Abstract

"Update on the Qualification of PEMs (Plastic Encapsulated Microcircuits) in Space"

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This paper enumerates many of the common misconceptions and myths that have previously prevented the widespread use of plastic encapsulated microcircuits in space applications. It points out those key parameters and limitations that must be understood (and therefore controlled) before accepting such devices in critical applications. It dispels the fallacies that are often quoted to preclude the use of plastic encapsulated microcircuits in space and presents qualification and reliability data supporting the use of PEMs in space. Finally it addresses some of the heritage that PEMs have achieved in satellite applications.

The areas that are addressed include moisture effects ("popcorn", moisture intrusion, ionic impurities, etc), mass differences, changes in the material properties of the encapsulation materials that may occur under irradiation, shock and vibration effects, and outgassing from common plastic encapsulation materials. Cost will not be addressed as the cost of plastic encapsulated microcircuits suitable for space is not dominated by the cost of the package, but by qualification and data requirements. Data is presented that shows that high quality plastic encapsulated devices exhibit significant advantages over hermetic ceramic packaging, and do so with (at least) equivalent reliability.

Finally this paper addresses futures. Hermetic ceramic packaging has reached the end of its useful life. Future generations of products are demanding packages with over 2,000 I/Os. Decreasing bond pad pitch on the die has exceeded the ability of the contract assemblers to do wire bonding. Flip chip alternative assembly of packages requires the application of an organic underfill, which itself is incompatible with the sealing process temperatures of hermetic assemblies. A progression of future packaging technologies which support the ICs being designed in this millenium is presented.