

## The Application of High Density Electronic Packaging for Spacecraft Cost and Mass Reduction

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It has become clear over the past few years that packaging of spacecraft electronic systems must be improved. Not only have the weight and volume taken-up by conventional packaging and interconnect systems become excessive, but active devices have advanced to the point where system performance is often limited by the packaging. Since electronic systems account for up to 30% of the size and weight budgets of a spacecraft, the utilization of high density electronic packaging will be a very important path to overall spacecraft miniaturization,

In the late 1970's high density interconnection technologies were being introduced into mainframe computer applications. Subsequently, these technologies have been applied to avionic, telecommunication, biomedical and automotive systems. In each application the driving forces behind the adoption of these technologies were; improved electrical performance, miniaturization, reduced power consumption, increased reliability and reduced manufacturing costs. The application of these technologies to planetary missions could provide significant benefits by way of reduced cost and design time if commercial technology and best commercial manufacturing practices are accepted.

A mixed signal telecommunication function will be used as an example to illustrate the potential mass, volume and power reduction achievable with the implementation of high density packaging technologies. We will describe the technology selection tradeoff space and the influence of each constraint on the final design. Results of this study will be given which compare size, performance, cost, risk and system level impact.,

Finally, the technical and cultural obstacles which have inhibited the implementation of these technologies will be discussed. Specifically, the issues of space qualified hardware and technology availability will be addressed. Space qualification is perceived by industry as being the most significant obstacle to the insertion of innovative technologies and in many cases prohibited the use of best commercial practices.