Tech Brief

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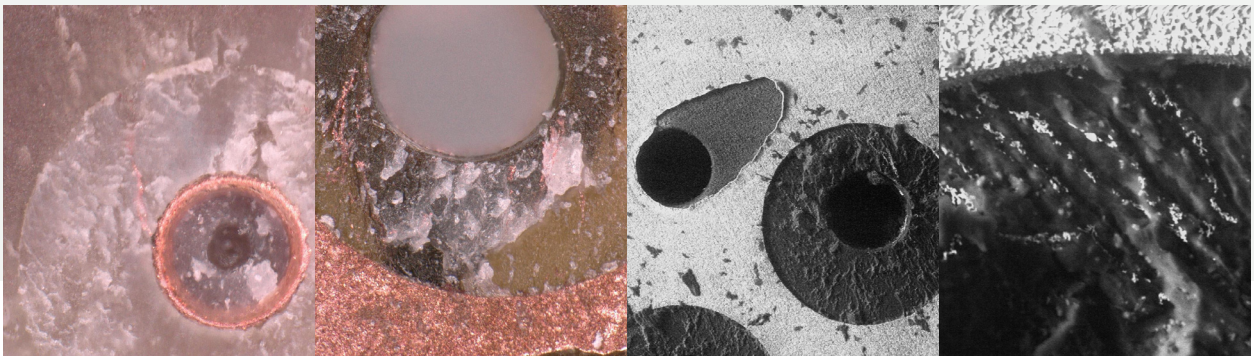

How to Mitigate CAF Dendrite Shorting

Conductive Anodic Filament (CAF) formation is a type of electrochemical migration that forms along the epoxy or glass interface within a PCB. This growth on the board itself causes problems in the form of reduced electrical resistance or internal shorting.

CAF is specific to the internal layers of PCBs because of the way layers of fiberglass and metalization are stacked. This is done repeatedly, with 8-12 layers on a typical bare board. Within these layers, you have copper plating and drilling. Depending on the quality of the drilling process and various bonding and plating issues, voids in the fiberglass/resin may be formed. If not sealed properly, chemicals such as etching acids can get in and facilitate corrosion.

Many factors create CAF dendrite shorting, such as humidity, voltage levels, soldering and reflow. While this problem cannot be completely eliminated, it can be mitigated by process control parameters.

Here are some of the best mitigation strategies:

Rinsing and drying properly — removal of etching acids and other fabrication chemicals is crucial to minimizing risk, as well as fully drying and properly storing bare boards to minimize moisture content.

Monitoring — keeping tabs on your bare boards allows you to watch for growth and catch it before it becomes out of control. SIR testing is well-suited for monitoring CAF formation and lot testing of bare boards for impedance can reveal internal issues prior to assembly.

Assessing the critical part of the laminating process — by assessing this, we can ensure there's good resin flow to create isolation wells for each drill well hole, or via.

Board fabrication defects — fracturing, voids, and mis-registration can create pathways for CAF. Damage during drilling can create these pathways – drill speed, feed rate and other factors influence how likely these issues are to occur.

Decreased conductor spacing, increased voltages, and higher operating temperatures increase the risk of CAF based failures, making PCB manufacturing processes even more critical. While it is a problem we will continue to deal with in this field, it is also a problem that can be alleviated through best practices and its consequences diminished.