

## Sym. G : Electro-packaging

### CSP & BGA PACKAGES

#### E-THU-07

**A STUDY ON HIGH RELIABILITY BGA PACKAGE WITH OVAL TYPE SOLDER BALL LAND DESIGN**  
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In this paper, we propose the solder ball lands of oval type for the laminated substrate design of BGA. With this design concept, the experiment was performed for relative comparison between the conventional circular type and the proposed oval type BGAs. The experiments for the interconnecting reliability comparison between the two types shows that the shear strength for proposed oval type is higher than that for the conventional circular type. With the proposed oval design, the minimum and average value of solder ball reliability performance were improved relative to the circular type. Also, its standard deviation value was decreased. Additionally, the proposed oval type lands can allow the designers to insert at least 50% more traces between adjacent unit-pitched-solder ball lands than conventional ones facilitating routing in small sized package design. The simulation result of solder ball fatigue life with BGA package was also covered in this paper with the mechanical model of oval typed design. Our simulation also shows good agreement with the experimental result, which predicts that the oval type has longer fatigue life than the circular type does. These study results can be widely applied to the up-coming advanced package technology implementations like chip scale packages(CSP's) for better reliability.

#### E-THU-08

**ANALYSIS OF SOLDER BALL RELIABILITY OF T-FBGA, HIROSHI FUNAKURA**(Toshiba Co., 1,Komukai Toshiba-cyo,Saiwaiku,Kawasaki,210,Japan)

T-FBGA(Tape-Fine Pitch Ball Grid Array) is characterized by following features;

- \* A polyimide substrate is used.
- \* Terminal interconnection is provided by wire bonding.
- \* A die is attached to the substrate with an organic adhesive.
- \* Solder balls are buried into the substrate.

The most significant consideration for successful T-FBGA construction should be the assurance of solder ball reliability. Due to a large mismatch in the Coefficient of Thermal Expansion(CTE) between T-FBGA and Printed Wiring Board(PWB), the solder joint is susceptible to thermal stress and subsequent fatigue failure during Thermal Cycling Test(TCT).

In the prospect of obtaining an optimum T-FBGA construction, we performed extensive and systematic stress simulations by means of FEM analysis. Our simulations were particularly focused on the role of Epoxy Molding Compound(EMC) and the adhesive.

Among various results from the simulations, followings are noteworthy;

- \* The thermal/mechanical characteristics of the EMC is most closely related to reliability.
- \* The solder joint has the smallest stress when the CTE of the EMC is 11.2 ppm.
- \* The thermal/mechanical characteristics of the adhesive has small influence on the reliability.

#### E-THU-09

**The Influence of Adhesion of Heat Spreader and Adhesive on Reliability of the High Power BGA.** I. S. Park, I. S. Kang, S. J. Heo, Y. C. Kim, J. S. Kim and Y. G. Kim (Package R&D Center, LG Semicon. Co., Ltd)

With the increasing speed and power of devices, excellent heat dissipation is required in electronic packages. One of the solution would be high power BGA which consist of heat spreader and BGA substrate. But, as the delamination of Cu heat spreader from the BGA substrate commonly encounters with reliability problem in high power BGA devices, achievement of the high adhesion reliability becomes necessary. The main factors influencing adhesion are surface state of heat spreader and adhesive type. The oxide treatment increases the surface energies of heat spreader. Though the adhesion of two types of heat spreaders, bare and oxide treated heat spreaders, is similar, the pressure cooker test(PCT) shows much higher adhesion reliability in the oxide treated heat spreader. According to SEM and XPS analysis, delamination occurs in the oxide layer. The adhesive type and properties strongly affect the adhesion reliability. Especially, the moisture absorption of adhesive induces the residual stress which strongly affect the reliability of BGA. As a result, the adhesion reliability of heat spreader and BGA substrate has a great impact on the high power BGA reliability.

#### E-THU-10

**CHIP ARRAY BGA PACKAGE PROCESS CHARACTERIZATION**

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Chip Array BGA package has been developed based on the existing package manufacturing infrastructure. Its process is as simple as conventional plastic BGA process. As a result it will promise to be a lowest cost package among many chip scale and near chip scale packages. Either glob-top or encapsulant mold compound was used to protect active dies. The glob-top and mold process technology in electronic package has been well established, but no evaluation was reported for large area application. This paper presents the results of warpage comparison when low shrinkage glob-top and mold encapsulants were used. The package distortion was greater in the package used a glob-top encapsulant than in the package used a mold compound. Both packages showed good reliability results. The solder ball joint was evaluated after mounted on PCB board. Tie bar design and die flag design was engaged to improve fabrication yield and reliability sensitivity.