



Failure Analysis:  
Popcorn Crack

A customer provided three devices that were failures and wanted acoustic microscopy performed in order to see the internal features before doing a destructive analysis.

Packages: BGA, PLCC-84, SOIC-8 (mounted to PCB)

Solution:

AcousTech performed the following imaging:

BGA – C-mode (reflective) scans from the topside showing the die surface and substrate surface, plus a through-transmission scan to evaluate the entire thickness of the package.

PLCC-84 – C-mode scans from both the topside and bottomside showing the die surface, paddle (both sides) and lead fingers (both sides), plus a through-transmission scan.

SOIC-8 mounted to PCB – A C-mode scan from the topside was the only available option since the part was mounted.

Summary:

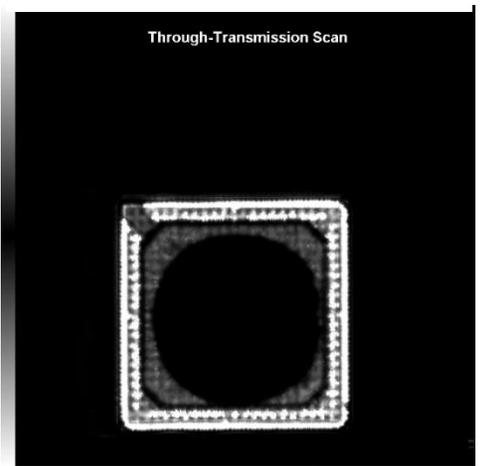
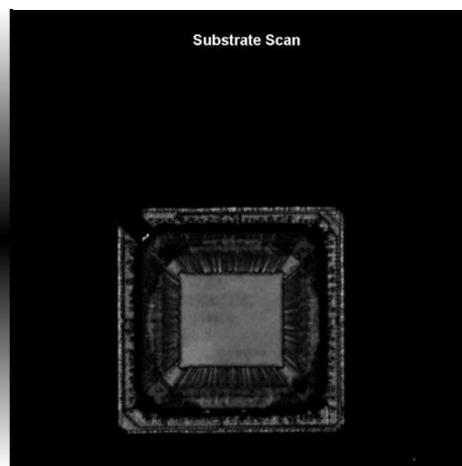
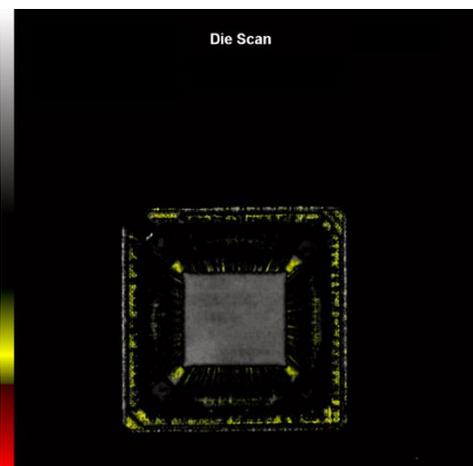
Each device displayed cracking and/or delamination characteristic of a moisture-induced failure often referred to as “popcorn cracking.” This occurs when residual moisture within the plastic package is subjected to rapid heating, such as during the soldering operation. As the internal moisture vaporizes, it expands with sufficient pressure to separate internal interfaces or crack the mold compound, often producing an audible “popping” sound.

**BGA**

No delamination visible at the die surface.

Evidence of a circular pattern of delamination or cracking is visible at the substrate.

The extent of the package crack is clearly visible in the through-transmission image. The crack’s circular pattern is characteristic of a moisture-induced “popcorn crack.”



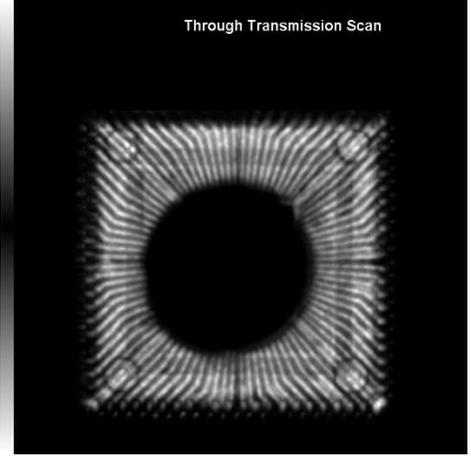


### PLCC-84

Extensive delamination is visible at the die surface, paddle, and some areas of the lead fingers.

A circular pattern of delamination and cracking is visible on the bottomside of the part.

The “popcorn crack” is confirmed by the through-transmission image. In this instance, the crack extends downward from the edge of the paddle toward the bottom of the package.



### SOIC-8 (MOSFET) mounted to PCB

Optical image of device mounted to PCB.

Acoustic image showing delamination at the paddle. Although no evidence of package cracking is present, the delamination is characteristic of a moisture-induced failure.

