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Void Reduction during Low Pressure Lamination of Electronic Assemblies

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Abstract

Lamination of a populated printed circuit board to a heat sink allows complete testing of each component on the board prior to bonding. This processing approach requires the use of a low temperature, low pressure curing adhesive to avoid damaging board components during the adhesive curing process. However, curing at low pressures may increase the formation of voids at the adhesive interface.

Void content at the interface of the bonding adhesive and rigid substrate can affect critical performance metrics such as thermal transfer, bond strength, and stress decoupling which can ultimately lead to poor device reliability. In this paper, the contribution of substrate size and lamination method on void content is investigated. It is shown that void content increases with increasing air escape path length. Since the voids are pockets of air entrapped during lamination, the best way to minimize void formation at low lamination pressures is to assemble the laminate in the absence of air, i.e., under vacuum.

Differential vacuum pressure lamination (DVPL) is an alternative to the standard vacuum bag process widely utilized today for lamination of populated electronic assemblies. It is shown that the DVPL process dramatically reduces void content at the adhesive interface while maintaining comparable rates of throughput. Data are also provided linking this reduction in void content to improvement in critical performance metrics, demonstrating that using the DVPL process will lead to an increase in component reliability. The experiments were conducted with a commonly used silicone-based, heat cured, thermal interface adhesive, Arlon's G2p Thermabond®.