



MISTRAS' worldwide leadership in Acoustic Emission (AE) testing is helping to launch another practical application – detecting pad cratering of printed circuit boards. AE testing provides very early-detection and location capabilities prior to electronic signature.

AE PAD CRATERING DETECTION OF PRINTED CIRCUIT BOARDS

PROBLEM

Printed circuit boards help power some of the industry's greatest and most advanced technologies, so ensuring their proper functionality is paramount.

Yet electronics assemblies with large flip-chip BGA packages can be prone to either pad cratering or brittle intermetallic (IMC) failures under excessive printed circuit board bending.

Electrical testing or non-destructive testing methods cannot detect pad cratering cracks, which pose a long-term risk to reliability since cracks may spread under increased loads and subsequently lead to electrical failure. Since the beginning of pad cratering doesn't produce an instantaneous electrical signature, early detection has been an issue.

Currently, the industry is challenged by the inability to detect pad cratering without an explicit electronic signature in an efficient fashion. The process of pad cratering initiates well ahead of actual electronic failure, which gives ample time for detection and location, provided the right diagnostic solution is in place – like Acoustic Emission (AE) testing.

SOLUTION

An Acoustic Emission application was recently developed by CISCO Systems, Inc. to detect the onset of pad cratering. The instantaneous release of elastic energy associated with the initiation and growth of an internal crack produces an acoustic emission, which can be monitored to accurately determine the onset of both pad cratering and brittle intermetallic (IMC) failures. In addition, when detected by multiple sensors, the source of the Acoustic Emission can be located using triangulation techniques.

AE monitoring can detect the rapid release of energy within a material at its earliest stages of breakdown.

By monitoring the surface-mount solder attachments on printed circuit boards, an AE testing system can not only detect pad cratering in its earlier stages, but also:

- Identify the time at which failure initiates prior to electronic signature
- Identify location of AE signals the pad cratering produces
- Quantify the strain at which the event occurs, which can be used as a design tool

IPC STANDARDS WORK

The IPC 6-10d Task Group (Surface Mount Attachment Reliability Test Methods) is developing test guidelines for AE measurement during mechanical testing. The latest update on the process of this document (IPC-9709) can be accessed online at (www.ipc.org).

THE MISTRAS HISTORY

By performing thousands of Acoustic Emission (AE) field tests of a wide variety of structures, MISTRAS has developed an extensive database for interpreting the significance of AE signals as they relate to flaws, cracks and leaks. This experience has produced numerous knowledge-based systems that reach a broad range of industries and exceed customer expectations. Our state-of-the-art AE systems and sensors are manufactured under ISO-9001 Certification and calibrated and maintained by MISTRAS' highly-trained staff.

PERTINENT PUBLICATIONS

- A. Bansal et al, "A New Approach for Early Detection of PCB Pad Cratering Failures", IPC/APEX Conference, Las Vegas, NV, April (2011).
- A. Bansal et al, "Method for Early Detection of PCB Bending Induced Pad Cratering", Engineering Components and Technology Conference (ECTC), Lake Buena Vista, FL, June (2011)
- A. Bansal et al, "Investigation of Pad Cratering in Large Flip-Chip BGA using Acoustic Emission", IPC/APEX Conference, San Diego, CA, February (2012).

WORLDWIDE HEADQUARTERS:

195 Clarksville Rd •
Princeton Jct, NJ 08550 • USA
T: +1.609.716.4000 • F: +1.609.716.0706
E-MAIL: sales@mistrasgroup.com

Visit our website for an office near you
www.mistrasgroup.com

