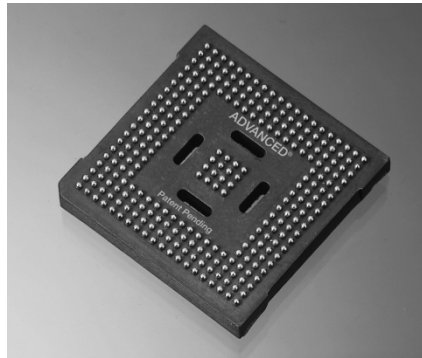




Test Report

RoHS Qualification
New High Temp. Molded LCP Insulators
1.27mm Pitch BGA Interconnect Product Family



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1 Purpose:

To ensure process compatibility with the RoHS Directive* a design of experiments (DOE) was conducted to validate the solderability compliance of the new high temperature molded LCP material used in the 1.27mm pitch BGA Interconnect product family. (*Refers to Directive 2002/95/EC “The restriction of the use of certain hazardous substances in electrical and electronic equipment.”)

2 Testing Summary:

The parts, made up of terminal assemblies and LCP wafers (insulators), were run through the testing listed below. Inspection, test parameters, and results are listed in Section 4.

- 1) Part Inspection
- 2) Subassembly / Part Assembly
- 3) Board Attachment
- 4) Analysis (x-ray / cross section)

3 Components:

SK9399-G (Gold plated PCB)
SK9399-TL (Tin/Lead plated PCB)
4891-7 (Tin/Lead solder sphere)
8128-7 (Lead-free solder sphere)
RGS841-636GG/ RGS841-819GG
 7122-841R – insulator
 4982GG1 – terminal
 (4982G shell / 1427-1G contact)

4 Testing Requirements:

Plating Test Matrix

The terminals are plated with Gold and attached to the two types of boards, Gold and Tin/Lead, using Tin/Lead solder spheres and Lead-free solder spheres. (see matrix below)

Tin /Lead solder sphere (Tin/Lead oven profile – see section 7)
RGS841-636GG: 8 on GG PCB / 8 on TL PCB

Lead-free solder sphere (lead-free oven profile – see section 7)
RGS841-819GG-B: 8 on GG PCB / 8 on TL PCB

RoHS Survivability Test

All non-lead material in the DOE has passed RoHS temperature requirements of 260°C peak for 40 seconds when measured on the top surface of the part, 2°C per second ramp and decline. Run 3 times; second and third run after ambient cool down.

Attributes monitored during-after test

- 1) Assembly non-conformities
- 2) Wafer geometry/dimensional variation or distortion
- 3) Solder reflow
- 4) Correct interface attachment

5 Testing Results:

Section 1: Inspection

- 1.) Incoming quality inspection:
 - a) Parameters: All components must pass incoming inspection (print specification).
 - b) Resultant: All parts passed incoming quality inspection.

Section 2: Measurement

- 1) Baseline data on the flatness and hole true position of the wafers.
 - a) Parameters: All wafers must pass print specification for flatness (0.003) and true position.
 - b) Resultant: All parts passed specifications.

Section 3: Assembly

- 1.) Install terminals into wafers (per matrix)
 - a) Parameters: Per normal manufacturing process; assemble terminals and contacts into the wafer.
 - b) Resultant: The parts were assembled correctly by manufacturing.
- 2.) Inspect terminal assemblies
 - a) Parameters: The parts were visually inspected for misalignment, skiving, non-populated, contact height, wafer cracking around hole, and configuration.
 - b) Resultant: The parts passed both print and visual inspection.
- 3.) Attach solder spheres to parts (per matrix)
 - a) Parameters: Solder spheres were attached using normal manufacturing process.
 - b) Resultant: The solder spheres were attached by manufacturing.
- 4.) Inspect parts after solder sphere attach
 - a) Parameters: Solder spheres were visually inspected for reflow, sink marks, and other non-conformities.
 - b) Resultant: The solder spheres passed visual inspection.
- 5.) Measure flatness and true position on the assembly with solder spheres
 - a) Parameters: All wafers must pass print specification for flatness (0.006) and true position.
 - b) Resultant: All parts passed specifications.

Section 4: Cross Section

- 1) Cross section one part from each group
 - a) Parameters: Cross-sectioned parts through center of terminal.
 - b) Resultant: The parts were cross-sectioned correctly.
- 2) Inspect Cross Section parts
 - a) Parameters: The parts were visually inspected under a scope looking for solder non-conformities (wicking, poor attach, grain structure, voids, etc.).
 - b) Resultant: The parts passed inspection.

