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Effect of stand‑off height on the shear strength of ball grid array solder joints under varying pad sizes

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Abstract
The solder joints of ball grid array utilized in consumer electronics systems or assemblies degrade and fail overtime. Their degree of degradation is more critical, especially at elevated temperatures and mechanical loading conditions. This study presents the effect of component standoff height (CSH) on the shear strength reliability of ball grid array solder joints under different pad sizes. Investigation of the impact of standoff height on the mechanical reliability of the solder joint of ball grid array components under different pad sizes was conducted in this work. Isothermal ageing of test samples were conducted at 150 °C for 8 days. This study focuses on establishing the relationship between CSH and shear strength of the solder joints under different pad sizes and the corresponding effect of prolonged elevated temperature conditions on the mechanical integrity of the soldered joints. The work also identifies the failure mode and examines the region of the failed joints and surfaces to provide information on the morphological characteristics of the material microstructure. The results of this study demonstrate that the smallest pad size (19 mil) gave the lowest shear strength of 61.08 MPa with a high standoff height of 0.25 mm as compared to the largest pad size (24 mil) with the highest shear strength of 70.43 MPa having a relatively low standoff height of 0.22 mm.

Keywords: Stand-off height · Ball grid array · Solder joint · Shear strength · Pad sizes

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