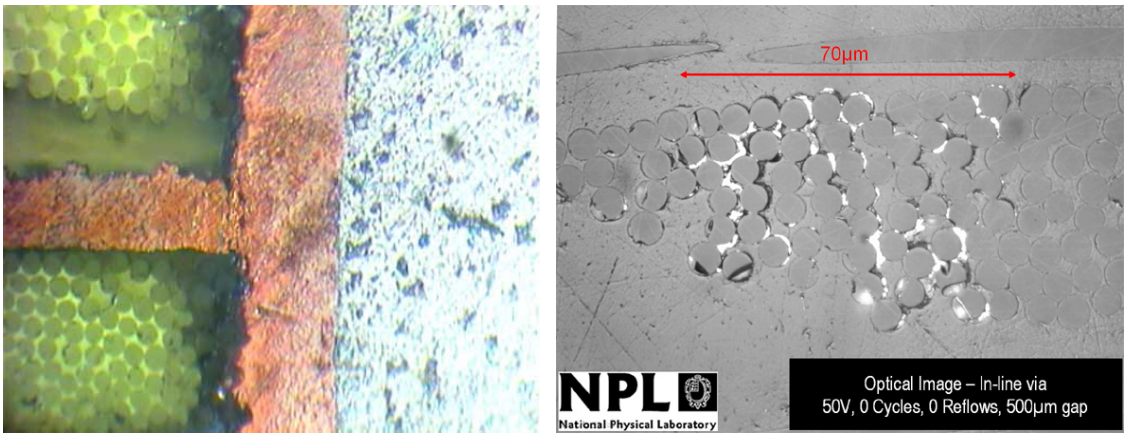
LEADOUT
Low Cost Lead-Free Soldering Technology
to Improve Competitiveness of European SMEs

SMART GROUP

LEADOUT Defect of the Month

Conductive Anodic Filament (CAF)



The first photograph above shows a cross section of a printed board and the glass strands making up part of the laminate. Back lighting the section helps show up the glass strands in the epoxy resin. The second photograph courtesy of NPL shows a section of a glass bundle and separation of the strands with CAF failure.

Conductive Anodic Filament (CAF) is a failure found in printed circuit boards. This can occur under high humility and high voltage gradients found on ever smaller and more closely spaced through hole terminations demanded by design engineers. CAF was highlighted as an issue in the late 70s and has been researched by many engineers including the National Physical Laboratory NPL in England www.npl.co.uk/ei

CAF is a conductive path that forms between two through holes or vias that are closely spaced, the formation follows the glass strand bundles present in the laminate. It is an electrochemical reaction that forms over time between an anode and cathode junction in the epoxy/glass that is used to produce printed circuit boards. It can grow from the anode on one circuit layer to a cathode on another. Although not a dendrite that may be associated with poor cleaning on the surface of the board, the results are the same, a short leading to failure.

If during PCB manufacture the gap between closely spaced vias is decreased CAF can form reducing the resistance between the two junctions. This can be exaggerated by higher humidity, the drilling quality, copper plating wall penetration, fracture of the laminate glass/resin bond, laminate selection and the operating voltage. Recent trials has show the laminates subjected to multiple reflow cycles, high temperatures and circuit layout can all impact the time to failure. It is fair to say that many examples of CAF have never been correctly identified as a point of failure as it is often catastrophic. For further information on CAF and NPL projects go to www.npl.co.uk/ei

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