

Influence of shear strength on long term biased humidity reliability of Cu ball bonds

Abstract

This paper compares and discusses the influence of shear strength (in terms of shear-per mils-square) of Au and Cu ball bonds on the biased humidity reliability performance in SOIC 8LD leaded package. Biased (HAST) highly accelerated temperature and humidity stress test, 130 °C, 85 % RH) has been carried out to estimate the long term reliability of Au and Cu ball bonds. Lognormal reliability plots have been plotted for the three legs (control, leg 1 and leg 2) whereby Shear-per-mil-square of 6.68 is identified to have better mean-time-to-failure (t50) compared to other two legs. Open failure from biased HAST 96, 192 h are subjected for secondary electron microscopy cross-sectioning and found typical interfacial CuAl intermetallic compound corrosion microcracking. HAST failure rates have been analyzed and the Cu ball bond lifetime has been established by using Peck model. The obtained Cu ball bond lifetime, of SPMS of 6.68 is >25 years and belongs to wearout reliability data point. This proves significant influence of SPMS on biased HAST failure rate. The higher the ball bond shear strength the lower the failure rate of biased HAST test. Hence, we should implement control on the average SPMS ≥ 7.50 g/mil².

Keywords

Bond lifetime; Failure rate; Reliability data; Secondary electron microscopy