Section 5: Board Attach

- 1) Board assembly: Attach parts to PCBs
 - a) Parameters: The parts were attached per the test matrix. (Section 7 for profile)
 - b) Resultant: The parts were attached by manufacturing.

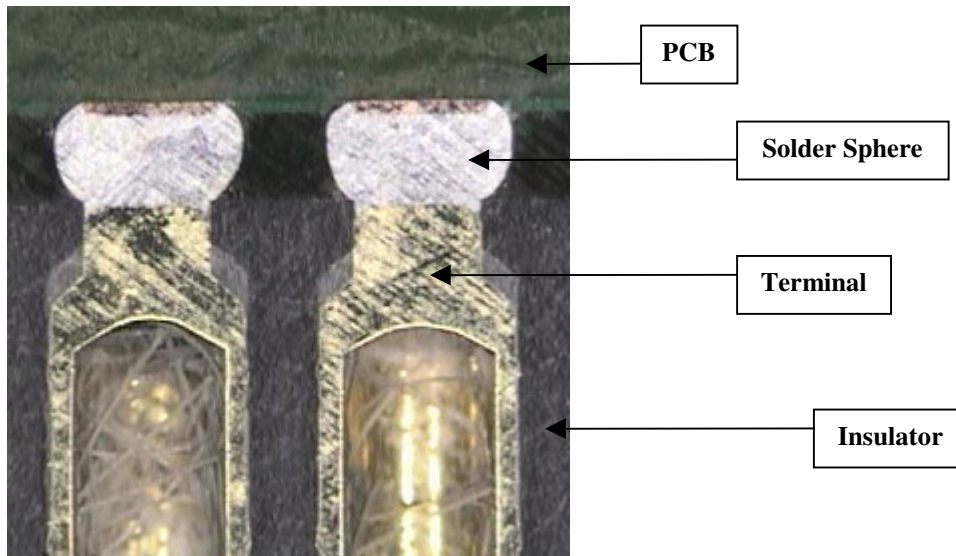
- 2) Inspection of board attachment
 - a) Parameters: The parts were visually inspected for correct attachment looking at placement and solder reflow.
 - b) Resultant: The parts passed visual inspection.

Section 6: Board Attach Inspection:

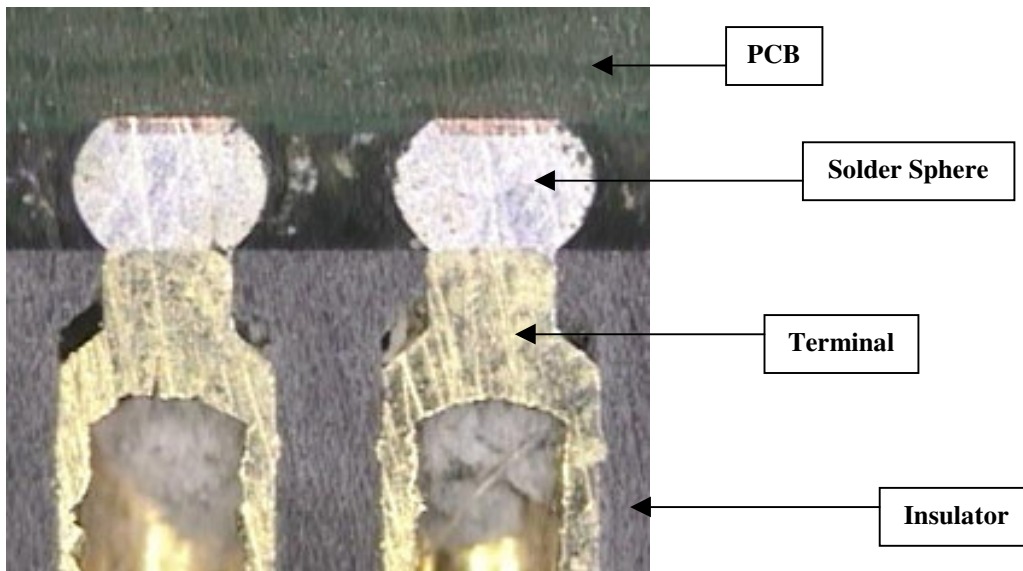
- 1) X-ray the attached parts.
 - a) Parameters: X-ray one part from each group, visually inspecting for any solder non-conformities.
 - b) Resultant: The parts were x-rayed correctly and no defects were found.
- 2) Cross section parts: (see **Figures 1-2 below**)
 - a) Parameters: Cross section parts from each group. Section through the middle of the terminal.
 - b) Resultant: The parts were sectioned correctly.
- 3) Inspection of cross-sectioned parts
 - a) Parameters: Visual inspection of the cross-sectioned parts, looking for correct solder reflow (attachment).
 - b) Resultant: The parts show a good attach between the terminal and board. All the plating variations showed good attachment. Example; Gold terminal on a Gold board with Tin/Lead solder sphere vs. Gold terminal on a Gold board with lead-free solder sphere show the same characteristics.

