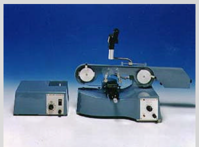
Model 850



Low Damage Cross Sectioning of Flip Chip Packages

Applications Laboratory Report 19

Cutting and Sectioning

1.0: Purpose

Modern packaging schemes used in the semiconductor industry often need to be evaluated for many different reasons. Quality control of new packages which incorporate surface mounting techniques are important in maintaining reliability and performance in today's smaller, denser packaging schemes. Many different methods are currently used for cutting cross sections of entire packaged devices, most of them being Diamond Wheel Sawing. However, aggressive sawing techniques lead to problems such as delamination and die cracking, causing uncertainty as to whether the package is good prior to cutting. This report investigates the ability of Wire Sawing to successfully cut packages in cross section without damage to the die and preventing delamination issues. Three packages with different capping materials were cut using the Model 850 Wire Saw and will be evaluated based on the above requirements.

2.0: Experiments and Procedures

Three different packages were cut using the Model 850, all of which were similar in design with the exception of the capping layer, which varied in material composition. The packages themselves consist of a PC Board type substrate with the die mounted device side down onto the substrate with an adhesive. A thermal conducting layer is placed above the Si die and is then encapsulated using a Cu or composite lid. Below is a diagram of the devices which were cut using the Model 850.

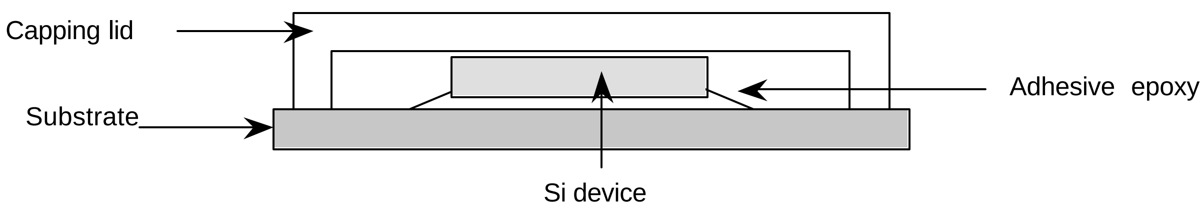


Figure 1: Illustration of the package construction which was cut using the Model 850 Wire Saw. The main areas of interest are where the die interfaces with the various package materials. These areas are where cracking and delamination normally occur during the cutting process.

The Model 850 Wire Saw was setup to cut through the packages using a thin metal wire in conjunction with an abrasive slurry. The optimum abrasive, wire speed, load, etc. all need to be used to ensure the most efficient and effective cut. The parameters used for cutting each specimen are listed in the table below.

Sample #	Abrasive	Wire	Speed	Load	Cutting Time	Final Wire Diameter
1	14 micron Boron Carbide	0.010" stainless steel	10	10 notch	15 minutes	0.010"
2	14 micron Boron Carbide	0.010" stainless steel	10	10 notch	41minutes	0.0045"
3	14 micron Boron Carbide	0.010" stainless steel	10	10 notch	13 minutes	0.009"

The two differences in cutting time are a result of the different capping materials used for encapsulation of the die. Samples 1 and 3 are composed of a ceramic composite material and cuts very quickly as compared with sample 2 which is composed of Cu. There were no wire blade failures during the experiments and the cuts themselves were straight and smooth.

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3.0: Results and Conclusion

It was found that the cutting process was a success using the Model 850 Wire Saw due to the gentle nature of the cutting procedure as compared to traditional diamond wheel sawing. The ability of the wire saw to gently cut through virtually any materials with precision make it an excellent choice for evaluating interfaces between various types of materials. With careful selection of abrasive grit size, load, and wire speed, a good compromise between cutting time and surface finish can be found and enables determination of defect structures to be carried out with a high degree of confidence.

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