Atmel CGA 625 Mounting Evaluation
Saab Space

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Package Assembly

Mounting verification of NTK 625 CLGA Package from Atmel

- Atmel (e2v in Grenoble) mounted Solder Column Interposer on Ceramic Land Grid Array
  - Eutectic solder on flash Au, Alpha SLS65 flux and no cleaning
- Column Pitch = 1 mm
- Column width 0.62 – 0.82 mm
- co-planarity ? µm
Production Processes

- Screen printing,
- Pick&Place,
- Reflow Soldering
- Repair - hot air rework station
  - Dispensing solder paste
  - Pre-Heating complete board before replacement
  - Optimize thermal profile rigorously
Qualification programme

- **Environmental tests**
  - Shock, 600g 3 axis
  - Vibration, sinusoidal and random
  - Thermal cycling, 500 cycles according to ECSS-Q-70-08A, §13.2

- **Analysis methods**
  - Electrical monitoring during environmental testing using Daisy Chain
  - Visual Inspection
  - X-ray inspection using 2D-5 axes microfocus equipment
  - Micro sectioning
  - Dye penetrant and pull test
Test Boards

- 4 test boards, A1 – A4,
  - 18-layer glass reinforced polyimide, thickness 2.9 ± 0.3 mm
  - Board dimension 160.0 x 233.4, manufactured by Printca
  - Circular pads and tear-drop pads with Ø31 mil and via-in-pad design
  - Plating minimum 10 µm Sn63/Pb37 hot oil reflowed solder

Matrix showing environmental tests etc subjected to each board. The light grey colour indicates the board submitted to repair.

* If needed, extended micro sectioning can be performed
** Dye penetrant test after 200 thermal cycles
*** 600g shock test

<table>
<thead>
<tr>
<th>PCB/Work order</th>
<th>No. of MCGA625</th>
<th>Environmental tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Random vibration §9.1</td>
</tr>
<tr>
<td>A1 / 1353</td>
<td>2</td>
<td>Yes</td>
</tr>
<tr>
<td>A2 / 1354</td>
<td>2</td>
<td>Yes</td>
</tr>
<tr>
<td>A3 / 1355</td>
<td>1</td>
<td>Yes</td>
</tr>
<tr>
<td>A4 / 1356</td>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>
3D X-Ray
After mounting

Teardrop pad

Circular pad
Results after 500 cycles

- Electrical: No failures detected
- Visual: No cracks observed in 60x magnifications
Visual Inspection - teardrop (1356)

After soldering

After 200 cycles
Visual Inspection - teardrop (1356)

After 500 cycles
Visual Inspection – circular pad (1353)

After soldering

After 200 cycles
Visual Inspection – circular pad (1353)

After 500 cycles
Visual Inspection Rework – circular pad (1354)

After 200 cycles

After Rework
Visual Inspection Rework – circular pad (1354)

After 500 cycles
Results after 500 cycles

- **Dye penetrant:**
  - No cracks > 25% of the circumference of the column observed at PCB-column interface, cracks observed at interposer side
Dye Penetrant (1355)
Picture of board After 200 cycles

- PCB
- Columns
- Break at Pads on PCB
- Break at Package pad
Die Penetrant (1355)
Board After 200 cycles

Corner Picture
Solder joint break at PCB
Dye Penetrant (1355)  
Board After 200 cycles

Corner picture  
Solder joint break  
at Interposer
Die Penetrant (1356)
Picture of board after 500 cycles
Dye Penetrant (1356)
Picture of board after 500 cycles

Corner Picture
Solder joint break at PCB
Dye Penetrant (1356)
Picture of board after 500 cycles

Corner Picture
Solder joint break at Interposer
Dye Penetrant (1356)
Picture of board after 500 cycles

Corner Picture
Solder joint break at package pad

Dye penetrant difficult to flow between ceramic and package
Results after 500 cycles

- **Micro section:**
  - No cracks > 25% of the circumference of the column observed at PCB-column interface
Micro Sectioning of CGA 625

Cross sections for the micrographs
Micro Sectioning (1353)
Picture of board after 500 cycles

Solder joints between corner columns and PCB. No cracks were found in these solder joints.
Solder joints between corner columns and package. Cracks (typical) were found along the interposer.
Micro Sectioning (1353)
Picture of board after 500 cycles

Solder joints between corner columns and package. A severe crack were found in the Interposer region.
Material analysis of the column / package interface
www.space.se

Thank You for Your Attention