ABSTRACT

EXTREME THERMAL ENVIRONMENTAL TESTS OF PLASTIC ENCAPSULATED COTS

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A number of commercial off-the shelf (COTS) plastic commercial parts from different vendors were purchased and performed extreme thermal cycle (-185 ~ 135°C) tests. The parts were electrically tested and were evaluated before and after the thermal tests using scanning electron microscope (SEM), C-mode scanning acoustic microscope (C-SAM), X-ray, and optical visual microscope. C-SAM is one of the acoustic micro-imaging methods available for non-destructive detection of delamination. Under previous non-thermal studies a number of interesting anomalies and potential defects were found including minimum die attach (10%), voids at the leads within the thinning encapsulant, and mylar tape used in the assembly of the package and the space part prescreening. Anomalies detected by these techniques were analyzed using parts physical constructive analyses to establish the potential application of the plastic packages in space missions. All anomalies and defects were verified. Current studies including constructive physical Analyses (CPA) are focusing on thermal extremes induced failure mechanism that effects device package reliability. The results of this study could lead to understanding the limits of the long-term reliability problems of the improved plastic microelectronic parts especially in extreme thermal cycle environments and lead to better ways to detect failure mechanism and perform device package qualification.