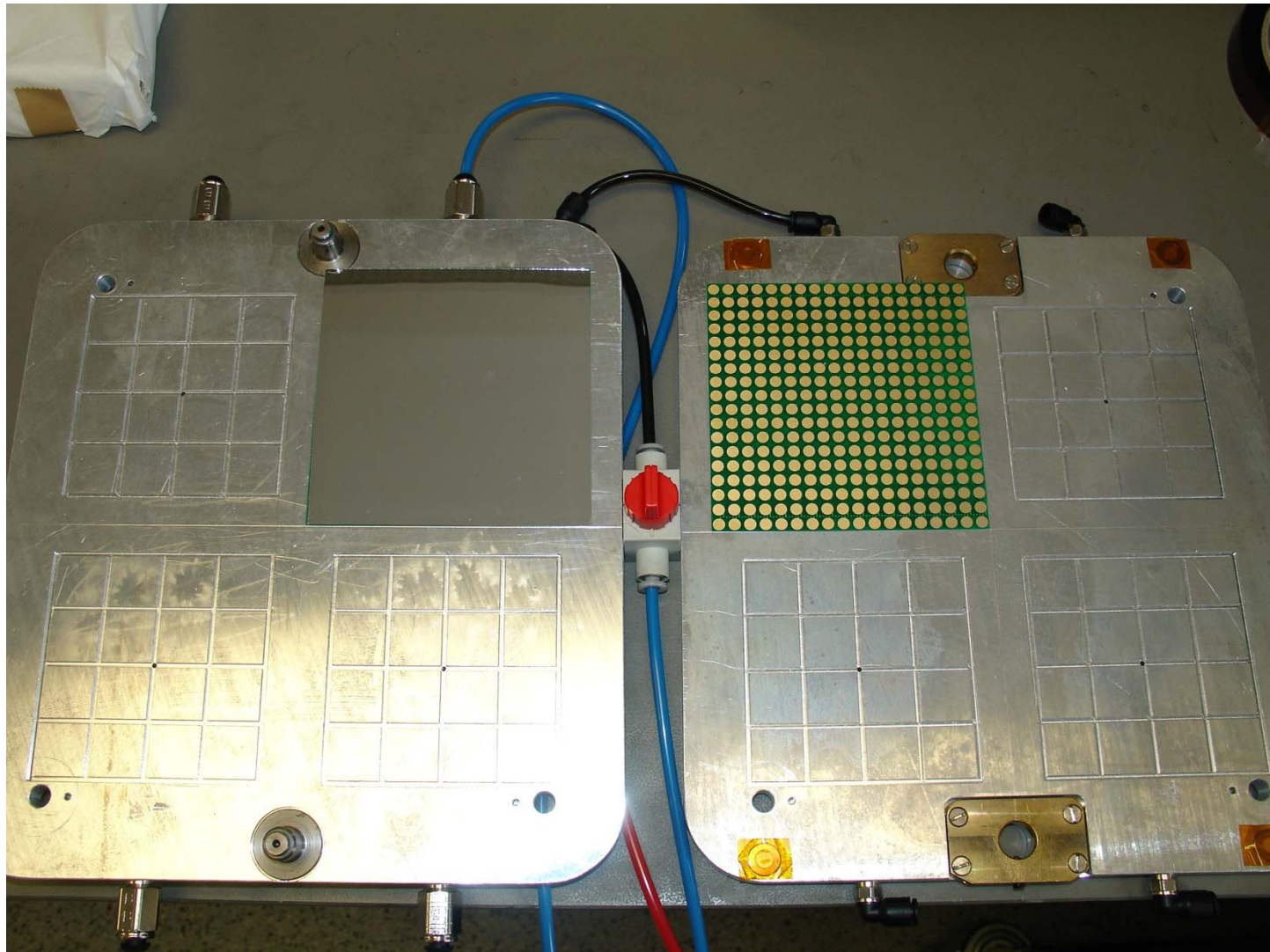
6. Remove assembled board

Vacuum Transfer Jig controls

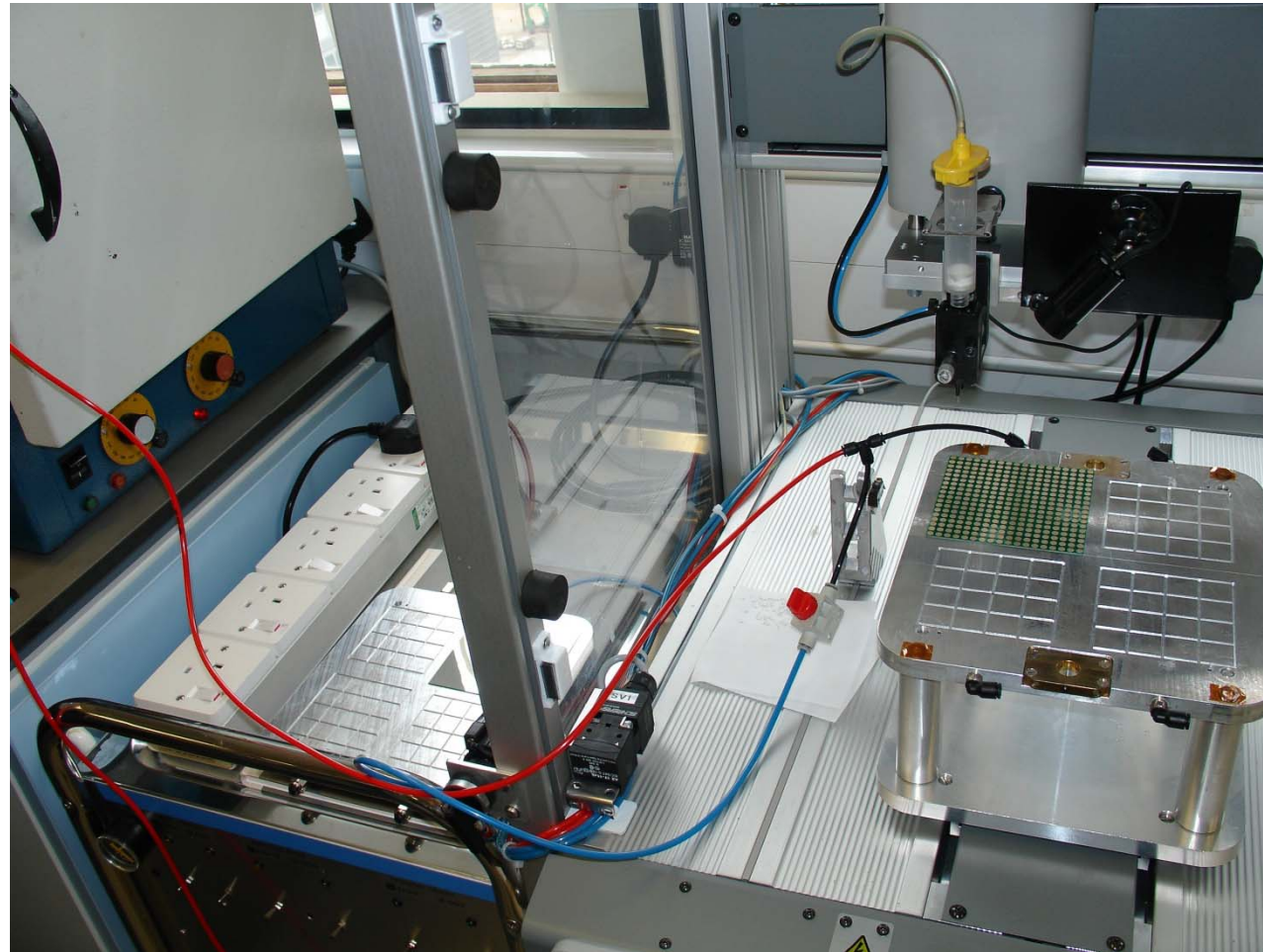
Portable vacuum Jig
Control Trolley
with resevoir
for moving transfer jigs
from glue robot to
alignment workstation
Panel controls vacuum
on/off to the various jigs.



Vacuum Jigs



Integration with glue robot



Summary

- System has been “checked out”
 - Testing with boards from Cambridge
 - Have glass plates in hand
 - Have a couple of real wafers
 - Will attach to boards and check resistances
- Pretty much ready to go
 - Waiting for the real ASU boards
 - Probably need to check how flat they are on the back with the ASIC in place