Figures 1-2 Cross Section of board assembly

- (1) RGS841-636GG with Tin/Lead solder sphere on a Gold plated PCB



(2) RGS841-819GG with lead-free solder sphere on a Gold plated PCB

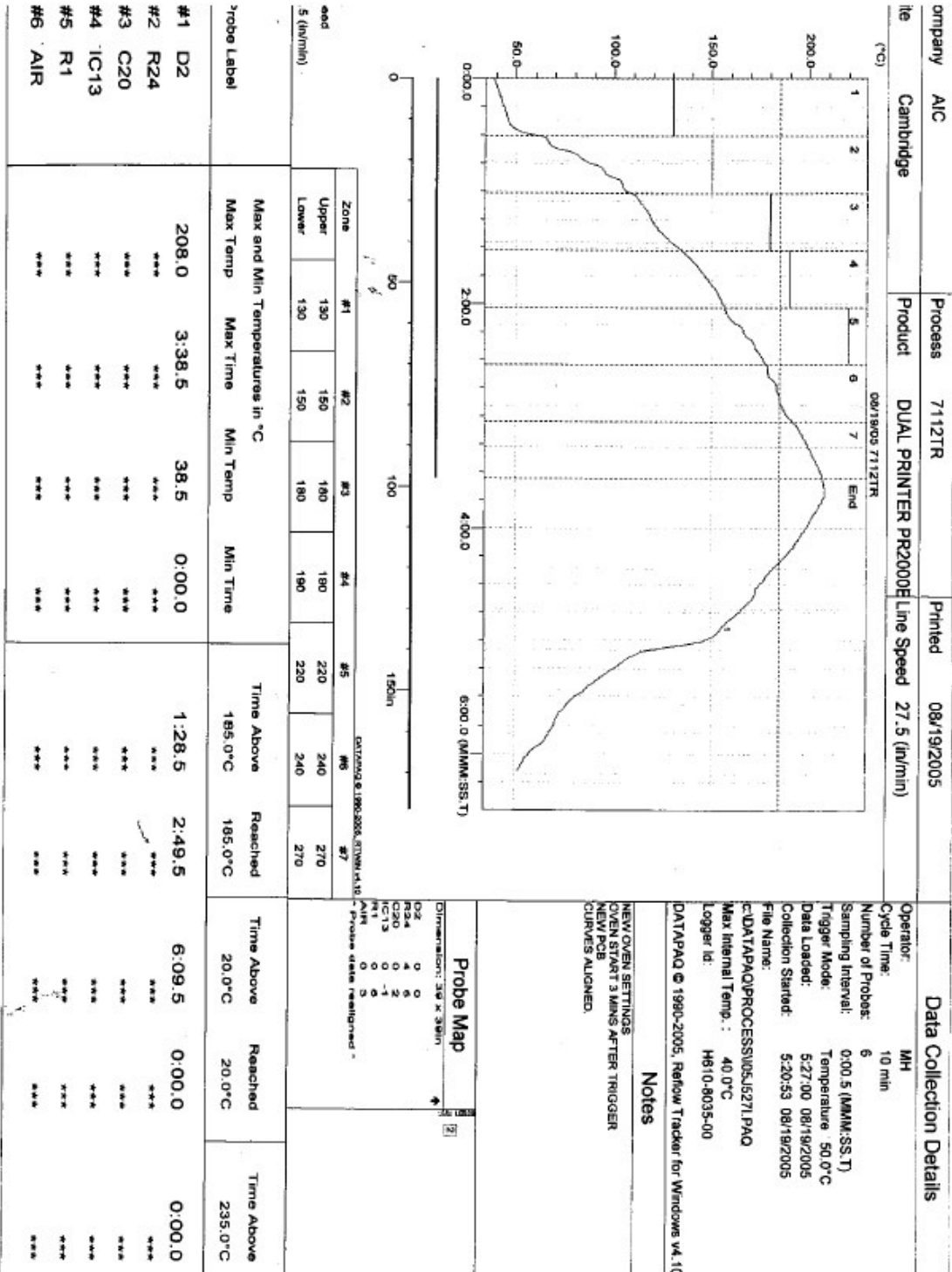


6 Conclusion:

The high temperature molded LCP insulator for the 1.27mm pitch BGA Interconnect product family has been approved by engineering for use in lead-free applications meeting RoHS standards.

7 Oven Profile:

Tin/Lead Profile



Lead-free Profile

