

“Designing for Small Volume Assembly of Advanced Electronic Packages”

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ABSTRACT Ultralow volume SMT printed wiring assemblies are required for space and other high reliability applications. Described herein is a general methodology to Design For Producibility and Reliability (DFPAR) for very small volume production runs. In cases where the entire volume for fabrication and assembly is less than five products, traditional statistical process control (SPC) is inadequate due to reliance on statistics of much larger volumes and the assumption of the central limit theorem (CLT). Data acquisition for process parameter estimation from such a small sample size is difficult but also critical for producing high reliability surface mount assemblies.

Small volume assembly is often as expensive or even more expensive than high volume production to achieve acceptable performance levels. Cost factors such as materials, assembly time, and quality assurance remain important for small volume assembly. The fabrication and assembly of electronic circuit card assemblies (CCAs) and electronic box units at NASA is such an example. The methodology for DFPAR for small volumes discussed here is based on the Taguchi loss function. Five steps will be addressed for the case of assembling low volume, high reliability surface mount assemblies.

There is a need for high reliability surface mount assembly processes for aerospace, military, and medical applications. This approach for improving design for producibility and reliability of electronic system assembly processes can be utilized as a starting framework.