Failure of Multilayer Ceramic Capacitors Mounted on a Printed Circuit Board Subjected to Bending Test

Hui-Wen Chang[1], Yu-Hsi Huang[2], Ching-Kong Chao[1]

[1]Department of Mechanical Engineering, National Taiwan University of Science and Technology, Chinese Taipei, [1]Department of Mechanical Engineering , National Taiwan University, Chinese Taipei

During the assembly process of electronic components, mechanical stress can cause bending on printed circuit boards, subsequently leading to damage to the components mounted on them. This type of damage poses a threat not only to the reliability and performance of electronic products but also has the potential to increase production and maintenance costs. Therefore, to mitigate the risk of mechanical stress-induced damage to printed circuit boards and components, and to enhance the durability of electronic products. The core objective of this research is to gain an in-depth understanding of the impact of mechanical stress on multi-layer ceramic capacitors placed on printed circuit boards. It involves assessing the effects of stress, particularly from three-point bending tests, on the performance and reliability of these multi-layer ceramic capacitors. The research includes conducting various tests on these capacitors, such as capacitance, dynamic impedance, displacement, strain, and electrical signal measurements. These testing parameters primarily aim to evaluate the health of the capacitors and to detect any signs of damage. Furthermore, non-destructive evaluation and analysis carried out on test specimens subjected to three-point bending tests utilizing 3D X-Ray technology. Observing external and internal structures of multi-layer ceramic capacitors, to identify the presence of cracks or other potential degradation issues. Keywords: multi-layer ceramic capacitors, three-point bending tests, dynamic capacitance values, displacement, strain analysis, electrical signal detection, non-destructive inspection and analysis, cracks, 3D X-ray.