

Application of acoustic microscopy to the evaluation of ICs and the underfilling material application to BGA arrays of the ICs (110-175MHz)

The technique

The target of these measurements is to non-destructively identify the existence of discontinuities, i.e. enclosed air, in the underfilling material below the chip in the BGAs. The method that is used is acoustic microscopy. The scanning step applied in the c-scan is of several tenths of μm . Images of the amplitude of the echoes generated in the various interfaces were mainly created since we are searching for the existence of air. This phenomenon has as a result the generation of significant echoes from the interface between the air and the substrate of the chip. In the case where we have water rather than air the amplitude of the echoes is related to the difference of the acoustic impedance between the water and the substrate. The calculation of the acoustic wave propagation velocity in the Hysol material (underfilling material) and its impedance is very important in order to measure with high fidelity the thickness of the materials below the substrate of the chip above the BGA.

The materials were tested being immersed in deionized water.

Application

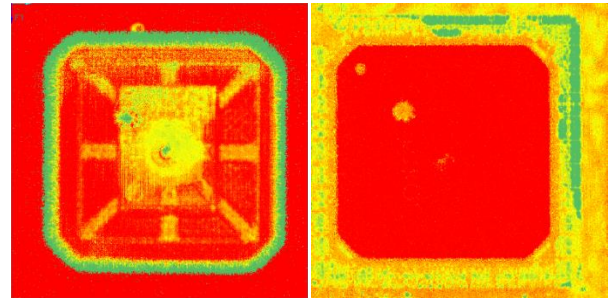


Figure 1 The existence or not of the underfilling material is revealed.

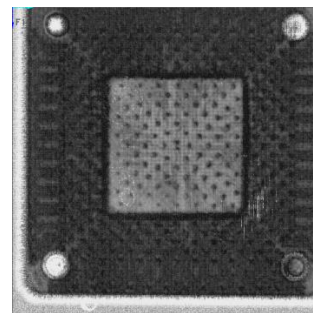


Figure 2 The BGA (scan with $50\mu\text{m}$ step).

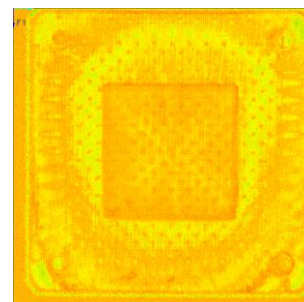


Figure 3 The ripple of the applied material that is revealed in the BGA level (scan with $60\mu\text{m}$ step).

The Equipment Used for the Measurements

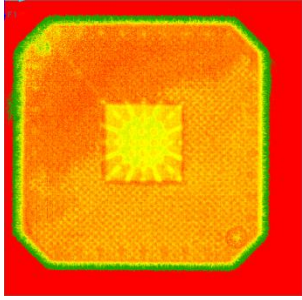


Figure 4 The permeance of the underfilling material in the BGA.

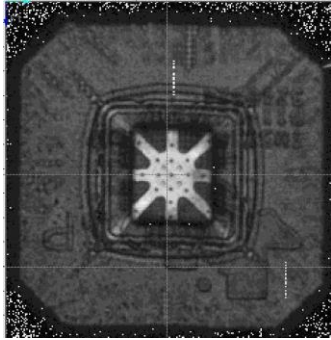


Figure 5 Image from the IC.

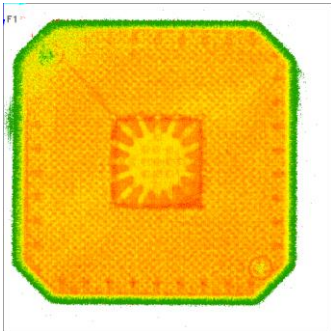


Figure 6 Image from the IC.

