Acoustic microscopy applied for SiP Physical analysis

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Today packaging evolution is towards thinner and thinner layers with a total package thickness below 1.0 mm and die thickness below 0.3mm. These thin packages are exposed to reflow temperatures of 220°C to 250°C with the lead free solder. Critical failure like delamination or cracks can occur during this process due to moisture absorbed by the epoxy moulding compound or material mismatch. Non-destructive acoustic test method is a common detection method for this kind of failure. In thinner packages the reflected acoustic signal from the top of the die is superimposed on the reflected signal from the bottom of the die because of the high speed propagation in the silicon die. Because of this problem its become difficult to extract the information of a delamination or a crack in this kind of package.

SiP packages are even more complex to analyze because they are made up various thin levels of electronic functions. Each level represents a specific function on a PCB mounted. The 3D package study is generally fussy because the different levels are in a different PCB (see figure 1) and the acoustic waves are not able to go through different layers. We will focus only on the front level where a silicon die is present.

Figure 1 –3D BGA module architecture

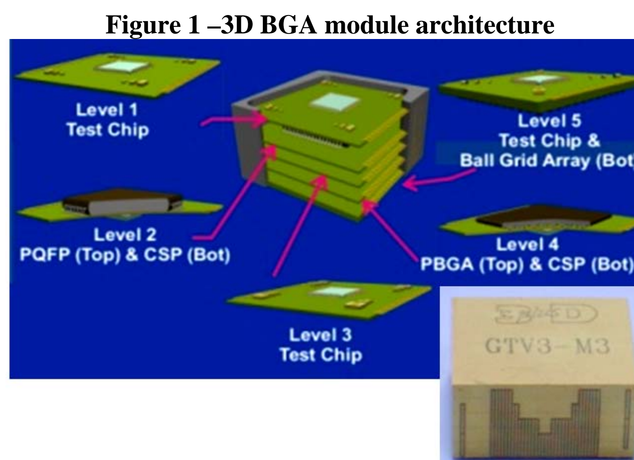

Figure 1 –3D BGA module architecture

The main idea of this work is to monitor package variations (interfaces) during ageing tests and compare acoustic images obtained at each step of the specific thermal cycling.

Physical observation with an acoustic microscope
Key words: non destructive analysis, ultrasonic, acoustic, signal processing
Duration 20 minutes